February 2022

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Credit Suisse Global Investment Returns Yearbook 2022

Article intended for glanduca.odes.ac.cr



Elroy Dimson, Paul Marsh, Mike Staunton

Thought leadership from Credit Suisse and the world's foremost experts

Introduction

We are delighted to publish the 14th edition of the Credit Suisse Global Investment Returns Yearbook produced in collaboration with Professor Elroy Dimson of Cambridge University, Professor Paul Marsh and Dr. Mike Staunton of London Business School. It remains a body of work of which we are exceptionally proud at Credit Suisse, with the unrivalled breadth and quality of its underlying data making it the global authority on the long-run performance of financial assets.

At present, investors are being forced to re-examine the economic parameters that have hitherto shaped much of their investment thinking and professional careers, namely an environment of low inflation and interest rates and abundant liquidity. We believe the Yearbook provides a unique historical perspective to assist asset allocation decisions as we witness a shift from conditions that have proved so supportive for financial assets in the world since the Global Financial Crisis to a potentially less benign backdrop.

To address the key question as to what such a regime shift means for portfolios, the study allows readers to specifically examine stock and bond returns across the full spectrum of inflationary outcomes experienced by the core Yearbook countries stretching across 122 years of history. We can also assess the impact of the associated interest rate hiking cycles. One simple conclusion is that returns deteriorate for both asset classes as inflation rises. This will come as no surprise to bond investors, but there is a firm reminder that equities are not the oft-described "inflation hedge."

While the Yearbook never seeks to provide year-to-year projections for markets, it does help frame appropriate longer-term return assumptions, with the findings shaping the modelling of our own researchers. A halt to the seemingly inexorable fall in real yields and the implicit cost of equity removes a powerful factor that has led to a repricing of equities. It has rewarded "duration" in all its guises. However, being barely positive, risk-free rates still remain exceptionally low historically



and, as the study underlines, should typically serve as an anchor for return expectations for stocks and bonds going forward. With risk free rates close to zero, return projections are essentially a reflection of the reward for risk.

In this year's edition, the authors present a deep-dive into the topic of portfolio diversification or, as the eminent Harry Markowitz once described it, "the only free lunch in finance." Their analysis confirms that the risk-reduction benefits from international and cross-asset diversification remain material over time although they caution against undue complacency. However, in the current environment, a topical question is whether diversification helps in crises. Stock and country diversification does appear to suffer from higher correlation in the short term, though proves less concerning in the longer term. But there is much to be had in crisis periods from cross-asset diversification and in that respect pro-active asset allocation strategies.

We trust you will find this year's edition as insightful as ever and that it helps you navigate through the new investment challenges in 2022.

Axel P. Lehmann
Chairman of the Board of Directors
Credit Suisse Group AG

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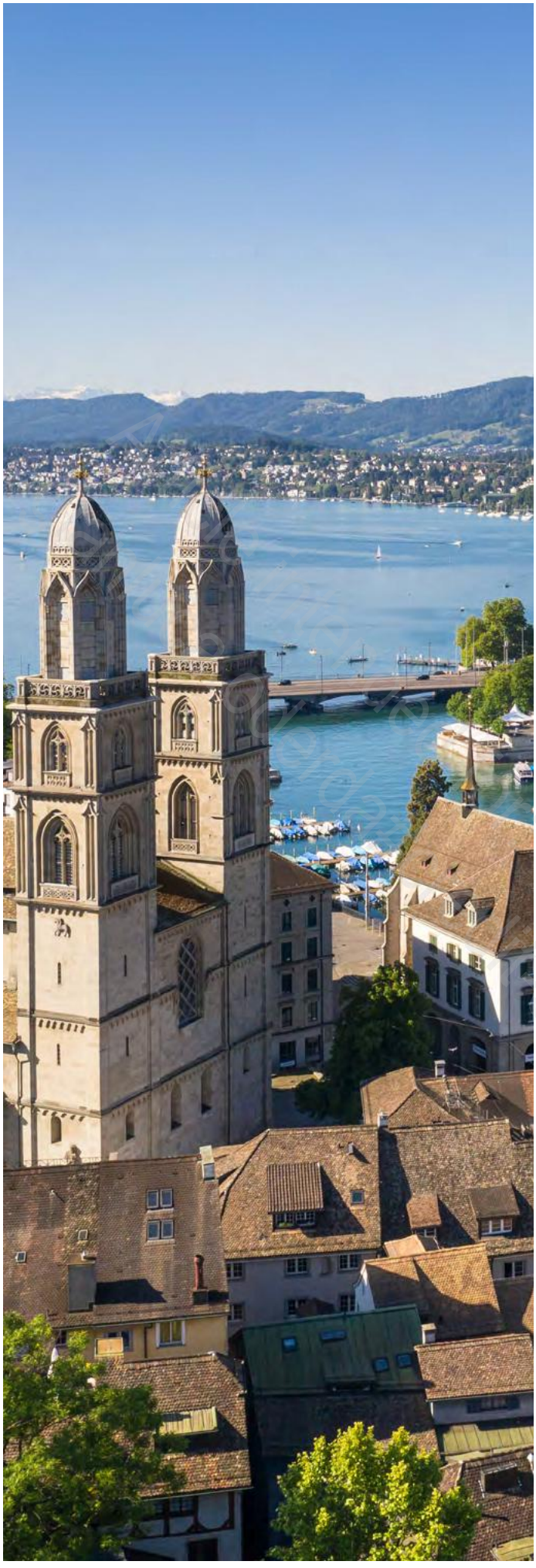

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ISBN 978-3-033-09081-1

See page 261 for copyright and acknowledgement instructions, guidance on how to gain access to the underlying data, and for more extensive contact details.

Chapter 1: Historical perspective

This chapter explains the purpose of the Yearbook – learning from financial history – and using it to shed light on issues facing investors today, such as rising inflation and rising interest rates. It describes the coverage of the Yearbook – now expanded to 35 countries – and its underlying database. It provides historical perspective on the evolution of equity and government bond markets since 1900, and the industrial transformation that accompanied this.

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Introduction

The Credit Suisse Global Investment Returns Yearbook documents long-run asset returns to help investors learn from the past. Each annual edition adds a further year of data and experience – the long-run is, after all, just a long sequence of short-run periods from the past. Each year brings its own surprises, rewards, setbacks, and inevitably, new investment concerns.

Imagine an investor who slept through 2021, perhaps after reading last year's Yearbook. Awaking on New Year's Day 2022, our investor was told the year had been dominated by new strains of COVID-19, a global supply chain crisis, a surge in energy prices, the rapid return of inflation, the prospect of an end to easy money and a rate hiking cycle, together with concerns that stocks and bonds may no longer be providing a hedge for each other. Against this unpromising background, imagine the investor's surprise when told that global equities gave a return of 18% in 2021, while US stocks returned 25%. In contrast, world bonds fell by 4%.

The American writer Kurt Vonnegut said that "History is merely a list of surprises. It can only prepare us to be surprised yet again." While there is some truth in this, long-run financial history has much more to offer than just to ready us for the next surprise.

The purpose of the Yearbook

The Yearbook documents and analyzes global investment returns over the last 122 years since 1900. Its aim is to use financial history to shed light on issues facing investors today. Various quotes sum up this aim. The philosopher George Santayana said, "Those who cannot remember the past are condemned to repeat it." Historian Niall Ferguson observed, "The past is our only reliable guide to the present and to the multiple futures that lie before us, only one of which will actually happen." Our favorite quotation is from Winston Churchill who said, "The longer you can look back, the farther you can look forward."

Currently, investors have many concerns, but top of the list comes inflation. Last year, we reported that, in 2020, the average inflation rate across the 21 countries for which we have continuous data since 1900 was just 0.4%, its lowest level since 1934. In 2021, that figure rose more than tenfold to 4.4%, with US inflation hitting 7%, and UK and German inflation exceeding 5%. The worry is not just about inflation, but about the cure for inflation and that this heralds the end of ultra-loose monetary policy. Some central banks have already raised interest rates and the all-important Federal Reserve is expected to embark on a hiking cycle shortly.

The Yearbook can enhance our understanding of these issues thanks to its comprehensive and lengthy database. The long period that it spans saw two world wars, civil wars, revolutions, pandemics, crises, slumps, the Great Depression, bear markets, periods of inflation and deflation, and hiking cycles. It also saw times of recovery, growth, and booms; easing cycles and times of looser money; and extended periods of peace, prosperity, and technological advance.

In Chapter 2, we look at the history of inflation around the world and at how stocks and bonds have performed during different inflationary regimes. It is often stated that equities are a hedge against inflation, and we examine this claim. In fact they are not, but over the long run, they have been an excellent inflation beater.

We also examine how stocks, bonds and bills have performed during hiking and easing cycles. There have been stark differences, with hiking cycles proving the more challenging for asset returns. Another topical concern we address is the stock-bond correlation. While over the last two decades investors have grown used to stocks and bonds providing a hedge for each other, we show that this is rather exceptional in the context of the longer-run history.

These are the concerns "du jour," but new ones will emerge in 2022. Whatever they may be, the Yearbook provides a rich resource. For example, it provides extensive evidence on the market impact of crises, the duration of market declines and the time to recovery, the impact of fiscal and monetary stimuli on stock and bond prices, the effects of increases and decreases in real interest rates, the impact of low real interest rates on future expected returns, the likely future risk premium, the speed with which we can expect market volatility to revert to "normal", and what the meaning of normal is in financial markets.

The Yearbook database

The core of the Credit Suisse Global Investment Returns Yearbook is the long-run DMS database (Dimson, Marsh, and Staunton, 2022). This provides annual returns on stocks, bonds, bills, inflation and currencies for 35 countries. We believe the unrivalled breadth and quality of its underlying data make the Yearbook the global authority on the long-run performance of stocks, bonds, bills, inflation and currencies. The Yearbook updates and greatly extends the key findings from our book "Triumph of the Optimists."

Of the 35 countries, 23 (the DMS 23) have 122-year histories from 1900 to 2021. Over the last two years, we have added a further 12 markets, with start dates in the second half of the 20th century, with either close to, or more than

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50 years of data. Together with the DMS 23, these make up the DMS 35. We feature these 35 individual markets in Chapter 9, where we present detailed information and historical performance statistics, and list our data sources.

In addition, we monitor 55 additional markets for which we have equity returns data for periods ranging from 13 to 47 years. We also have inflation, currency and market capitalization data, but not yet bond or bill returns. These 55 countries, taken together with the DMS 35, provide a total of 90 developed and emerging markets (the DMS 90), which we use for constructing our long-run equity indexes.

Figure 1 shows the consolidated dataset of 90 markets. The vertical axis lists the markets, ranked by the number of years for which we have data. We include markets only if we have at least a decade of returns. The horizontal axis runs from 1900 to 2021 inclusive. Prior to 1950, the units of time are demi-decades; from 1950 onward, time is measured in years.

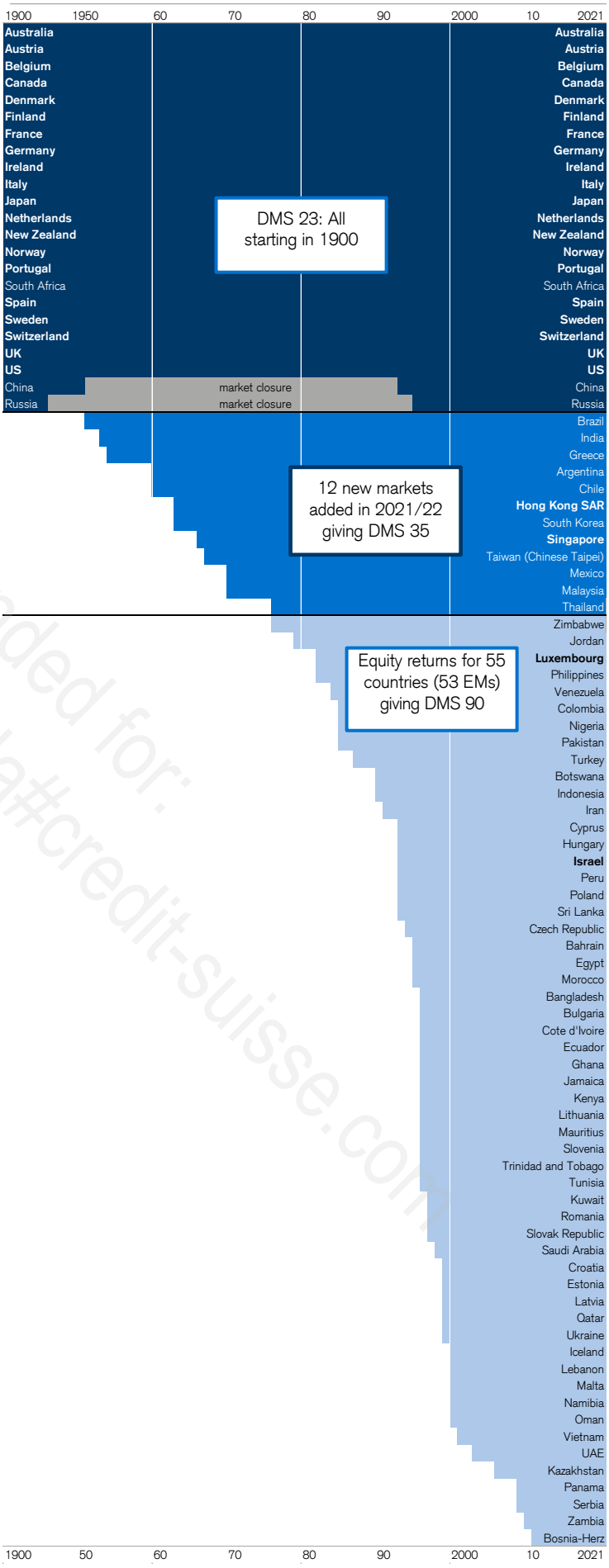
The shading in the chart denotes three levels of coverage. The top panel shows the 23 Yearbook countries for which we have data for all asset classes starting in 1900. The DMS 23 comprise the United States and Canada, ten eurozone countries (Austria, Belgium, Finland, France, Germany, Ireland, Italy, the Netherlands, Portugal and Spain), six other European countries (Denmark, Norway, Russia, Sweden, Switzerland and the United Kingdom), four Asia-Pacific markets (Australia, China, Japan and New Zealand) and one African market (South Africa). All have continuous histories except China and Russia. Both had long market closures following total losses to investors after the communist revolutions. They resume when their markets reopened in the early 1990s.

New countries added in 2021/22

The middle panel shows the 12 new markets added in 2021/22, seven from Asia, four from Latin America and one from Europe. Unlike the DMS 23, these markets do not start in 1900, but in the second half of the 20th century. They were added to enhance our emerging market (EM) coverage. All 12 were EMs at their start dates. However, both Hong Kong SAR and Singapore have now long been regarded as developed markets (DMs). In **Figure 1**, we show countries deemed to be DMs today in bold typeface. All the DMS 23 are currently DMs, except for China, Russia and South Africa.

Eight of the new markets have long-established stock exchanges dating back well over a century: Argentina (1854), Brazil (1890), Chile (1893), Greece (1876), Hong Kong SAR (1890), India (1875), Mexico (1894) and Singapore (1911). Unfortunately, we have been unable to obtain

Figure 1: Markets in the DMS long-term dataset, 1900–2021



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total returns data back to the origins of these exchanges. However, we have assembled 62 years of data for Argentina since1960, 71 years of data for Brazil since 1951, 62 years of data for Chile since 1960, 68 years for Greece since 1954, 59 years for Hong Kong SAR since 1963, 69 years for India since 1953, 53 years for Mexico since 1969 and 56 years for Singapore since 1966.

The other four markets have stock exchanges that were established after World War II, and we have total return series that span almost the entire period since they opened. Thus we have 52 years of data for Malaysia since 1970, 59 years of data for South Korea since 1963, 55 years for Taiwan (Chinese Taipei) from 1967 and 46 years for Thailand from 1976.

The bottom panel of **Figure 1** shows the 55 additional markets. Just two of these are today deemed developed, i.e. Luxembourg, where its exchange opened in 1928, but where our data starts more recently, and Israel, which was promoted to developed status by MSCI in 2010. The remaining 53 markets are all today classified as EMs or frontier markets.

The DMS database also includes five composite indexes for equities and bonds denominated in a common currency, here taken as US dollars. These cover the World, World ex-USA, Europe, Developed markets and Emerging markets. The equity indexes are based on the full DMS 90 universe and are weighted by each country's market capitalization. The bond indexes are based on the DMS 35 and are weighted by gross domestic product (GDP). The five composite indexes all have a full 122-year history starting in 1900.

Together, at the start of 2022, the DMS 35 markets made up 98.7% of the investable equity universe for a global investor, based on free-float market capitalizations. Our 90-country world equity index spans the entire investable universe. We are not aware of any other world index that covers as many as 90 countries.

Most of the DMS 35 and all the DMS 23 countries have experienced market closures at some point, mostly during wartime. In almost all cases, it is possible to bridge these closures and construct a returns history that reflects the experience of investors over the closure period. Russia and China are exceptions. Their markets were interrupted by revolutions, followed by long periods of communist rule. Markets were closed, not just temporarily, but with no intention of reopening, and assets were expropriated.

For 21 countries, we thus have a continuous 122-year history of investment returns. For Russia and China, we have returns for the pre-communist era, and for the period since these markets reopened in the early 1990s.

The expropriation of Russian assets after 1917 and Chinese assets after 1949 could be seen as wealth redistribution, rather than wealth loss. But investors at the time would not have warmed to this view. Shareholders in firms with substantial overseas assets may also have salvaged some equity value, e.g. Chinese companies with assets in Hong Kong (now Hong Kong SAR), and Formosa (now Taiwan (Chinese Taipei)). Despite this, when incorporating these countries into our composite indexes, we assume that shareholders and bondholders in Russia and China suffered total losses in 1917 and 1949. We then re-include these countries in the indexes after their markets re-opened in the early 1990s.

The DMS 23 series all commence in 1900, and this common start date aids international comparisons. Data availability and quality dictated this start date, which proved to be the earliest plausible date that allowed broad coverage with good quality data (see Dimson, Marsh, and Staunton, 2007).

Financial markets have changed and grown enormously since 1900. Meanwhile, over the last 122 years, the industrial landscape has changed almost beyond recognition. In the following sections, we look at the development of equity markets over time, including the split between DMs and EMs, how government debt for different countries has evolved, and at the Great Transformation that has occurred in industrial structure due to technological change.

The evolution of equity markets

Although stock markets in 1900 were rather different from today, they were not a new phenomenon. The Amsterdam exchange had already been in existence for nearly 300 years; the London Stock Exchange had been operating for over 200 years; and five other markets, including the New York Stock Exchange, had been in existence for 100 years or more.

Figure 2 (overleaf) shows the relative sizes of equity markets at the end of 1899 (left panel) and how this had changed by end-2021 (right panel). Today the US market dominates its closest rival and accounts for 60% of total world equity market value. Japan (6.2%) is in second place, the UK (3.9%) in third position, while China is in fourth position (3.6%) after underperforming the world index by 46% in 2021. France, Switzerland, Canada and Germany each represent between two and three percent of the global market, followed by Australia, Taiwan (Chinese Taipei), India and South Korea, all with 1.4%–2% weightings.

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In **Figure 2**, 12 of the DMS 35 countries – all those accounting for around 1½% or more of world market capitalization – are shown separately, with the remaining 23 Yearbook markets grouped together as "Smaller DMS 35" with a combined weight of 8.2%. The remaining area of the right-hand pie chart labeled "Not in DMS 35" shows that the 35 Yearbook countries now cover all but 1.3% of total world market capitalization. This remaining 1.3% is captured within the DMS 90 and is made up almost entirely of emerging and frontier markets.

Note that the right-hand panel of **Figure 2** is based on the free-float market capitalizations of the countries in the FTSE All-World index, which spans the investable universe for a global investor. Emerging markets represent a higher proportion of the world total when measured using full-float weights or when investability criteria are relaxed (see Dimson, Marsh and Staunton (2021)).

The left panel of **Figure 2** shows the equivalent breakdown at the end of 1899. At the start of the 20th century, the UK equity market was the largest in the world, accounting for almost a quarter of world capitalization, and dominating the USA (15%). Germany (13%) ranked third, followed by France, Russia, and Austria-Hungary. Again, 11 Yearbook countries are shown separately, while the other 12 countries for which we have data for 1900 are aggregated and labeled "Smaller DMS 23" countries.

In total, the DMS database covered over 95% of the global equity market in 1900. The countries representing the missing 4.7% labeled as "Not in DMS 23" have been captured in later years by the 12 new markets added in 2021/22 and the full DMS 90 database. However, we do not have returns data for these markets back in 1900.

Survivorship bias

A comparison of the left- and right-hand sides of **Figure 2** shows that countries had widely differing fortunes over the intervening 122 years. This raises two important questions. The first relates to survivorship bias. Investors in some countries were lucky, but others suffered financial disaster or very poor returns. If countries in the latter group are omitted, there is a danger of overstating worldwide equity returns.

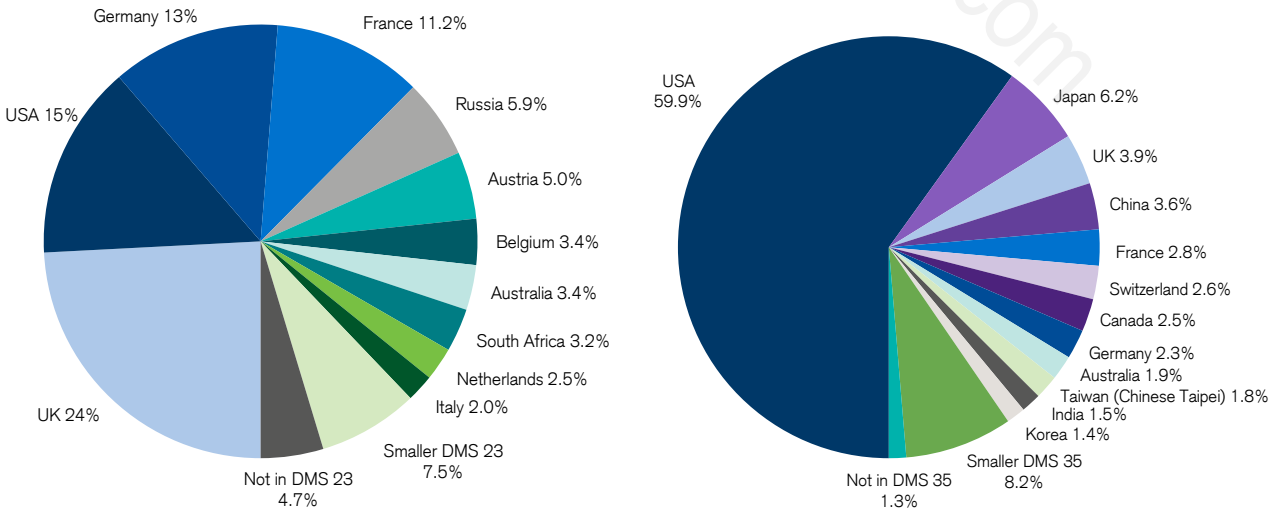
Austria and Russia are small markets today, accounting for just 0.06% and 0.34% of world capitalization. Similarly, China was a tiny market in 1900, accounting for 0.34% of world equities. In assembling the DMS database, it might have been tempting to ignore these countries, and to avoid the considerable effort required to assemble their returns data back to 1900. However, Russia and China are the two best-known cases of markets that failed to survive, and where investors lost everything. Furthermore, Russia was a large market in 1900, accounting for some 6% of world market capitalization. Austria-Hungary was also large in 1900 (5% of world capitalization) and, while it was not a total investment disaster, it was the worst-performing equity market and the second worst-performing bond market of our 21 countries with continuous investment histories.

Ensuring that the DMS database contained returns data for Austria, China, and Russia from 1900 onward was thus important in eliminating survivorship and "non-success" bias.

Success bias

The second and opposite source of bias, namely success bias, is even more serious. **Figure 3** provides insight on this by showing the evolution of equity market weightings for the entire world

Figure 2: Relative sizes of world stock markets, end-1899 (left) versus start-2022 (right)



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equity market over the last 122 years. It shows the equity market share for 12 key countries, with other markets aggregated into the "Other" category. In this, and the charts that follow, countries are identified by their ISO 3166 alpha-3 country codes. Mostly, these three-character abbreviations map onto the country's name. For a full list of ISO codes, see page 250.

Figure 3 shows that the US equity market overtook the UK early in the 20th century and has since been the world's dominant market, apart from a short interval at the end of the 1980s, when Japan briefly became the world's largest market. At its peak, at start-1989, Japan accounted for 40% of the world index, versus 29% for the USA. Subsequently, Japan's weighting has fallen to just 6%, reflecting its poor relative stock-market performance. The USA has regained its dominance and today comprises 60% of total world capitalization.

The USA is by far the world's best-documented capital market. Prior to assembly of the DMS database, the evidence cited on long-run asset returns was almost invariably taken from US markets and was typically treated as being universally applicable. Yet organized trading in marketable securities began in Amsterdam in 1602 and London in 1698, but did not commence in New York until 1792.

Since then, the US share of the global stock market has risen from zero to 60%. This reflects the superior performance of the US economy, the large volume of IPOs, and the substantial returns from US stocks. No other market can rival this long-term accomplishment. But this makes it dangerous to generalize from US asset returns since they exhibit "success bias." This is why the Yearbook focuses on global returns.

The emergence of equity markets

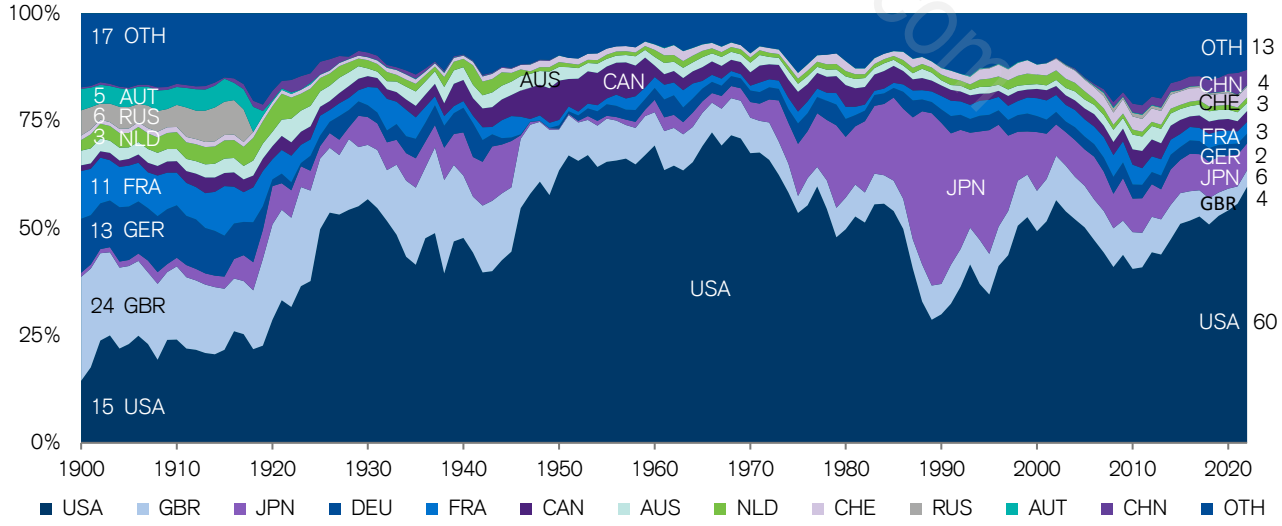
It is interesting to examine the emergence of markets over time, and how EMs have performed relative to DMs. As we have already noted, all but three of the DMS 23 countries are today classified as DMs. However, back in 1900, several countries that we today regard as developed would then have been classified as emerging. Indeed, if we go back far enough in time, even the USA was an emerging market.

The terms "emerging markets" and "emerging economies" first "emerged" in the early 1980s and are attributed to World Bank economist Antoine van Agtmael (Agtmael, 2007). Before then, investors mostly used the arguably more accurate term "less developed" – as there is no guarantee that markets will emerge. However, "emerging markets" moved into the lexicon, perhaps because of its more optimistic overtone.

Investors today rely on the major index providers to classify markets into DMs, EMs, and frontier markets. They employ multiple criteria. MSCI uses 23 variables, FTSE Russell employs 13, and S&P ten, with ten more used if a change is indicated. Despite the varying criteria, there is substantial agreement on the boundary between DMs and EMs. There is less agreement on the border line between EMs and frontier markets. In the Yearbook, we focus simply on developed markets versus those with developing status, grouping EMs and frontier markets together and referring to them generically as "EMs."

An emerging market is not the same as an emerging economy. When the International Monetary Fund (IMF) classifies countries into advanced and developing economies, it focuses

Figure 3: The evolution of equity markets over time from end-1899 to start-2022



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mostly on economic criteria such as GDP per capita, export diversification, and the degree of integration into the global financial system.

Index compilers also use economic criteria, but they use capital market criteria as well, such as market size, liquidity and accessibility to global investors. This involves considering openness to foreign ownership, ease of capital inflows and outflows, investor rights, regulatory frameworks, and issues such as the ability to sell short. Investor and market opinion also matter.

The use of capital market criteria means that some economies that the IMF deems developed are still categorized by the index companies as EMs, most notably South Korea and Taiwan (Chinese Taipei). The biggest difference between MSCI and other index providers is that MSCI views South Korea as emerging, whereas FTSE Russell and S&P categorize it as developed. One reason why MSCI considers South Korea – and all index compilers deem Taiwan (Chinese Taipei) – to be emerging is because their foreign-exchange markets are not fully liberated.

To analyze historical data, we need a way to identify whether a market was a DM or EM for each year in the past. From the start of MSCI's EM index in 1987, we adopt MSCI's annual classification of developed versus not-yet-developed markets. Before 1987, we use our own algorithm to determine which markets were DMs and which were EMs.

In 2010, the Yearbook noted that, despite the complexity of index compilers' procedures, there was a simple rule that replicated classification decisions accurately. This was to categorize countries as developed if they had per capita GDP above USD 25,000. Given the success of this rule, we apply it to historical data adjusting for US inflation to obtain the equivalent cut-off for earlier years.

For the 23 countries in our database in 1900, seven would have been deemed EMs: China, Finland, Japan, Portugal, Russia, South Africa and Spain. Three are still classified as emerging today – 122 years later – namely, China, Russia and South Africa. Using the GDP per capita rule, we estimate that Finland would have moved to developed in 1932, Japan in 1967 and Spain in 1974, while Portugal would still be emerging today (despite being promoted to developed by the index providers in 1997–98).

Looking at other countries, Hong Kong moved from emerging to developed in 1977, Singapore in 1980 and Israel in 2010. South Korea is on the cusp using our criterion, which helps explain why index providers differ in its categorization.

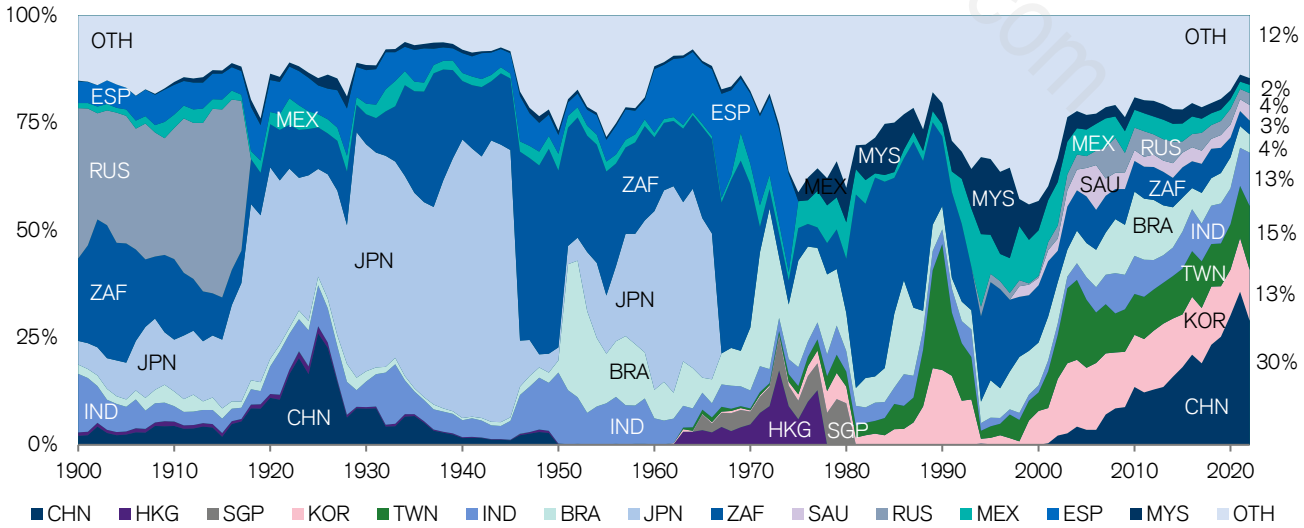
Some countries have gone backwards. Chile and Argentina would have been deemed DMs in 1900, but by the 1950s, Chile had slipped to emerging, while Argentina followed in 1975, and is today an MSCI "Standalone" market, below EM status. Greece was promoted to DM in 2001, but has since been demoted back to EM.

These moves reflect the shifting fortunes of countries, but it is striking that there have been so few shifts from EM to DM over 122 years. The outstanding success stories are obvious, but it is easy to forget the problems that have afflicted once highly promising countries such as Argentina, Nigeria, Venezuela, and Zimbabwe.

The evolution of emerging markets

Markets experience periods of success and setback. We saw in **Figure 3** how the world equity market (mostly DMs by weighting) has

Figure 4: The evolution of emerging markets 1900–2021



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evolved over the last 122 years. In **Figure 4,** we examine the proportions of the worldwide emerging equity market represented in each year by individual countries.

This chart is based on the DMS 90 population of countries, where only countries classified as EMs are included each year. It covers all the countries shown in the legend back to 1900 or to the start date of the country's stock exchange if this was after 1900. For many countries, we have country capitalization data long before we have equity returns data.

Figure 4 shows a volatile pattern highlighting four aspects of emerging market history. First, there are major events such as revolutions, wars, and crises. The communist revolutions led to the complete disappearance of Russia and China; they reappear when markets re-opened in the early 1990s. Similarly, the Japanese market was decimated by World War II, while the Spanish market was severely attenuated by the Spanish Civil War. Moving to more recent times, the chart shows the impact of the Asian Financial Crisis in the late 1990s.

Second, there are sharp falls to zero weighting (and the country disappearing from the chart) when the market is promoted from EM to DM. The chart shows this happening at the end of 1965 for Japan, 1973 for Spain, 1976 for Hong Kong SAR and 1979 for Singapore.

Third, there are occasional booms or declines, e.g. Japan's boom post World War II and China's astonishing growth since the early 1990s. The chart also shows a turbulent history for Brazil and Mexico, including several slumps.

Finally, the chart shows those markets that emerged in most cases during the latter part of the 20th century, most notably India, South Korea, Taiwan (Chinese Taipei) and especially China. Each major EM's end-2021 weighting is shown on the right-hand side of the chart.

China is by far the largest EM today. Its weight in the EM indexes has grown rapidly from 3% in the early 2000s to 30% today, down from 37% at the end of 2020 due to the poor performance of the Chinese market during 2021. With the gradual inclusion of A-shares, its weighting is expected to grow further. Just as the USA dominates DMs, China is preeminent among EMs. After China, and based on MSCI's categorizations, the largest EMs are Taiwan (Chinese Taipei), India, South Korea, Brazil, South Africa, Saudi Arabia and Russia.

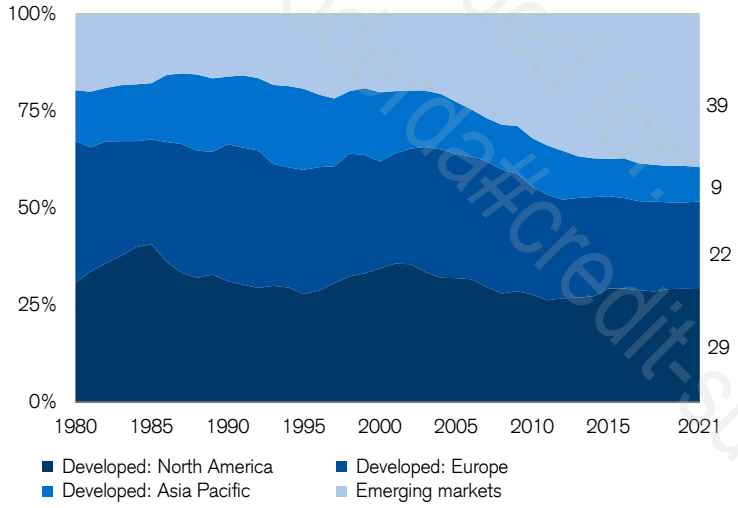
EM and DM weightings

Developing countries matter. They account for 87% of the world's population (nearly seven times that of DMs) and 77% of its land mass (over three times that of DMs). The top panel of **Figure 5** shows how their share of GDP has grown since 1980. This chart aggregates the DMS 90 countries into four blocs. Three relate to DMs in Asia-Pacific, Europe and North America. The remaining (light-shaded) bloc consists of all EMs. The EM group accounted for 39% of world GDP at market exchange rates by end-2021, up from 20% in 1980.

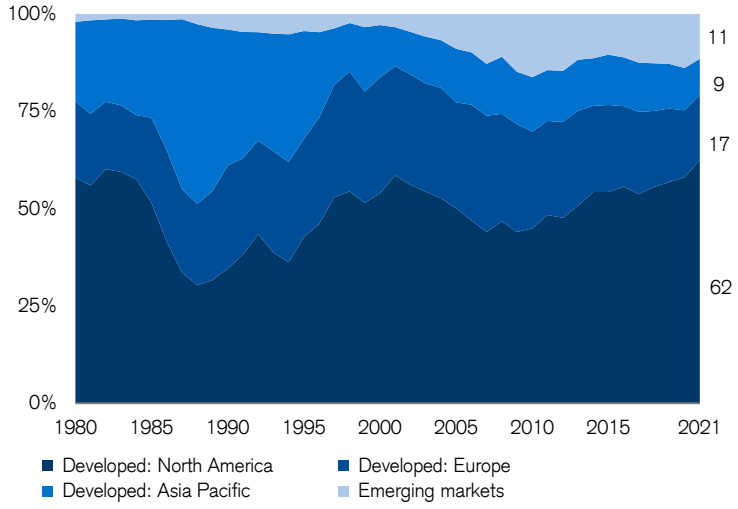
The lower panel of **Figure 5** shows the weightings assigned to EMs in global indexes. At just under 11.5%, the end-2021 index weightings are less than a third of the corresponding GDP weights. While the EM GDP weightings have continued to grow, their weighting in the global index is now lower than it was at the end of 2010 when it hit 16.3%.

Figure 5: EM versus DM weightings, 1980–2021

(a) GDP weights (at market exchange rates)



(b) Weightings in global equity indexes



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The low EM weightings relative to GDP are explained by the focus of index compilers on the investable universe from the perspective of a global investor. While the weightings are market-capitalization-based, they understate the full market capitalizations for three reasons.

First, they exclude or underweight markets or segments that are difficult to access because of constraints on foreign ownership or other regulatory restrictions; e.g. until 2018, the large Chinese A-share market was excluded from the MSCI Emerging Markets Index, while, even now, it has only a partial weighting in A-shares.

Second, index compilers screen out individual stocks deemed hard to deal in, typically because of their low free-float and/or poor liquidity. This has a proportionately greater impact on EM versus DM weightings as a greater proportion of EM stocks fail the free-float and liquidity hurdles.

Finally, and very importantly, since the start of the 21st century, index compilers have moved to free-float weighting. This involves excluding shares that are not at present freely available for trading from market capitalization calculations.

Free-float weightings are much lower for EMs than DMs, because of the far-higher proportion of state-owned enterprises, greater crossholdings, and larger founder stakes. In the 2019 Yearbook, we reported that the weighted-average free-float in the USA was around 96%, while in both the UK and Switzerland, it exceeded 90%. In contrast, China and India both had free-floats below 50%, while Russia's free-float was below 40%. When markets were weighted by size, the average float for EMs (42%) was less than half that for DMs (89%).

In summary, if there were no exclusions, restrictions or the application of free-float weighting, we estimate that the overall weighting of EMs would be far higher than the 11.5 shown in the lower panel of **Figure 5**.

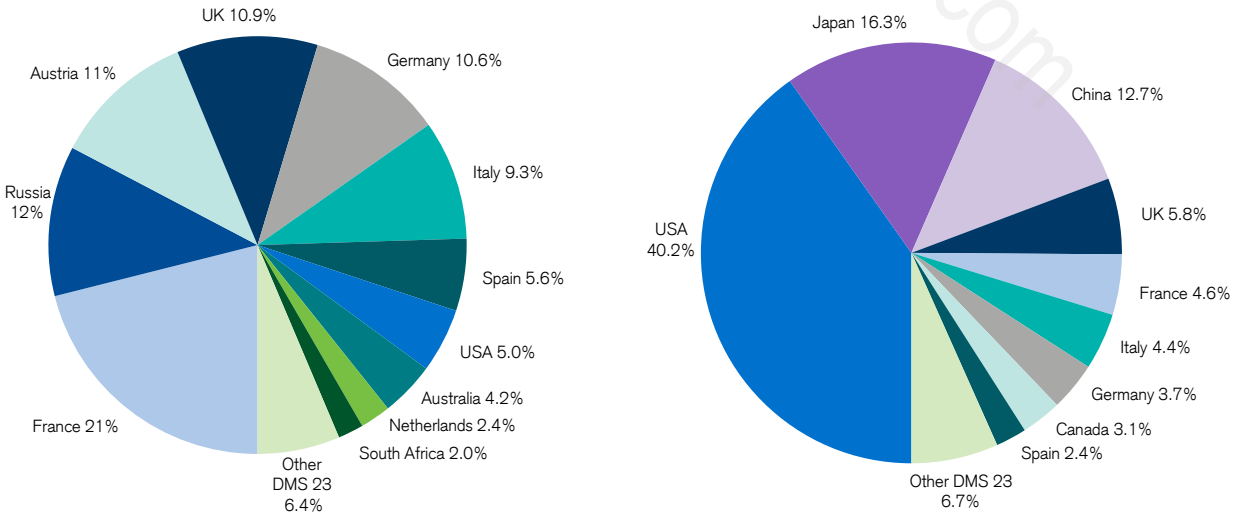
The remaining puzzle from **Figure 5** is why EMs have a lower weighting in world indexes today than a decade ago. This is not because of promotions from EM to DM as the only MSCI promotion over this period was Israel, with a tiny weighting. Instead, the explanation is that EMs have underperformed DMs (especially the USA) over this period, while EM equity issues were insufficient to overcome this underperformance.

The evolution of government bond markets

At the end of June 2021, the value of world bonds was USD150 trillion, greater than the (full-float) value of world equities at some USD105 trillion. Bonds are clearly a very important asset class, and they feature prominently in the Yearbook. The Yearbook focuses on sovereign bonds, providing historical returns on long maturity government bonds as well as very-short-term treasury bills.

Just as the shifting fortunes of nations have changed the composition of the world equity market, there have been equivalent changes in the make-up of the world sovereign bond market. The right-hand side of **Figure 6** shows the composition of the government bond market today for the DMS 23 countries. These countries currently account for 85% of the value of world sovereign bonds (the DMS 35 accounts for 92%). Our data are taken from the Bank for International Settlements (BIS, 2022).

Figure 6: Relative sizes of government bond markets, end-1899 (left) versus mid-2021 (right)



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As with the global equity market, the USA dominates, accounting for 40% of total value. Japan ranks in second place, followed by China. These three countries together account for almost 70% of the total. The UK is in fourth place, followed by France, Italy, Germany, Canada and Spain. The remaining 12 countries are grouped together under "Other DMS 23."

These figures are for sovereign bonds. For total debt, including corporate bonds, the percentage shares and the rankings are similar, although China takes second place from Japan, and Germany and Canada move ahead of Italy.

The left-hand side of **Figure 6** shows the position 122 years earlier at the start of 1900. Our data is taken from the International Monetary Fund's Historical Public Debt Database (HPPD) (IMF, 2010). Unlike the BIS data used for mid-2021, the HPPD dataset shows total central government debt rather than government debt securities. While this includes sovereign bonds, it is a broader measure representing the stock of all government liabilities. It includes all debt instruments, including loans, debt securities, currency and deposits, other accounts payable, and insurance, pension and standardized guarantee schemes.

Figure 6 shows that the situation in 1900 was very different from today. Perhaps surprisingly, France was the most indebted nation, representing 21% of the total for the DMS 23 countries. It was followed by Russia at 12%, Austria (then Austria-Hungary), the UK and Germany, all at around 11%, Italy at 9%, Spain at 6% and the USA at just 5% of the total.

Figure 7 shows the evolution of national shares of government debt from 1900 to the present day. Russia and China are omitted over the periods when their capital markets were closed. The chart shows that there were dramatic shifts in the pattern of government indebtedness at the end of World War I, and again during and following World War II. It also clearly shows the emergence of the USA as a major borrower from the end of World War I, then Japan from the 1970s and finally China over the last two decades.

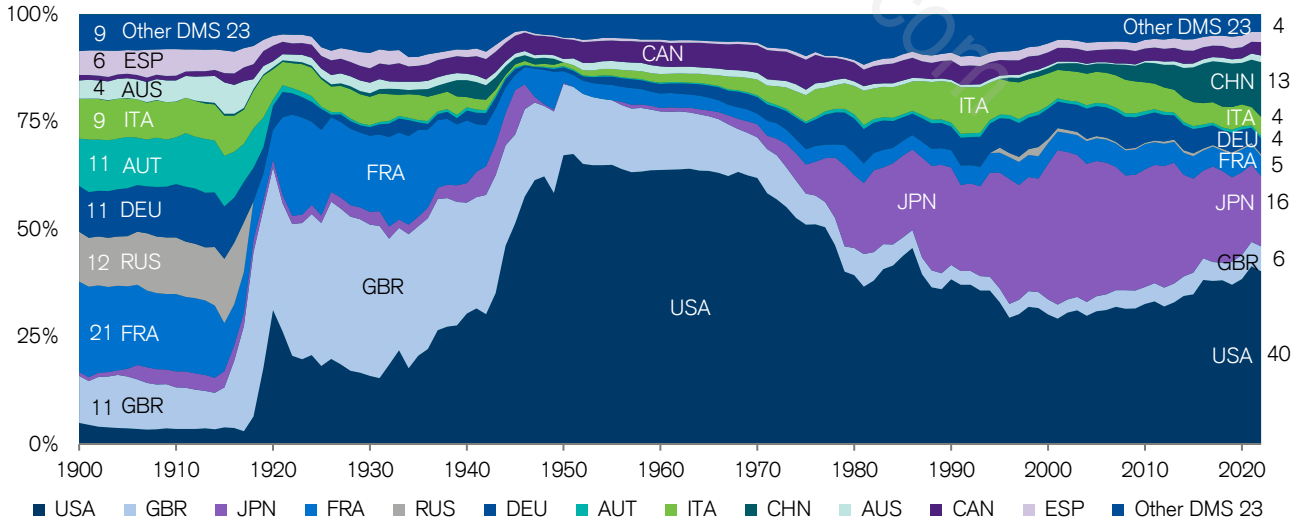
Index weightings

For the five Yearbook composite indexes, countries need to be allocated appropriate weights at the start of each year. For our equity indexes, we follow standard practice and use country market-capitalization weights. In line with the major index providers, country weights since 2000 are free-float adjusted.

The use of market capitalization weights for equity indexes has a theoretical underpinning since, according to the capital asset pricing model, such a benchmark is the mean-variance-efficient portfolio if you do not have special insight into the value of any particular security.

By analogy, we might consider weighting the composite bond indexes by the debt weightings shown in **Figure 7**. These are book values, not market values, at least until the last few years. They are based on total government debt rather than sovereign bonds and, while they contain the latter, they include bonds of all maturities rather than the longer-dated bonds that we feature in the Yearbook. Nevertheless, they are the closest proxy available for market value debt weights.

Figure 7: The evolution of government debt over time from end-1899 to mid-2021



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However, market value weighting for bond indexes does not have the same theoretical justification as for equity indexes. For market value weighted bond portfolios to be efficient, bonds would need to represent wealth within the overall economy. However, controversy continues as to whether government bonds do represent wealth (see Barro, 1974). Arguably, net wealth in bonds is zero because for every borrower there must be a lender.

Clearly, some form of weighting scheme is required for bond indexes, otherwise tiny countries will receive the same weight as the USA, China or Japan. In the Yearbook, we have chosen to weight our composite bond indexes by the size of each country's economy, i.e. by its GDP converted to USD at market exchange rates.

Figure 8 shows the evolution of the relative sizes of the DMS 23 countries' economies over time. The pattern over time is somewhat smoother than for the country indebtedness numbers in **Figure 7**.

A strong argument against using debt weights for bond indexes is summed up by what Larry Siegel (2003) calls the "bums problem." This is particularly acute for corporate bonds, but also applies to sovereign bonds. The "bums problem" is that sovereign bond indexes that are weighted by government debt – by definition – give the greatest weight to the countries that are most indebted. The quality of these debts and the countries' ability to service and ultimately repay them is often not proportional to the size of the debt burden.

To check whether the "bums problem" would show up in our bond indexes, we computed our world bond index using two alternative weighting schemes, and compared the annualized returns over the period 1900–2020. Using debt weights, as in **Figure 7**, the annualized return was 53 basis points lower than that obtained using GDP weights, as in **Figure 8**. Furthermore, this downward bias was not just a feature of the turbulent first half of the 20th century. The annualized return from using debt weights was 54 basis points lower from 1940–49 and 52 basis points lower thereafter.

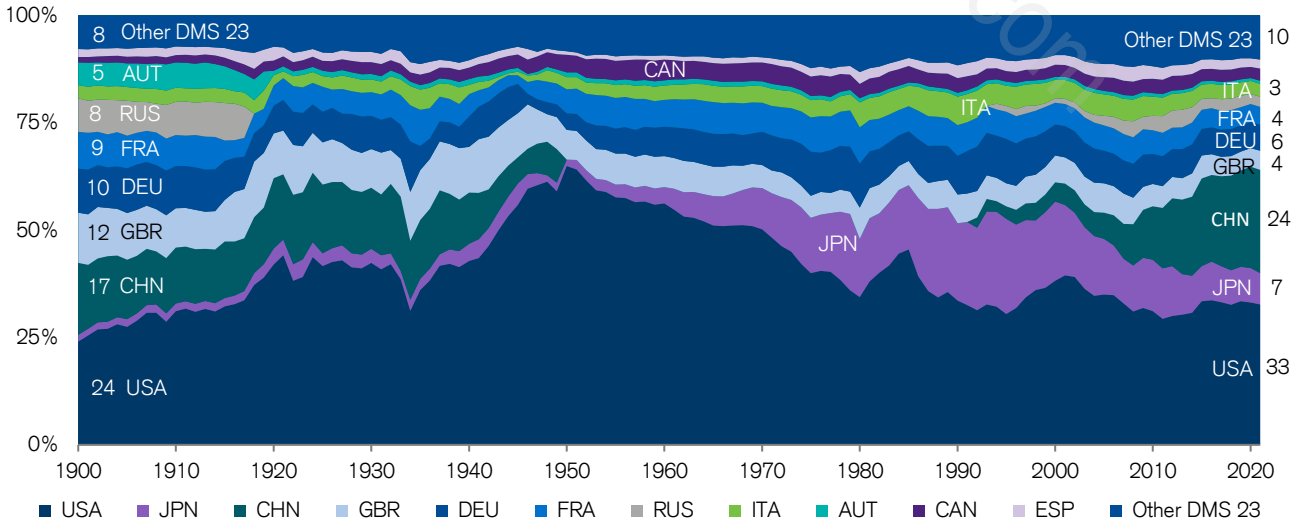
The great industrial transformation

At the start of 1900 – the start date of our global returns database – virtually no one had driven a car, made a phone call, used an electric light, heard recorded music, or seen a movie; no-one had flown in an aircraft, listened to the radio, watched TV, used a computer, sent an e-mail, or used a smartphone. There were no x-rays, body scans, DNA tests or transplants, and no-one had taken an antibiotic; as a result, many would die young.

Mankind has enjoyed a wave of transformative innovation dating from the Industrial Revolution, continuing through the Golden Age of Invention in the late 19th century, through to today's information revolution. This has given rise to entire new industries: electricity and power generation, automobiles, aerospace, airlines, telecommunications, oil and gas, pharmaceuticals and biotechnology, computers, information technology, and media and entertainment.

Meanwhile, makers of horse-drawn carriages and wagons, canal boats, steam locomotives, candles and matches have seen their industries

Figure 8: The evolution of relative GDP over time from end-1899 to start-2022



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decline. There have been profound changes in what is produced, how it is made, and the way in which people live and work.

These changes can be seen in the shifting composition of the firms listed on world markets. **Figure 9** shows the industrial composition of listed companies in the USA and UK. The upper two charts show the position at the start of 1900, while the lower two show the start of 2022. Markets at the beginning of the 20th century were dominated by railroads, which accounted for 63% of US stock market value and almost 50% in the UK. 122 years later, railroads have declined almost to the point of stock-market extinction, representing less than 1% of the US market and close to zero in the UK.

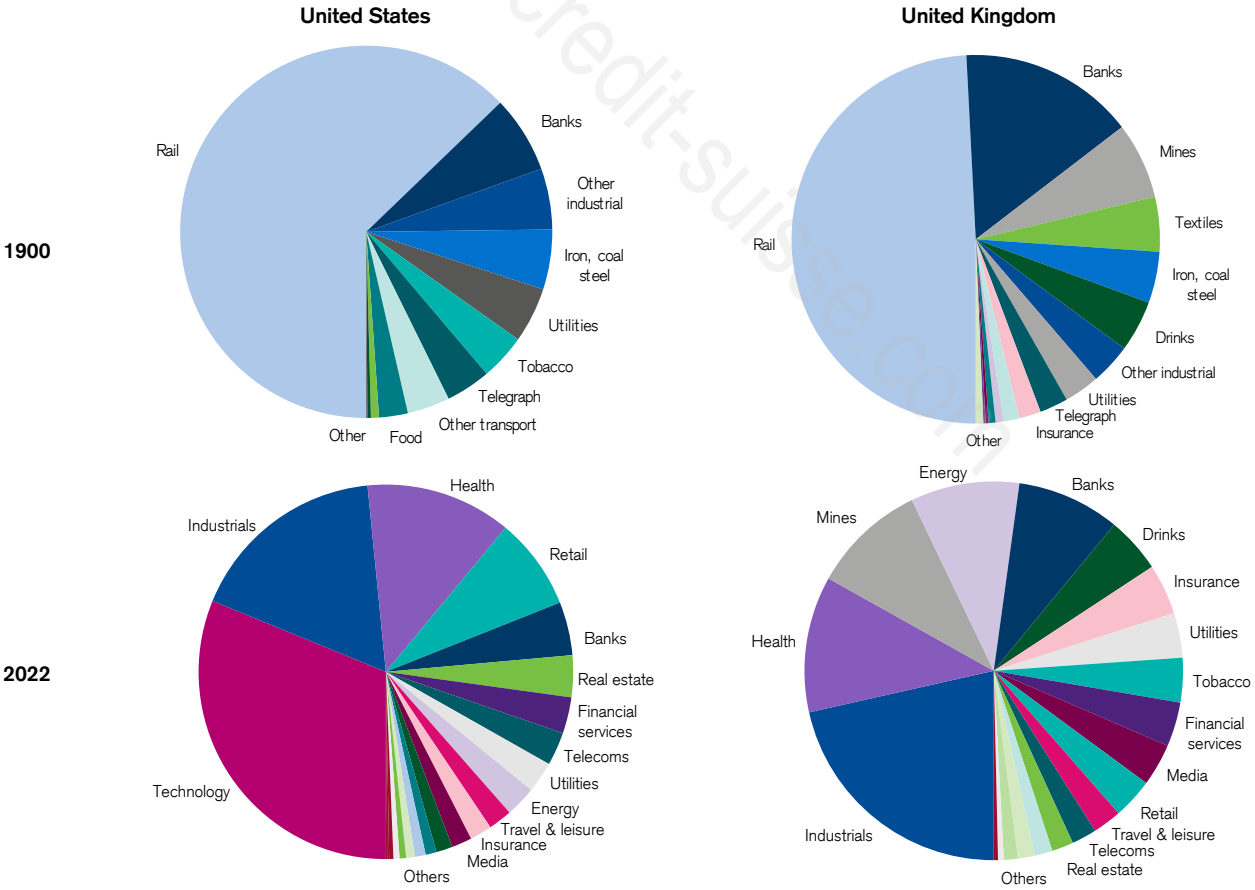
Of the US firms listed in 1900, more than 80% of their value was in industries that are today small or extinct; the UK figure is 65%. Besides railroads, other industries that have declined precipitously are textiles, iron, coal and steel. These industries still exist, but have largely moved to lower-cost locations in the emerging world. Yet similarities between 1900 and 2022 are also apparent. The banking and insurance industries continue to be important.

Similarly, such industries as food, beverages (including alcohol), tobacco, and utilities were present in 1900 just as they are today. And, in the UK, quoted mining companies were important in 1900 just as they are in London today.

But many industries that initially seem similar have changed radically. For example, compare telegraphy in 1900 with smartphones in 2022. Both were high-tech at the time. Or contrast other transport in 1900 – shipping lines, trams, and docks – with their modern counterparts, airlines, buses and trucking. Similarly, within industrials, the 1900 list of companies includes the world's then-largest candle maker and the world's largest manufacturer of matches.

Another statistic that stands out from **Figure 9** is the high proportion of today's companies that come from industries that were small or non-existent in 1900: 63% by value for the USA and 44% for the UK. The largest industries in 2021 are technology (in the USA, but not the UK), the catch-all group of industrials, healthcare, oil and gas, banking, mining (for the UK, but not the USA), insurance, other financials and retail. Of these, oil and gas, technology and healthcare (including pharmaceuticals and biotechnology)

Figure 9: Industry weightings in the USA (left) and UK (right), start-1900 compared with start-2022



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were almost totally absent in 1900. Telecoms and media, at least as we know them now, are also new industries.

Our analysis relates only to exchange-listed businesses. Some industries existed throughout the period, but were not always listed. For example, there were many retailers in 1900; but, apart from the major department stores, these were often small local outlets rather than national and global retail chains like Walmart or Tesco, or online global giant Amazon. Similarly, in 1900, a higher proportion of manufacturing firms were family-owned and unlisted.

In the UK and other countries, nationalization has also caused entire industries – railroads, utilities, telecoms, steel, airlines and airports – to be delisted, often to be re-privatized later. We included listed railroads, for example, while omitting highways that remain largely state-owned. The evolving composition of the corporate sector highlights the importance of avoiding survivorship bias within a stock market index, as well as across indexes (see Dimson, Marsh and Staunton, 2002).

In the 2015 Yearbook, we asked whether investors should focus on new industries – the emerging industries – and shun the old declining sectors. We showed that both new and old industries can reward as well as disappoint. It all depends on whether stock prices correctly embed expectations. For example, we noted above that, in stock-market terms, railroads were the ultimate declining industry in the USA in the period since 1900. Yet, over the last 122 years, railroad stocks have beaten the US market, and outperformed both trucking stocks and airlines since these industries emerged in the 1920s and 1930s.

Indeed, the research in the 2015 Yearbook indicated that, if anything, investors may have placed too high an initial value on new technologies, overvaluing the new, and undervaluing the old. We showed that an industry value-rotation strategy helped lean against this tendency and had generated superior returns.

Concluding remarks

The Credit Suisse Global Investment Returns Yearbook documents long-run asset returns to help investors learn from the past and to shed light on the issues facing investors today.

2021 brought high rewards for equity investors, and somewhat disappointing returns for those investing in bonds. It also brought new concerns. These included fast-rising inflation in many key markets, fears about monetary tightening, and a worry that equities and bonds might no longer be acting as a hedge for each other.

All three of these issues are addressed later in the Yearbook, illustrating the power of the Yearbook database and research to help enlighten current concerns. The Yearbook, of course, addresses a host of other issues that, while not currently at the front of investors' minds, may become salient during 2022.

Over the last two years, we have added 12 new markets to our database, greatly expanding our coverage of emerging markets. We have also added two new composite indexes covering developed and emerging markets back to 1900. The Yearbook now covers 35 markets and five composite indexes in detail. Twenty-three of the countries and all five indexes span the 122-year period since 1900. We have also added more recent supplementary data on equity returns for a further 55 countries, thus expanding our coverage to 90 markets.

We believe the unrivalled breadth and quality of its underlying database make the Yearbook the global authority on stocks, bonds, bills, inflation and currencies.

In this chapter, we have examined the evolution of both equity and government bond markets over time, including the emergence of markets, and the split between developed and emerging markets. In addition, we have examined the industrial transformation since 1900 that accompanied this. We have noted that, if anything, investors may have placed too high an initial value on new technologies, overvaluing the new and undervaluing the old.

We have also discussed the important issues of both survivorship and success bias, and the measures we have taken to address these. We explain why it is dangerous to generalize from US asset returns since they exhibit "success bias." This is why the Yearbook focuses on global returns.

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Chapter 2: Long-run asset returns

Many people consider the long term to be ten or 20 years. This chapter explains that much longer periods than 20 years are needed to understand risk and return in stocks and bonds, because markets are so volatile. The chapter summarizes the long-run returns on stocks, bonds, bills and inflation over the last 122 years. In a concluding discussion, we show that higher levels of inflation have been associated with lower performance from stocks and bonds. Finally, we report that asset returns have been superior when interest rates are eased, whereas they have been lower during periods of rising interest rates.

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Photo: Paris, France; Getty Images, ElOjoTorpe

Why a long-term perspective is needed

To understand risk and return, we must examine long periods of history. This is because asset returns, and especially equity returns, are volatile. This is readily illustrated by recent history. The 21st century began with one of the most severe bear markets in history. The damage inflicted on global equities began in 2000 and, by March 2003, US stocks had fallen 45%, UK equity prices halved and German stocks fell by two-thirds. Markets then staged a remarkable recovery that reduced and, in many countries, eliminated the bear-market losses.

World markets hit new highs at the end of October 2007, only to plunge again in another epic bear market fueled by the Global Financial Crisis. Markets bottomed in March 2009 and then staged another impressive recovery. Yet, in real terms, it took until 2013 for many of the world's largest markets to regain their start-2000 levels. Global equities then rose, with relatively few setbacks, for more than a decade. Meanwhile, volatility stayed remarkably low, albeit with occasional spikes. When markets are calm, we know there will be a return to volatility and more challenging times – we just cannot know when.

"When" proved to be in March 2020 as soon as the COVID-19 pandemic sent stocks reeling once again, falling by more than a third in many countries. Volatility skyrocketed to levels even higher than those seen during the Global Financial Crisis. The world experienced its third bear market in less than 20 years. Markets then staged a remarkable recovery and volatility fell once again.

The volatility of markets means that, even over long periods, we can still experience "unusual" returns. Consider, for example, an investor at the start of 2000 who looked back at the 10.5% real annualized return on global equities over the previous 20 years and regarded this as "long-run" history, and hence providing guidance for the future. But, over the next decade, our investor would have earned a negative real return on world stocks of –0.6% per annum.

The demons of chance are meant to be more generous. Investors who hold equities require a reward for taking risk. At the end of 1999, investors cannot have expected, let alone required, a negative real return from equities; otherwise, they would have avoided them. Looking in isolation at the returns over the first 22 years of the 21st century tells us little about the future expected risk premium. In the first decade, investors were unlucky and equity returns were attenuated by two deep bear markets. This was a brutal reminder that the very nature of the risk for which they sought a reward means that events can turn out poorly, even over multiple years. In the second decade, investors were lucky; markets recovered quickly from the Global Financial Crisis, which was followed by more than a decade of strong returns. They then recovered even faster from the initial falls during the COVID-19 pandemic.

At the same time, the returns over the last two decades of the 20th century also revealed nothing very useful when taken in isolation. These returns must surely have exceeded investors' prior expectations and thus provided too rosy a picture of the future. The 1980s and 1990s were a golden age. Inflation fell from its highs in the 1970s and early 1980s, which lowered interest rates and bond yields. Profit growth accelerated and world trade and economic growth expanded. This led to strong performance from both equities and bonds.

Long periods of history are also needed to understand bond returns. Over the last 40 years, our world bond index has provided an annualized real return of 6.4%, not far below the 7.4% from world equities. Yet, today, long sovereign bonds in most developed countries are selling on prospective real yields that are close to zero or negative. Extrapolating bond returns from the last 40 years into the future would be foolish. That was a golden age for bonds, just as the 1980s and 1990s were a golden age for equities.

However, golden ages, by definition, are exceptions. To understand risk and return in capital markets – a key objective of the Yearbook – we must examine periods much longer than 20 or even 40 years. This is because stocks and bonds are volatile, with major variation in year-to-year returns. We need very long time series to support inferences about investment returns.

Since 1900, there have been several golden ages, as well as many bear markets; periods of great prosperity as well as recessions, financial crises and the Great Depression; periods of peace and episodes of war. Very long histories are required to hopefully balance out the good luck with the bad luck, so that we obtain a realistic understanding of what long-run returns can tell us about the future.

In the remainder of this chapter, we document the long-run history of stocks, bonds, bills, and inflation since 1900 based on the DMS 35 countries and five composite indexes. Throughout the chapter, we distinguish between the 21 countries where we have full 122-year financial histories starting in 1900; the two other countries with 1900 start dates, but which have broken histories, Russia and China; and the DMS 12 countries which have start dates in the second half of the 21st century.

Credit Suisse Global Investment Returns Yearbook 2021 Summary Edition

Equity returns since 1900

The top left panel of **Figure 10** shows the cumulative total return from stocks, bonds, bills and inflation from 1900 to 2021 in the world's leading capital market, the United States. Equities performed best. An initial investment of USD 1 grew to USD 87,928 in nominal terms by end-2021. Long bonds and Treasury bills gave lower returns, although they beat inflation. Their respective index levels at the end of 2021 are USD 364 and USD 78, with the inflation index ending at USD 33. The chart legend shows the annualized returns. Equities returned 9.8% per year versus 5.0% on bonds, 3.6% on bills and inflation of 2.9% per year.

Since US prices rose 33-fold over this period, it is more helpful to compare returns in real terms. The top right panel of **Figure 10** shows the real returns on US equities, bonds and bills. Over the 122 years, an initial investment of USD 1, with dividends reinvested, would have grown in purchasing power by 2,698 times. The corresponding multiples for bonds and bills are 11.2 and 2.4 times the initial investment, respectively. As the legend to the chart shows, these terminal wealth figures correspond to annualized real returns of 6.7% on equities, 2.0% on bonds, and 0.7% on bills.

The chart shows that US equities totally dominated bonds and bills. There were severe setbacks of course, most notably during World War I; the Wall Street Crash and its aftermath, including the Great Depression; the OPEC oil shock of the 1970s after the 1973 October War in the Middle East; and the two bear markets in the first decade of the 21st century. Each shock was severe at the time. At the depths of the Wall Street Crash, US equities had fallen by 80% in real terms. Many investors were ruined, especially those who bought stocks with borrowed money. The crash lived on in the memories of investors for at least a generation, and many subsequently chose to shun equities.

The top two panels of **Figure 10** set the Wall Street Crash in its long-run context by showing that equities eventually recovered and gained new

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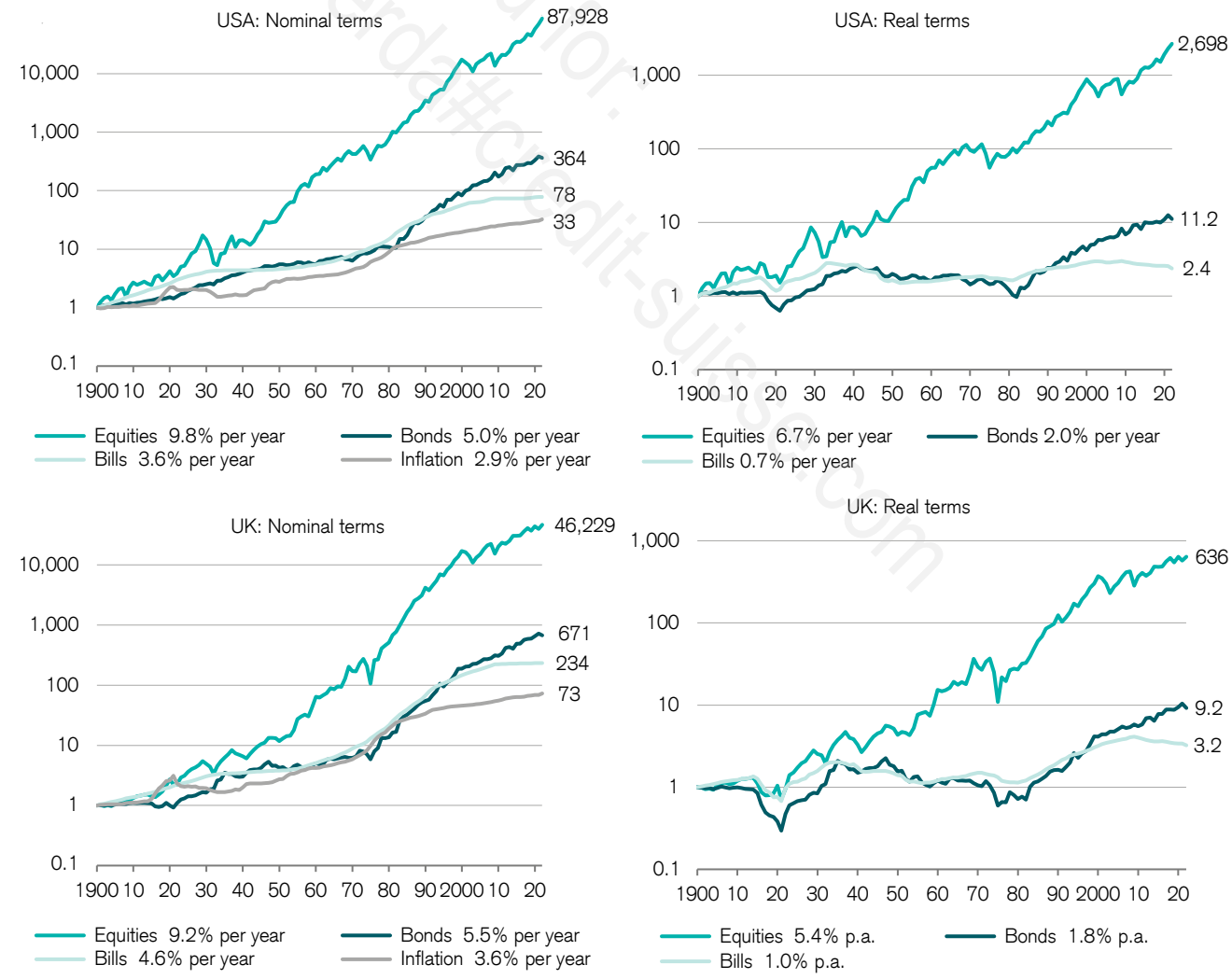
Figure 10: Cumulative returns on US and UK asset classes in nominal terms (left); real terms (right), 1900–2021



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highs. Other dramatic episodes, such as the October 1987 crash, hardly register; the COVID-19 crisis does not register at all since the plot is of annual data, and the market recovered and hit new highs by year-end; the bursting of the technology bubble in 2000 and the Global Financial Crisis of 2007–09 show on the chart, but are barely perceptible. Besides revealing impressive long-run equity returns, the chart sets the bear markets of the past in perspective. Events that were traumatic at the time now just appear as setbacks within a longer-term secular rise.

We cautioned above about generalizing from the USA, which, over the 20th century, rapidly emerged as the world's foremost political, military and economic power. By focusing on the world's most successful economy, investors could gain a misleading impression of equity returns elsewhere or of future returns for the USA.

The bottom two panels of **Figure 10** show the corresponding charts for the UK. The right-hand chart shows that, although the real return on UK equities was negative over the first 20 years of the 20th century, the story thereafter was one of steady growth broken by periodic setbacks. Unlike the USA, the worst setback was not during the Wall Street Crash period, but instead in 1973–74, the period of the first OPEC oil squeeze following the 1973 October War in the Middle East. UK bonds also suffered in the mid-1970s due to inflation peaking at 25% in 1975.

The chart shows that investors who kept faith with UK equities and bonds were eventually vindicated. Over the full 122 years, the annualized real return on UK equities was 5.4%, versus 1.8% on bonds. As in the USA, equities greatly outperformed bonds, which in turn gave higher returns than bills. These returns are high, although below those for the USA. However, for a more complete view, we need to look at investment returns across all countries.

Long-run returns around the world

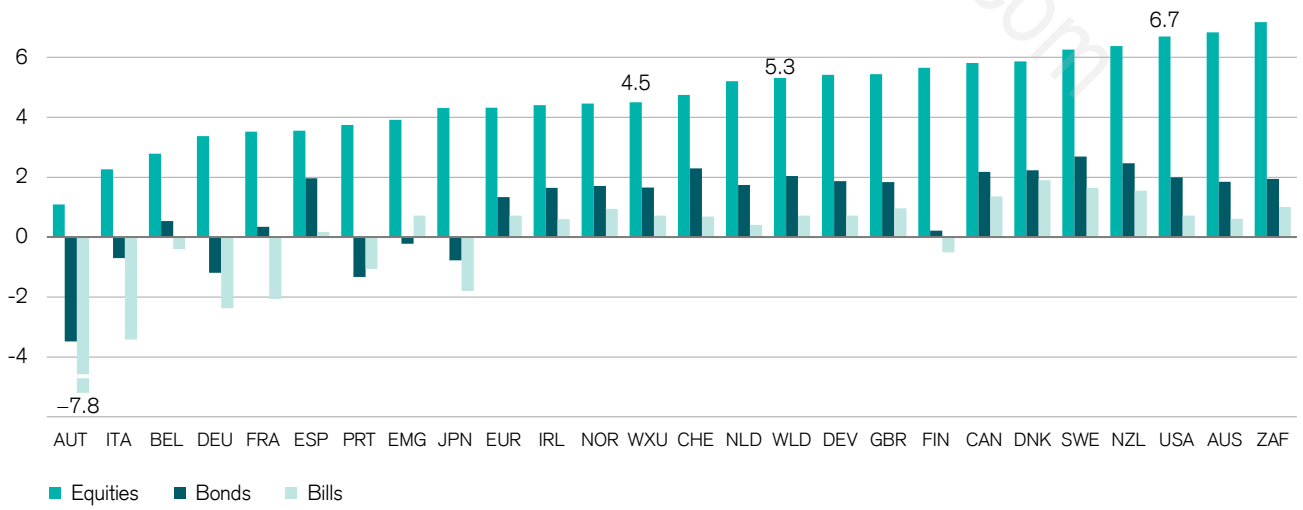
Figure 11 shows annualized real equity, bond and bill returns over the last 122 years for the 21 Yearbook countries with continuous investment histories plus the five composite indexes, namely, the World index (WLD), the World ex-USA index (WXU), the Europe index (EUR), the Developed Markets index (DEV) and the Emerging Markets index (EMG) ranked in ascending order of equity market performance. The real equity return was positive everywhere, typically around 3% to 6% per year.

Equities were the best-performing asset class everywhere. Furthermore, bonds outperformed bills in every country except Portugal. This overall pattern, of equities outperforming bonds and bonds beating bills, is what we would expect over the long haul since equities are riskier than bonds, while bonds are riskier than cash.

Figure 11 shows that, while most countries experienced positive real bond returns, five had negative returns. Mostly, countries with poor bond returns were also among the worst equity performers. Their poor performance arose during the first half of the 20th century. These were the countries that suffered most from the ravages of war and from periods of high or hyperinflation associated with the wars and their aftermath.

Figure 11 shows that the USA performed well, ranking third for equity performance (6.7% per year) and sixth for bonds (2.1% per year). However, these are local currency real returns. As we show in Chapter 3, in common currency terms, the USA had the best performing equity

Figure 11: Real annualized returns (%) on equities versus bonds and bills internationally, 1900–2021



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market in the world and ranked fifth for bonds. This confirms our earlier conjecture that US returns would be high since the US economy has been such an obvious success story, making it unwise for investors around the world to base future projections solely on historical US evidence.

The real return on US equities of 6.7% contrasts with the real USD return of 4.5% on the World-ex USA index. This difference of 2.2% per year, when compounded over 122 years, leads to a large difference in terminal wealth. A dollar invested in US equities in 1900 resulted in a terminal value of USD 2,698 in terms of real purchasing power (see **Figure 10**). An equivalent investment in stocks from the rest of the world gave a terminal value of USD 215 (see **Figure 134** in Chapter 9), less than a tenth of the US value.

A common factor among the best-performing equity markets over the last 122 years is that they tended to be resource-rich and/or New World countries. The worst-performing markets were afflicted by international or civil wars.

Long-run real equity returns

Table 1 provides statistics on long-run real equity returns. The top panel covers the 21 countries for which we have continuous histories from 1900 to 2021. The geometric means in the third column show the 122-year annualized returns and these are the figures that were plotted in **Figure 11**.

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Table 1: Real (inflation-adjusted) equity returns around the world, 1900–2021

Country	Start year	Geometric mean (%)	Arithmetic mean (%)	Standard error (%)	Standard deviation (%)	Minimum return (%)	Minimum year	Maximum return (%)	Maximum year
Countries and indexes with continuous histories since 1900									
Australia	1900	6.8	8.3	1.6	17.4	–42.5	2008	51.5	1983
Austria	1900	1.1	5.2	2.8	30.4	–59.6	1924	132.7	1921
Belgium	1900	2.8	5.4	2.1	23.5	–48.9	2008	105.1	1919
Canada	1900	5.8	7.2	1.5	16.8	–33.8	2008	55.2	1933
Denmark	1900	5.9	7.7	1.9	20.7	–49.2	2008	107.8	1983
Finland	1900	5.6	9.4	2.7	29.3	–61.5	1918	161.7	1999
France	1900	3.5	6.0	2.1	22.8	–41.5	2008	66.1	1954
Germany	1900	3.4	8.1	2.8	31.1	–90.8	1948	154.6	1949
Ireland	1900	4.4	7.0	2.1	22.7	–65.4	2008	68.4	1977
Italy	1900	2.3	6.1	2.5	28.1	–72.9	1945	120.7	1946
Japan	1900	4.3	8.7	2.6	29.0	–85.5	1946	121.1	1952
The Netherlands	1900	5.2	7.2	1.9	21.0	–50.4	2008	101.6	1940
New Zealand	1900	6.4	8.0	1.7	19.1	–54.7	1987	105.3	1983
Norway	1900	4.5	7.3	2.4	26.3	–53.6	2008	166.9	1979
Portugal	1900	3.7	8.5	3.0	33.6	–76.6	1978	151.8	1986
South Africa	1900	7.2	9.2	2.0	21.8	–52.2	1920	102.9	1933
Spain	1900	3.6	5.7	2.0	21.6	–43.3	1977	99.4	1986
Sweden	1900	6.3	8.4	1.9	21.0	–42.5	1918	67.5	1999
Switzerland	1900	4.7	6.5	1.7	19.3	–37.8	1974	59.4	1922
United Kingdom	1900	5.4	7.2	1.8	19.5	–56.6	1974	99.3	1975
United States	1900	6.7	8.6	1.8	19.8	–38.6	1931	55.8	1933
Europe	1900	4.3	6.1	1.8	19.6	–48.0	2008	75.2	1933
World ex-US	1900	4.5	6.2	1.7	18.8	–46.0	2008	79.6	1933
World	1900	5.3	6.8	1.6	17.3	–42.9	2008	67.6	1933
Developed markets	1900	5.4	6.9	1.6	17.4	–41.3	2008	65.1	1933
Emerging markets	1900	3.9	6.5	2.0	22.6	–63.1	1945	91.6	1933
Countries/markets with later start dates or discontinuous histories and hence later re-start dates (China and Russia)									
Argentina	1960	3.9	22.2	11.9	93.5	–78.5	1990	538.1	1976
Brazil	1951	6.4	16.4	6.4	53.6	–70.1	1990	224.8	1983
Chile	1960	11.8	18.7	6.1	48.0	–43.9	1965	282.7	1973
China	1993	4.3	9.4	6.4	34.3	–55.8	2008	99.5	2003
Greece	1954	4.7	13.2	5.9	49.1	–64.1	2008	236.1	1972
Hong Kong SAR	1963	8.8	15.4	5.0	38.6	–62.2	1974	129.5	1972
India	1953	6.7	9.8	3.1	26.1	–60.8	2008	88.2	1999
Malaysia	1970	6.6	12.4	5.4	38.6	–56.3	1997	157.1	1972
Mexico	1969	8.9	14.4	5.1	36.9	–60.8	1982	115.8	1983
Russia	1995	7.4	23.9	12.7	65.7	–75.5	1998	235.9	1999
Singapore	1966	5.5	9.8	4.1	30.8	–53.9	2008	108.8	1972
South Korea	1963	9.3	14.4	4.5	34.9	–51.4	2000	130.7	1972
Taiwan (Chinese Taipei)	1967	10.1	16.8	5.3	39.3	–68.0	1974	123.8	1987
Thailand	1976	7.3	14.0	6.0	40.8	–56.4	1997	122.3	2003

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The arithmetic means in the fourth column show the average of the 122 annual returns for each country/composite index.

The arithmetic mean of a sequence of different returns is always larger than the geometric mean. For example, if stocks double one year (+100%) and halve the next (–50%), the investor is back where he/she started, and the annualized or geometric mean return is zero. However, the arithmetic mean is one-half of +100 – 50, which is +25%. The more volatile the returns, the greater the amount by which the arithmetic mean exceeds the geometric mean. This is verified by the sixth column of **Table 1**, which shows the standard deviation of each market's returns.

The USA's standard deviation of 19.8% places it among the lower risk markets since 1900, ranking sixth after Canada (16.8%), Australia (17.4%), New Zealand (19.1%), Switzerland (19.3%) and the UK (19.5%). The World index has a standard deviation of just 17.3%, showing the risk reduction from global diversification.

The most volatile markets were Portugal (33.6%), Germany (31.1%), Austria (30.4%), Finland (29.3%), Japan (29.0%) and Italy (28.1%). These were the countries most seriously affected by the depredations of war, civil strife and inflation, and, in Finland's case, reflecting its concentrated stock market during more recent periods. **Table 1** shows that, as one would expect, the countries with the highest standard deviations experienced the greatest range of returns; in other words, they had the lowest minima and the highest maxima.

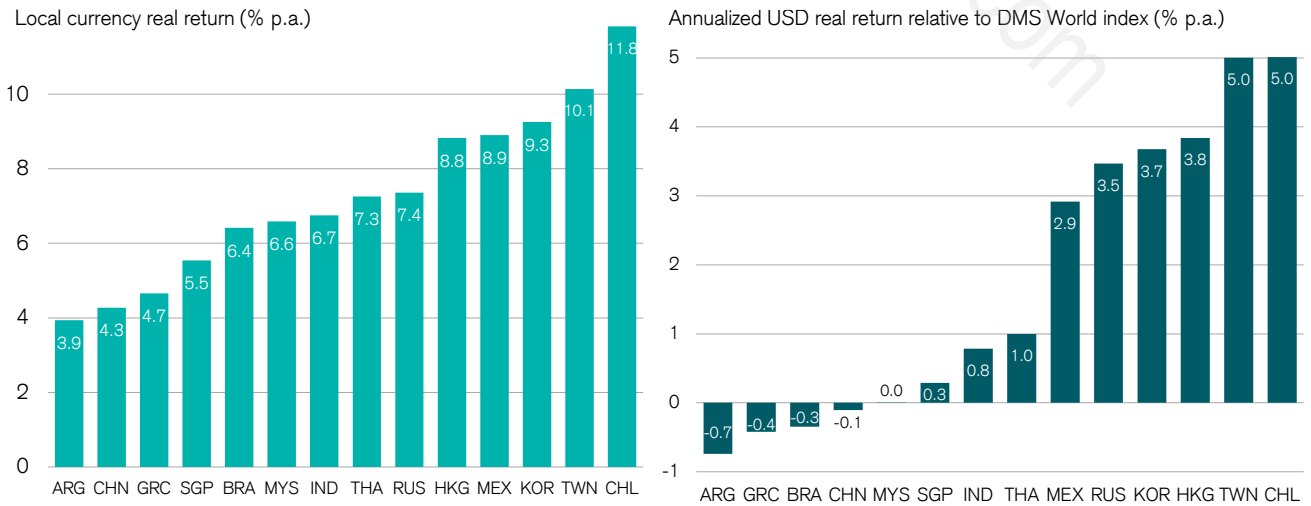
Bear markets underline the risk of equities. Even in a lower volatility market such as the USA, losses can be huge. **Table 1** shows that the worst calendar year for US equities was 1931 with a real return of –39%. However, during the 1929–31 Wall Street Crash period, US equities fell from peak to trough by 80% in real terms. The worst period for UK equities was the 1973–74 bear market, when stocks fell 70% in real terms and by 57% in a single year, 1974. For nearly half of the 21 countries, 2008 was the worst year on record. As we show in Chapter 4, over intervals of more than a year, even more extreme returns have occurred in many countries, both on the downside and the upside.

The lower panel of **Table 1** shows the remaining 14 markets in the DMS 35. Russia and China both start in1900, but equity investors lost everything in the 1917 and 1949 revolutions. Markets were then closed for many years, re-opening in the 1990s. China and Russia are thus included in **Table 1** from 1993 and 1995. For the other 12 countries, **Table 1** tracks their returns from the earliest date for which data is available.

The left-hand panel of **Figure 12** shows the annualized local real equity returns from the countries in the bottom section of **Table 1** (the geometric means from the third column). However, comparisons are difficult because of their different start dates. In the right-hand panel, we therefore show each country's real USD return relative to the return on the DMS World index over the same period.

Figure 12 shows that the annualized local currency real returns range from Argentina's 3.9% to Chile's 11.8%. The right-hand panel shows that Chile was also the best relative performer (just ahead of Taiwan (Chinese Taipei)), beating the World index by 5.0% per annum since its 1960 start date. The worst

Figure 12: Annualized real equity returns; absolute (left); versus DMS World index over matching periods (right)



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performer was Argentina, which, since its 1960 start date, underperformed the World index by 0.7% per year.

Hong Kong SAR, South Korea, Mexico and Russia also outperformed strongly. The remaining countries performed broadly in line with the World index. The most noteworthy is China, which underperformed the World index by 0.1%, despite unprecedented growth in real GDP since 1990 of 9.2% per annum versus 2.4% for the USA. This is a reminder of the lack of a relationship between long-term GDP growth and stock price performance (see Dimson Marsh and Staunton (2001, 2014).

Returning to **Table 1**, the markets in the bottom panel have an average volatility (standard deviation) of 45%, nearly double that of the average of 23.6% for those in the top panel. Every market in the bottom panel had a volatility above 30%, except for India (26%). Argentina (94%), Russia (66%), Brazil (54%), Greece (49%) and Chile (48%) were especially volatile, reflecting their historical hyperinflationary periods.

Every country in the top panel is today classified as a DM, except for South Africa. Twelve of the 14 markets in the bottom panel are EMs. The other two, Hong Kong SAR and Singapore, are DMs, but were EMs when their return series started. In the 2021 Yearbook, we showed that although individual EMs have typically been more volatile than DMs, the average EM volatility has declined sharply over the last 20 years. Over the most recent five-year period, the gap between the average EM and DM has fallen to just 5%.

Inflation and real interest rates

Inflation was a major force over the 20th century and we clearly need to adjust investment returns for changes in purchasing power. **Table 2**

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Table 2: Inflation rates around the world, 1900–2021

Country	Start year	Geometric mean (%)	Arithmetic mean (%)	Standard error (%)	Standard deviation (%)	Minimum return (%)	Minimum year	Maximum return (%)	Maximum year
Countries and indexes with continuous histories since 1900									
Australia	1900	3.7	3.8	0.5	5.0	–12.6	1921	19.3	1951
Austria	1900	12.2	35.6	23.7	261.4	–4.7	1953	2876.6	1922
Belgium	1900	4.9	5.9	1.5	16.1	–37.9	1919	96.3	1917
Canada	1900	2.9	3.0	0.4	4.4	–15.8	1921	15.1	1917
Denmark	1900	3.6	3.8	0.5	5.9	–15.1	1926	24.4	1940
Finland	1900	6.8	8.4	2.3	25.6	–11.3	1919	241.4	1918
France	1900	6.6	7.2	1.1	11.9	–18.4	1921	65.1	1946
Germany*	1900	4.5	5.3	1.3	14.5	–9.5	1932	209bn	1923
Ireland	1900	4.0	4.2	0.6	6.7	–26.0	1921	23.3	1981
Italy	1900	7.8	10.0	3.0	33.5	–9.7	1931	344.4	1944
Japan	1900	6.4	9.5	3.6	39.9	–18.7	1930	361.1	1946
The Netherlands	1900	2.8	2.9	0.4	4.6	–13.4	1921	18.7	1918
New Zealand	1900	3.6	3.7	0.4	4.5	–12.0	1932	14.7	1980
Norway	1900	3.6	3.8	0.6	7.0	–19.5	1921	40.3	1918
Portugal	1900	7.1	7.9	1.3	14.4	–17.6	1948	80.9	1918
South Africa	1900	4.9	5.2	0.6	7.2	–17.2	1921	47.5	1920
Spain	1900	5.4	5.6	0.6	6.8	–6.7	1928	36.5	1946
Sweden	1900	3.3	3.5	0.6	6.5	–25.2	1921	39.4	1918
Switzerland	1900	2.1	2.2	0.5	5.0	–17.7	1922	25.7	1918
United Kingdom	1900	3.6	3.8	0.6	6.2	–26.0	1921	23.2	1975
United States	1900	2.9	3.0	0.4	4.7	–10.8	1921	20.4	1918
Countries/markets with later start dates or discontinuous histories and hence later re-start dates (China and Russia)									
Argentina	1960	69.6	178.8	82.1	646.3	–1.8	1999	4923.6	1989
Brazil	1951	64.4	169.8	53.5	450.9	1.7	1998	2477.1	1993
Chile	1960	27.7	43.0	13.0	102.4	–1.4	2009	606.1	1973
China	1993	3.6	3.8	1.1	5.7	–1.0	1998	25.5	1994
Greece	1954	7.2	7.5	1.0	8.0	–2.6	2014	30.7	1973
Hong Kong SAR	1963	4.9	5.0	0.6	4.8	–4.1	1999	19.7	1973
India	1953	6.9	7.0	0.7	5.5	–6.1	1975	25.4	1974
Malaysia	1970	3.3	3.3	0.4	3.0	–1.4	2020	17.9	1973
Mexico	1969	19.0	21.8	4.2	30.7	2.1	2015	159.2	1987
Russia	1995	16.3	18.4	5.3	27.5	2.5	2017	131.3	1995
Singapore	1966	2.5	2.6	0.6	4.4	–2.7	1968	27.2	1973
South Korea	1963	7.4	7.6	1.0	7.6	0.5	2020	32.2	1980
Taiwan (Chinese Taipei)	1967	3.6	3.8	0.8	6.3	–1.7	2001	34.0	1974
Thailand	1976	3.8	3.9	0.5	3.7	–0.9	2015	16.8	1980

* For Germany, the means, standard deviation, and standard error are based on 120 years, excluding 1922–23. Sources: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

shows inflation rates around the world over the long run. The table is again divided into a top panel, showing the 21 countries with continuous histories from 1900 to 2021 and a bottom panel showing the remaining countries in the DMS 35.

In the USA, annualized inflation was 2.9% per year, versus 3.6% in the UK. Thanks to the power of compounding, this apparently small difference meant that, while US consumer prices rose by a factor of 33, UK consumer prices rose 73-fold. Prices did not rise steadily throughout the 122 years and all countries experienced deflation at some stage in the 1920s and early 1930s. In the USA, consumer prices fell almost a third in the years after 1920 and did not regain their 1920 level until 1947.

In 17 of the 25 years since 1995, at least one, and, in 2020, as many as eight of the 21 countries shown in the top panel of **Table 2** experienced (generally mild) deflation. Over the last quarter-century, inflation has remained very low by historical standards. On average, in each year from 2008 to 2020, over half of the 21 countries had an inflation rate of 2% or less. From 2014 to 2019, an average of 17 of the 21 countries had rates below 2%. In 2020, only one country had an inflation rate above 2% and the average inflation rate across the 21 countries was just 0.42%, its lowest level since 1934.

This changed rapidly in 2021 when inflation rose substantially in most of the DMs in the top panel of **Table 2**. The average inflation rate across the 21 countries rose from 0.42% in 2020 to 4.4% in 2021. Annual inflation rose from 1.4% to 7.0% in the USA (the highest annual figure for 40 years), from 0.6% to 5.4% in the UK (the highest for 30 years), and from –0.3% to 5.3% in Germany (the highest for 40 years).

This was triggered by high consumer demand as economies recovered, severe supply chain problems and a poorly anticipated global energy crisis. During 2021, the debate has raged between "team transitory" and "team permanent," but most central banks and economists now expect inflation to be less transitory than originally expected. We examine the implications of higher inflation for asset prices later in this chapter.

The top panel of **Table 2** shows that, over the last 122 years, there were seven high-inflation countries: Germany, Austria, Portugal, Finland, France, Japan and Spain. There were two runners-up, Belgium, and South Africa, and one low-inflation country, Switzerland. The other countries fall in between, with inflation of around 3% to 4% per year. Note that the true 122-year mean and standard deviation for Germany are far higher than **Table 2** shows, as the hyper-inflationary years of 1922–23 are omitted.

Including these years, the 122-year arithmetic mean inflation rate would be 1.7 billion percent. However, even this massive German figure is dwarfed by Hungarian inflation in July 1946, which reached 42 quintillion percent per month.

After experiencing the highest inflation of any Yearbook country in the first half of the 20th century, Germany had the second-lowest inflation rate from 1950 onward (Switzerland had the lowest). Several countries, including the UK, moved in the opposite direction, from having comparatively low inflation to becoming relatively high inflation countries in the second half of the 20th century. US inflation was also higher from 1950 on, but was below the average of other countries in both periods. In many countries, inflation peaked in the 1970s and was gradually brought under control thereafter.

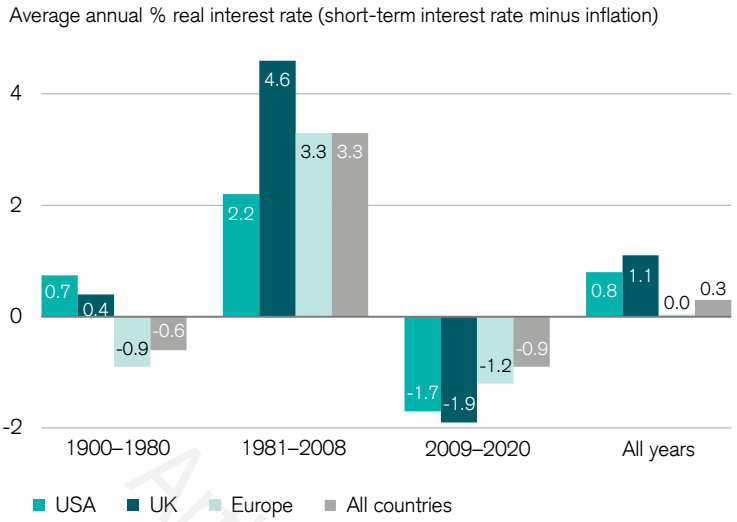
Moving to the bottom panel of **Table 2**, five countries experienced extraordinarily high annualized rates of inflation: 70% in Argentina, 64% in Brazil, 28% in Chile, 19% in Mexico, and 16% in Russia. Argentina was the most extreme and, over a 22-year period from 1970 to 1991, inflation never fell below 20%. It exceeded 100% in 14 years and peaked at 5,000% in 1989. Over the last 15 years, it has been below 20% just once. Brazil came a close second, also experiencing a 22-year period when annual inflation never fell below 20% and six calendar years during which inflation was close to or above 1000%. More recently, Brazilian inflation has been largely under control.

Long-run real bill returns

Treasury bills are an important asset class. They indicate the return on cash and provide a benchmark for the risk-free rate of interest. **Table 3** (overleaf) shows the annualized real returns on bills – the realized short-term rate of interest, adjusted for inflation – in the DMS 35 countries. Since 1900, US and UK investors earned annualized real returns of 0.7% and 1.0%. Investors in 13 markets – Argentina, Austria, Belgium, Brazil, Chile, Finland, France, Germany, Hong Kong SAR, Italy, Japan, Portugal and Russia – earned negative real returns. Almost all of them experienced high inflation at some point in history.

For Germany, **Table 3** excludes 1922–23, and its full 122-year record is far worse than recorded since, in 1923, German bill (and bond) investors lost virtually everything. While we can generally regard short-dated government bills as risk-free, this ceases to be true in cases of hyperinflation when bills can become riskier than equities. More recently, investors re-learned during the Euro crisis that even sovereign bills of developed countries can carry credit risk.

Figure 13: Real interest rates over sub periods, 1900–2021



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In the first half of the 20th century, there was little relationship between interest rates and inflation in the USA or other countries. From the 1950s onward, there has generally been a close relationship. In every country, there was a breakpoint in the real rate of interest at the end of the 1970s, with real rates thereafter being appreciably higher. There was a second breakpoint in 2008 when rates fell sharply.

Figure 13 focuses on these three sub-periods, 1900–80, 1981–2008 and 2009 to date. It shows the average annual real rate of interest in each period (and for the full 122 years) for the USA and UK, and the average for all European and DMS countries with continuous 122-year histories. In the USA, the average real interest rate was 0.7% from 1900 to 1980, compared with 2.2% from 1981 to 2008 and –1.7% since then; in the UK, the pre-1980 average annual real rate was 0.4%, compared with 4.6% from 1981 to 2008 and –1.9% since then.

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Table 3: Real interest rates around the world, 1900–2021

Country	Start year	Geometric mean (%)	Arithmetic mean (%)	Standard error (%)	Standard deviation (%)	Minimum return (%)	Minimum year	Maximum return (%)	Maximum year
Countries and indexes with continuous histories since 1900									
Australia	1900	0.6	0.7	0.5	5.2	-15.5	1951	18.5	1921
Austria	1900	-7.8	-4.0	1.6	18.1	-96.4	1922	12.2	1931
Belgium	1900	-0.4	0.4	1.1	12.4	-46.6	1941	69.0	1919
Canada	1900	1.3	1.5	0.4	4.7	-12.5	1947	27.1	1921
Denmark	1900	1.9	2.1	0.5	5.9	-15.8	1940	25.1	1921
Finland	1900	-0.5	0.4	1.0	11.4	-69.2	1918	19.9	1919
France	1900	-2.1	-1.6	0.8	9.2	-38.5	1946	29.7	1921
Germany*	1900	-2.4	-0.5	1.2	12.8	-91.9	1948	38.8	1924
Ireland	1900	0.6	0.8	0.6	6.4	-15.5	1915	42.2	1921
Italy	1900	-3.4	-2.4	1.0	11.0	-76.6	1944	14.2	1931
Japan	1900	-1.8	-0.3	1.2	13.3	-77.5	1946	29.8	1930
The Netherlands	1900	0.4	0.5	0.4	4.8	-12.7	1918	19.6	1921
New Zealand	1900	1.5	1.6	0.4	4.5	-8.1	1951	21.1	1932
Norway	1900	0.9	1.2	0.6	6.9	-25.4	1918	31.2	1921
Portugal	1900	-1.1	-0.6	0.9	9.5	-41.6	1918	23.8	1948
South Africa	1900	1.0	1.2	0.5	5.9	-27.8	1920	27.3	1921
Spain	1900	0.2	0.3	0.5	5.6	-23.8	1946	12.6	1928
Sweden	1900	1.6	1.8	0.6	6.4	-23.2	1918	42.7	1921
Switzerland	1900	0.7	0.8	0.4	4.8	-16.5	1918	25.8	1922
United Kingdom	1900	1.0	1.1	0.6	6.2	-15.7	1915	43.0	1921
United States	1900	0.7	0.8	0.4	4.6	-15.0	1946	20.2	1921
Countries/markets with later start dates or discontinuous histories and hence later re-start dates (China and Russia)									
Argentina	1960	-4.0	1.4	5.5	42.9	-68.3	1975	277.1	1984
Brazil	1951	-1.7	-0.3	2.0	16.6	-43.8	1964	66.8	1994
Chile	1960	-3.7	-0.8	2.4	18.9	-79.0	1973	36.5	1981
China	1993	0.8	0.8	0.8	4.2	-12.3	1994	8.6	1997
Greece	1954	0.8	0.9	0.6	4.9	-19.1	1973	8.6	1998
Hong Kong SAR	1963	-0.8	-0.7	0.5	3.8	-11.1	1973	10.0	1999
India	1953	0.3	0.4	0.6	4.9	-13.9	1974	16.1	1975
Malaysia	1970	0.8	0.8	0.4	2.8	-12.0	1973	4.6	1971
Mexico	1969	1.8	2.2	1.2	8.6	-24.8	1982	32.9	1988
Russia	1995	-0.2	0.5	2.4	12.3	-24.0	1998	50.9	1996
Singapore	1966	0.5	0.6	0.5	4.0	-18.4	1973	7.8	1968
South Korea	1963	2.1	2.3	0.8	5.8	-14.2	1963	14.7	1967
Taiwan (Chinese Taipei)	1967	0.8	0.9	0.6	4.2	-16.5	1974	9.3	1975
Thailand	1976	1.9	2.0	0.6	4.0	-6.9	1980	11.7	1998

* For Germany, the means, standard deviation, and standard error are based on 120 years, excluding 1922–23. Sources: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

The average annual real interest rate has clearly been very low – indeed negative – since the Global Financial Crisis. Investors are naturally now asking when real rates will return to normal, which begs the question, "what is normal?" Unfortunately, our view of normality is heavily conditioned by the period before the crisis. However, **Figure 13** suggests that, while current real rates are clearly not normal, nor were the very high real rates over the 28-year period before the financial crisis. This is yet another example of the need to look at very long periods of history to gain perspective on important current investment questions.

Long-run real bond returns

Table 4 shows that the 122 years from 1900 to 2021 were not especially kind to investors in government bonds. Across the 21 continuous history countries in the top panel, the average annualized real return was 1.0% (1.2% excluding Austria's very low figure). While this exceeds the average return on cash by 1.4%, bonds had much higher risk.

As already noted, real bond returns were negative in five of the countries in the top panel. German bonds performed worst, and their volatility was even higher than revealed in **Table 4** since the statistics exclude 1922–23. In 1923, hyperinflation resulted in an almost

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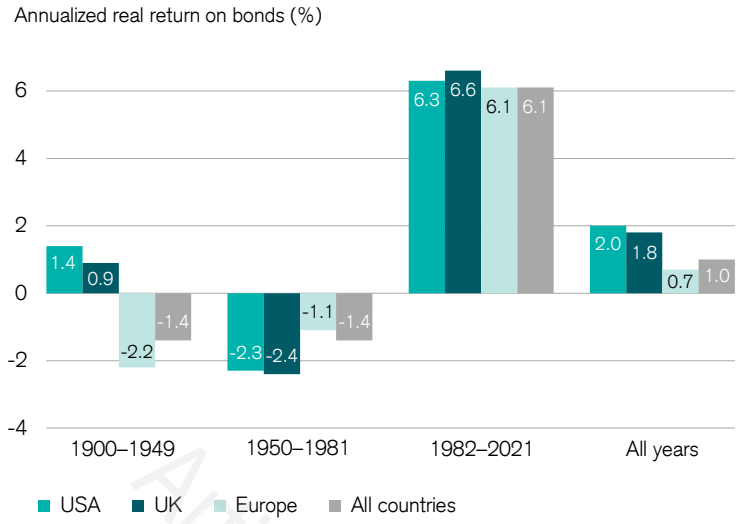
Table 4: Real bond returns around the world, 1900–2021

Country	Start year	Geometric mean (%)	Arithmetic mean (%)	Standard error (%)	Standard deviation (%)	Minimum return (%)	Minimum year	Maximum return (%)	Maximum year
Countries and indexes with continuous histories since 1900									
Australia	1900	1.8	2.7	1.2	13.1	–26.6	1951	62.2	1932
Austria	1900	–3.5	4.7	4.8	52.9	–94.7	1945	484.8	1926
Belgium	1900	0.5	1.7	1.4	14.9	–45.6	1917	62.3	1919
Canada	1900	2.2	2.7	0.9	10.3	–25.9	1915	41.7	1921
Denmark	1900	2.2	3.0	1.2	13.4	–27.6	1915	63.6	1983
Finland	1900	0.2	1.4	1.2	13.5	–69.5	1918	30.2	1921
France	1900	0.3	1.2	1.2	13.0	–43.5	1947	35.9	1927
Germany*	1900	–1.2	1.4	1.4	15.6	–100.0	1923	62.5	1932
Ireland	1900	1.6	2.7	1.3	14.8	–34.1	1915	61.2	1921
Italy	1900	–0.7	0.7	1.4	15.2	–64.3	1944	40.0	1996
Japan	1900	–0.8	1.7	1.7	19.2	–77.5	1946	69.8	1954
The Netherlands	1900	1.7	2.2	0.9	9.8	–18.1	1915	32.8	1932
New Zealand	1900	2.5	2.8	0.8	8.9	–23.7	1984	34.1	1991
Norway	1900	1.7	2.4	1.1	11.8	–48.0	1918	62.1	1921
Portugal	1900	–1.3	0.3	1.6	18.0	–45.1	1923	90.6	1986
South Africa	1900	1.9	2.5	0.9	10.3	–32.6	1920	37.1	1921
Spain	1900	2.0	2.7	1.1	12.6	–30.2	1920	53.2	1942
Sweden	1900	2.7	3.4	1.2	12.7	–37.0	1939	68.2	1921
Switzerland	1900	2.3	2.7	0.8	9.3	–21.4	1918	56.1	1922
United Kingdom	1900	1.8	2.7	1.2	13.5	–29.9	1974	59.4	1921
United States	1900	2.0	2.5	0.9	10.4	–18.1	1917	35.2	1982
Europe	1900	1.3	2.6	1.4	15.9	–52.6	1919	72.2	1933
World ex-US	1900	1.7	2.7	1.3	14.6	–46.1	1919	76.3	1933
World	1900	2.0	2.6	1.0	11.0	–31.6	1919	46.5	1933
Developed markets	1900	1.9	2.4	1.0	10.8	–31.8	1919	34.7	1933
Emerging markets	1900	–0.2	1.8	1.7	18.7	–76.4	1949	86.2	1933
Countries/markets with later start dates or discontinuous histories and hence later re-start dates (China and Russia)									
Argentina	1992	–1.4	3.4	5.9	32.3	–62.6	2008	119.8	2009
Brazil	1995	8.1	10.7	4.7	24.4	–40.1	2006	64.4	1999
Chile	1993	1.0	1.3	1.4	7.5	–25.2	2021	15.7	2019
China	1993	2.4	2.9	1.9	10.2	–16.8	2004	23.3	2005
Greece	1993	9.4	12.7	5.0	27.2	–56.6	2011	105.7	2012
Hong Kong SAR	1994	3.0	3.6	2.2	11.8	–18.4	2013	35.4	1998
India	1953	0.3	1.0	1.5	12.5	–24.5	1974	41.2	2002
Malaysia	1970	4.4	4.8	1.4	9.7	–22.0	1973	29.7	1987
Mexico	1995	6.9	7.3	1.9	9.7	–14.2	2021	24.3	2005
Russia	1995	4.5	11.2	8.0	41.5	–68.2	1998	145.5	1999
Singapore	1988	2.8	3.1	1.2	6.8	–14.4	2021	20.7	2002
South Korea	1963	8.6	9.4	1.8	14.1	–10.2	2005	51.1	1982
Taiwan (Chinese Taipei)	1995	4.1	4.3	1.2	6.3	–8.9	2007	16.2	2001
Thailand	1980	6.6	7.4	2.2	14.0	–22.3	1989	48.1	1986

* For Germany, the means, standard deviation, and standard error are based on 120 years, excluding 1922–23. Sources: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

Figure 14: Real bond returns over sub-periods, 1900–2021



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total real loss for German bond investors. In the USA, the annualized real bond return was 2.0%, marginally higher than the UK's 1.8%. These findings suggest that, over the full 122-year period, real bond returns in many countries were below investors' prior expectations, with the largest differences occurring in the highest-inflation countries.

Particularly in the first half of the 20th century, several countries experienced extreme and disappointingly low returns arising from the ravages of war and extreme inflation. This was followed by a degree of reversal, with the countries experiencing the lowest returns in the first half of the 20th century being among the best performers thereafter.

Over the full 122-year period, Sweden had the highest real bond return of 2.7% p.a., followed by New Zealand (2.5%), Switzerland (2.3%), and Canada and Denmark (both 2.2%). **Table 4** shows that New Zealand bonds had the lowest variability of 8.9%, followed by Swiss (9.3%) and Dutch (9.8%) bonds.

Since 1900, the average standard deviation of real bond returns across countries was 13.0% versus 23.2% for equities and 7.6% for bills (these averages exclude Austria). US real equity returns had a standard deviation of 19.8% versus 10.4% for bonds and 4.6% for bills. Stocks are clearly the riskiest asset class and we saw above that they have beaten bonds in every country. Similarly, bonds, which are less risky than equities, but riskier than bills, have beaten bills in every country except Portugal.

Our long-run findings thus provide strong support for one of the lasting laws of finance – the law of risk and return – and the notion that risk-bearing should carry an expected reward.

While bonds have generally been much less volatile than equities, they have experienced some protracted periods of very low or high returns. In **Figure 14**, we divide the period from 1900 to 2021 into three different regimes for bond returns: the first half of the 20th century, 1950–81, and 1982 to date. Within each of these sub periods, we report the annualized return on bonds for the USA, UK, Europe and all 21 countries with continuous histories. For Europe and for "All countries," we show the average annualized return for the individual countries.

The bars on the left of the chart show that, in the first half of the 20th century, annualized bond returns were positive, but quite low in the USA and UK, and negative in Europe and when averaged across all countries. These disappointing returns were largely due to high inflation during, and in the aftermath of the two World Wars. While the wars were bad for bond investors, there were periods in the first half of the 20th century when investors enjoyed high real bond returns, especially the deflationary period from 1926 to 1933 (see **Figure 28** in Chapter 4).

The second set of bars in **Figure 14** shows the real bond returns from 1950 to 1981. Returns were negative in the USA and UK, and, on average, across Europe and all 21 countries. A major culprit here was the inflationary 1970s.

The final sub-period shown in **Figure 14** covers the last 40 years from 1982 to the present. Over these four decades, real bond returns were astonishingly high. This was the golden age of bonds. In the early 1980s, governments started to tackle inflation using short-term interest rates as a policy instrument. This succeeded in reducing inflation, inflationary expectations and the risk premium bond investors require for inflation risk, thereby boosting bond prices.

Over time, real interest rates also fell from their high levels in the early and mid-1980s, giving a further boost to bond prices. Then, during the two bear markets of the early 21st century, the Eurozone crisis and the COVID-19 pandemic, bonds benefited from their safe-haven status, from policy interest rates being kept low to support economies, and from quantitative easing. They also benefitted from the negative stock-bond correlation, as discussed in Chapter 8.

Currently, the real yields on long sovereign bonds are close to zero or negative in most developed markets. Extrapolating the high returns of the last four decades into the future would thus be inappropriate. More generally, this is a further example of the importance of looking at very long periods of history to understand

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markets. Even a period as long as four decades can be quite misleading if naively extrapolated. In Chapter 5, we suggest a simple method for forecasting likely long-run real bond returns.

The last four decades of strong bond returns contrasts sharply with the 122-year record shown in the final set of bars in **Figure 14**. Over the period since 1900, the average annualized real bond return across the 21 countries with continuous histories was just 1.0% per year, with disappointing returns in many countries.

The bottom panel of **Table 4** shows generally higher real bond returns. As noted above, the bottom panel comprises mostly EMs, whereas the top panel consists mostly of DMs. However, this emphatically does not mean that EMs have enjoyed higher real bond returns than DMs – indeed quite the contrary as we will see in the next section. Instead, there are two reasons for the generally higher returns shown in the table.

First, the time periods covered in the bottom panel are more recent and mostly coincide with the golden age of bonds. Second, for countries such as Argentina, Brazil, Chile, Greece and Mexico, we have been unable to find reliable bond returns data extending through the prolonged periods of high inflation, periodic economic crises and, in some cases, sovereign bond defaults. Our bond returns for these countries therefore start later. Starting these series after periods of crisis and hyperinflation will undoubtedly overstate the true long-run returns.

Emerging versus developed market returns

Emerging markets tend to be associated with growth, and hence are often perceived as offering higher investment rewards. We explore whether this has been the case over the last 122 years by comparing the performance of the DMS Emerging Markets and DMS Developed Markets indexes, both for equities and bonds.

The DMS Emerging Markets equity index is constructed from the DMS 90 database. Starting in 1900, countries are classified as EMs or DMs at the start of each year. All countries for which we have data, and which are deemed to be EMs, are included in the index, weighted by their country capitalizations. To classify countries, we use the GDP per capita rule described in Chapter 1 until 1987 and MSCI categorizations thereafter. At the start of the 20th century, our EM index begins with seven constituent countries.

We add in further markets once returns data becomes available (see **Figure 1**). Thus we add Brazil in 1951, India in 1953, Greece in 1954, Chile in 1960, South Korea and the former Crown Colony of Hong Kong (now Hong Kong SAR) in 1963 (until the latter moved to developed status in 1977), Singapore in 1966 (until it moved to developed status in 1980), Mexico in 1969, Malaysia in 1970, Argentina, Thailand and Zimbabwe in 1976, and so on. We continue bringing other countries into the EM index until we reach 2021. Countries leave if they are promoted to DM status.

The DMS Developed Markets index is created using the same rule. This had 16 constituents in 1900 and was joined by Finland in 1932, Argentina in 1960 (until it moved to emerging status in 1976), Japan in 1966, Spain in 1974, Hong Kong SAR in 1977, Singapore in 1980, Luxembourg in 1982, Portugal in 1998, Greece from 2002 to 2013 and Israel in 2011. The DM index is computed annually based on all markets deemed to be developed at the start of the year in question.

The indexes are estimated in common currency, namely US dollars, although they can readily be converted to an alternative common currency (see Chapter 3). The creation of these indexes allows us to make comparisons between EM and DM performance over the full period of 122 years spanned by the DMS database.

The long-run performance of EM versus DM equities is plotted in the left-hand panel of **Figure 15**. EMs outperformed early in the 20th century, but were hit badly by the October 1917 Revolution in Russia when investors in Russian stocks lost everything. EMs underperformed in the global bull market of the 1920s, but were less severely affected than DMs by the Wall Street Crash. From the mid-1930s until the mid-1940s, EM equities moved in line with DMs.

From 1945 to 1949, EMs collapsed. The largest contributor was Japan, where equities lost 97% of their value in US dollar terms. Another contributor was China, where markets closed in 1949 following the communist victory and investors effectively lost everything. Other markets such as Spain and South Africa also performed poorly in the immediate aftermath of World War II. Nor were the 1950s kind to EM investors, where poor returns from Brazil contributed to underperformance.

After 1960, EMs staged a long fight back, albeit with periodic setbacks. From 1960 to 2021, their annualized return was 11.3% versus 9.6% from DMs. This was insufficient, however, to make up for their precipitous decline in the 1940s. The full 122-year graph shows that the terminal wealth from an initial investment of one dollar in EMs was USD 3,534. This is appreciably below DMs, which had a terminal value of USD 20,196. The annualized return from investing in EMs was 6.9% compared with 8.5% from DMs. The DMS World index, which includes every

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stock market in the DMS 90 population in every year for which data is available, had an annualized return of 8.4%. For a global investor, the impact from including or excluding particular EMs has been small. The rules for market classification and the dangers of survivorship bias also have a negligible impact on estimated equity returns or premiums.

The long-run performance of EM versus DM bonds is plotted in the right-hand panel of Figure 15. These long-run bond indexes are constructed using the same principles as the DM and EM equity indexes, but are based on the 35-country DMS 35 dataset as we do not yet have bond data for the supplementary 55 (almost entirely EM) countries (see **Figure 1**). The EM bond index thus has fewer constituents, starting with seven countries in 1900 and ending with 16 in 2021.

Figure 15 shows that EM bonds were ahead until the 1940s, when they plummeted. As was the case with the EM equity index, the largest contributor to this investment debacle was Japan, where bonds lost 99% of their value in US dollar terms. Another contributor was China, where investors effectively lost everything in 1949. Spanish bonds also performed poorly in the wake of the Spanish Civil War.

Unlike the EM equity index, however, there was no fight back in the second half of the 20th century. EM bonds underperformed DM bonds from 1950 to 2021, with the same finding being true for start dates of 1960, 1970 and 1980. However, EM bonds have outperformed DM bonds over the last 30 years, 20 years, and the last decade.

Over the full 122 years, EM bonds gave an annualized USD return of just 2.7% compared with 4.8% for DM bonds. These are nominal USD returns and, after adjusting for US inflation, a US investor in EM bonds would have lost money in real terms, with an annualized real return of –0.2% versus +1.9% for DM bonds. These results are unsurprising, given the crises of the 1940s and the high inflation rates since then in many EM countries.

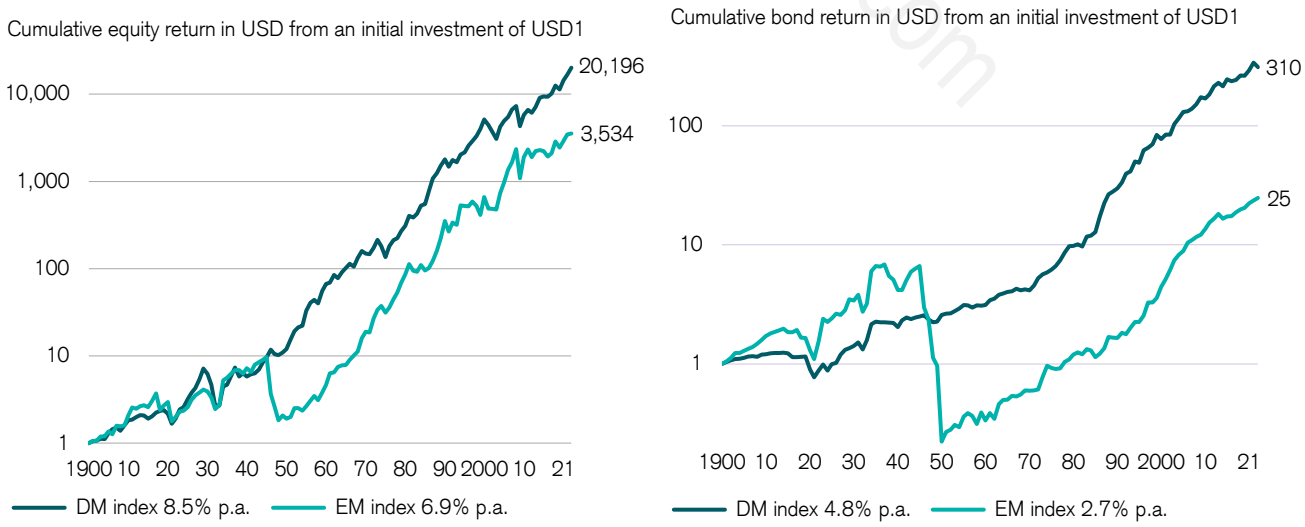
Real bond and equity returns versus inflation

The recent strong uptick in inflation in most developed economies has raised obvious questions about its likely impact on asset returns. Our discussion of bond returns above, together with the data in **Figure 14**, show the major impact that inflation has had on bond returns historically. It is often claimed that equities are a hedge against inflation, but has this been true historically? In **Figure 16**, we compare equity and bond returns with inflation in the same year for the full range of 21 countries for which we have a complete 122-year history. We exclude the hyperinflationary years of 1922–23 for Germany and 1921–22 for Austria.

Out of 2,558 country-year observations, we identify those with the lowest 5% of inflation rates (i.e. with very marked deflation), the next lowest 15% (which had limited deflation or stable prices), the next 15% (which had inflation of up to 1.6%) and the following 15%; these four groups represent half of our observations, all of which experienced inflation of 2.7% or less.

At the other extreme, we identify the country-year observations with the top 5% of inflation rates, the next highest 15% (which still experienced inflation above 7.4%), the next 15% (which had rates of inflation of 4.1%–7.4%) and the

Figure 15: Long run returns on EM and DM equities (left) and bonds (right), 1900–2021



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remaining 15%; these four groups represent the other half of our observations, all of which experienced inflation above 2.7%. In **Figure 16**, we plot the lowest inflation rate of each group as a dark turquoise rectangle.

The bars in **Figure 16** are the average real returns on bonds and equities in each of these groups. As one would expect, and as documented in the previous section, the average real return from bonds varies inversely with contemporaneous inflation. In periods of high inflation, real bond returns were particularly poor, while, in deflationary periods, they were excellent. As an asset class, bonds suffer in periods of inflation, but provide a hedge against deflation.

During marked deflation periods, equities gave a real return of 12.9%, greatly underperforming the bond return of 19.2% (see the left of the chart). Over all other intervals, equities outperformed bonds, with an average premium relative to bonds of just over 7%. During marked inflation periods, equities gave a real return of –10.0%, greatly outperforming the bond return of –24.7% (see the right of the chart). Although harmed by high inflation, equities were resilient compared to bonds.

Overall, equities performed especially well in real terms when inflation ran at a low level. High inflation impaired real equity performance, and deflation was associated with deep disappointment compared to government bonds.

Historically, when inflation has been low, the average realized real equity returns have been high, greater than on government bonds and very similar across the different low inflation groupings shown in **Figure 16**.

These results suggest that the correlation between real equity returns and inflation is negative, i.e. equities have been a poor hedge against inflation. There is extensive literature which backs this up. Fama and Schwert (1977), Fama (1981), and Boudoukh and Richardson (1993) are three classic papers, and Tatom (2011) is a useful review article. The negative correlation between inflation and stock prices is cited by Tatom as one of the most commonly accepted empirical facts in finance.

Yet it is widely believed that common stocks must be a good hedge against inflation to the extent that they have had long-run returns that were ahead of inflation. But their high ex-post return is better explained as a large equity risk premium (see Chapters 4 and 5). The magnitude of the equity risk premium tells us nothing about the correlation between equity returns and inflation. It is important to distinguish between beating inflation and hedging against inflation.

Interest rates and the control of inflation

Periodically, throughout history, there have been times when inflation has flared up – just as it did in 2021. In most countries, central banks are tasked with controlling this. Interest rate hikes are a key tool in controlling inflation. The direct channel of transmission is via bank borrowing costs. Banks pass on rate rises to customers through higher interest rates on credit cards, consumer credit, mortgages, other loans and corporate borrowing. This lowers the amount that consumers can spend, restricts the money supply and helps dampen inflationary pressures.

Financial markets are another key transmission mechanism. Markets rapidly incorporate news, so that rate changes immediately impact stock and bond prices. This alters the value of

Figure 16: Real bond and equity returns versus inflation rates, 1900–2021

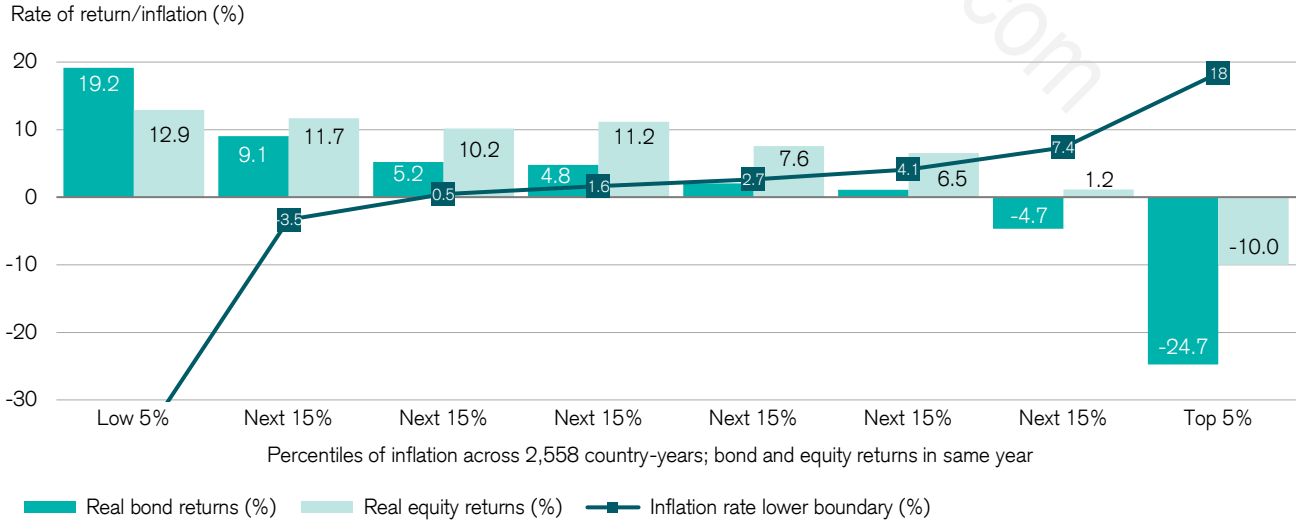

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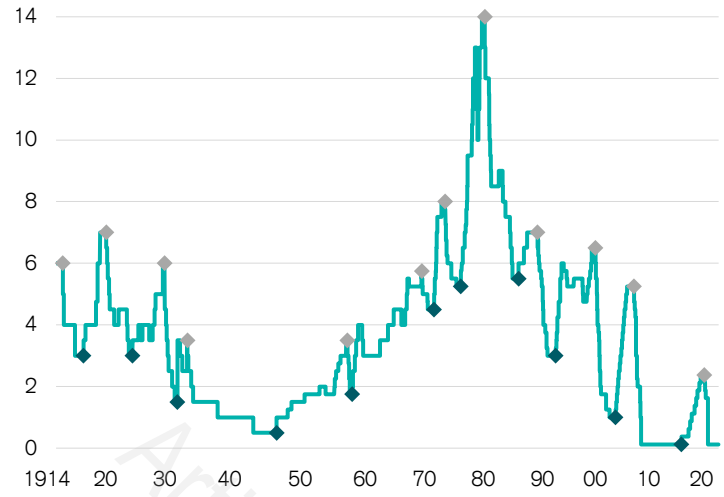
Figure 17: US Fed official interest rates (%), 1914–2021



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investors' portfolios, generating a "wealth effect," with lower wealth associated with less future spending and vice versa. Bond price changes reflect changes in the costs of longer-term loans and this impacts real economic activity.

Central banks are reviewing their stance after years of loose monetary policy and their special pandemic support. Several countries have already raised rates in 2021, including the UK, South Korea, Brazil, South Africa, Russia and New Zealand. The US Federal Reserve, European Central Bank and the Bank of Japan are scaling down their emergency support. All eyes, however, are on the Fed, as its interest rate hikes not only affect the USA, but the entire world. Currently, between five and seven rate rises are expected in 2022.

To see what we can learn from history, we examine asset returns over past hiking and easing cycles in the USA and UK. **Figure 17** shows the path of official US interest rates since the Federal Reserve System was created at the end of 1913. It shows the Fed's target rate since 1990 and, before that, the Federal Reserve discount rate. Official interest rates have varied greatly over time, ranging from near zero to a high of 14%. Rates were at their lowest during the Great Depression and World War II, and following the Global Financial Crisis and COVID-19 pandemic. Rates peaked during the high inflation of the late 1970s and early 1980s.

From this chart, we can readily identify periods when interest rates rose – "hiking cycles" or "tightening cycles." Similarly, there are periods of falling rates – "easing cycles" or "loosening cycles." The small dark turquoise diamonds show the start of hiking cycles, while the small gray diamonds show the start of easing cycles.

However, we have identified these turning points visually by ignoring any temporary jaggedness in the pattern of rates over time. So if the chart shows that rates rose from a low to a subsequent high, we define this as a hiking cycle, even though within this there may have been temporary rate cuts that were soon reversed. In real time, however, an investor would observe only the rate cut, not that it was destined to be temporary and be reversed, and that rates would then resume their climb to the high. To have divined the latter would have required clairvoyance.

To circumvent this problem, we adopt a simple trading rule that could be followed in real time. Investing after rate rises involves buying assets on the announcement of an initial rate hike, staying invested as long as rates continue to rise or stay the same, then selling on the announcement of a rate cut. Investing after rate falls involves purchasing after an initial rate cut and then holding until the next rate rise. This is a mechanical way of defining hiking and easing cycles that does not involve hindsight.

By defining cycles in this way, all points in time are designated as either falling within a hiking or an easing cycle. Our US data starts in 1914 and, from 1914 to 2021, US markets were in a rising interest rate mode 45% of the time and in a falling mode 55% of the time. The UK data starts in 1930 and UK markets spent less time in hiking mode (30%) and more time in periods of easier money (70%). The average number of rate hikes during hiking cycles was 4.5 in the USA and 2.5 in the UK. The average number of cuts during easing cycles was 4.7 in the USA and 5.5 in the UK.

Asset returns in hiking and easing cycles

The left-hand chart in **Figure 18** shows the returns from following this strategy. Looking first at the USA, for both stocks and bonds, there were large differences between the returns during rate falls and rises. Equities gave an annualized real return of just 3.0% during rate-rise periods, compared with 9.7% during rate falls. US bonds gave an annualized real return of just 0.2% in the rate-rise regime, compared with 3.7% while rates fell. In contrast, real bill returns were virtually the same under both regimes. The differences in returns between rate-rise and rate-fall periods were statistically significant at the 1% level for both equities and bonds, but insignificant for bills.

The annualized US inflation rate was also higher at 4.2% during hiking cycles compared with 2.3% during periods of easing. This difference

was significant at the 0.01% level. Hiking cycles are often triggered by inflation fears and are targeted at bringing it down. To achieve this typically requires multiple rate rises and there are also time lags. So it is unsurprising that inflation tends to be higher during tightening cycles.

The chart shows similar findings for the UK. Stocks gave an annualized real return of just 1.2% during periods of rising rates, versus 8.5% during easing cycles. This difference is statistically significant at the 2% level. UK bonds gave an annualized real return of 1.9% in the rate-rise regime, compared with 2.7% while rates fell, but the difference was not statistically significant. In contrast to the USA, the UK real bill return (real rate of interest) was 1.4% per annum higher during tightening than easing cycles. As in the USA, the annualized inflation rate during UK tightening cycles was higher (4.9%) than during easing cycles (3.6%), and this was statistically significant at the 1% level.

Premiums in hiking and easing cycles

Earlier in this chapter, we noted that, historically, in both the USA and UK, equities outperformed bonds and bills, providing a substantial risk premium, while bonds, in turn, outperformed bills. **Figure 19** shows that these premiums are elevated during easing cycles and much lower, or even non-existent, during hiking cycles.

During US easing cycles, equities gave a return that was 9.3% per year higher than that on Treasury bills, which was a far higher premium than the 2.7% during tightening cycles. But, even in tightening cycles, investors would have been better off remaining in stocks. During these periods, they would have been marginally better off in cash than bonds as the annualized premium of bonds versus bills was –0.1%. Note that the entire premium from long-term bond returns relative to bills was earned during easing cycles. These differences were statistically significant at the 1% level.

The UK results are very similar, but the chart shows that, in the UK, the entire long-run premiums of equities over Treasury bills, and of equities over bonds, were earned during easing cycles. During tightening cycles, investors would have received 0.6% more per annum from cash, and 0.7% more from bonds. Before transaction costs, investors would have been better off and would have experienced lower risk by selling out of equities during tightening cycles. As in the USA, the premium of bonds over bills was appreciably lower during tightening cycles, although it remained just above zero in the UK.

Volatility and Sharpe ratios

An obvious question is whether the return differences between hiking and easing cycles could be due to risk. The left-hand side of **Figure 20** (overleaf) shows that the volatility of equities and bonds was higher during easing cycles. Equity volatility was 27% higher in the USA and 5% larger in the UK, while bond volatility was 9% higher in the USA and 13% greater in the UK.

The right-hand side of the chart shows the corresponding Sharpe ratios, which measure the reward per unit of volatility. The Sharpe ratio is defined as the real annualized asset return less the real Treasury bill rate, all divided by the standard deviation of the real asset returns. Despite the higher volatility during easing cycles, the Sharpe ratios are still well above the corresponding ratios during hiking cycles. During easing cycles, US equities had a Sharpe ratio of 0.47 compared with 0.18 during periods of

Figure 18: Asset returns after rate rises and falls

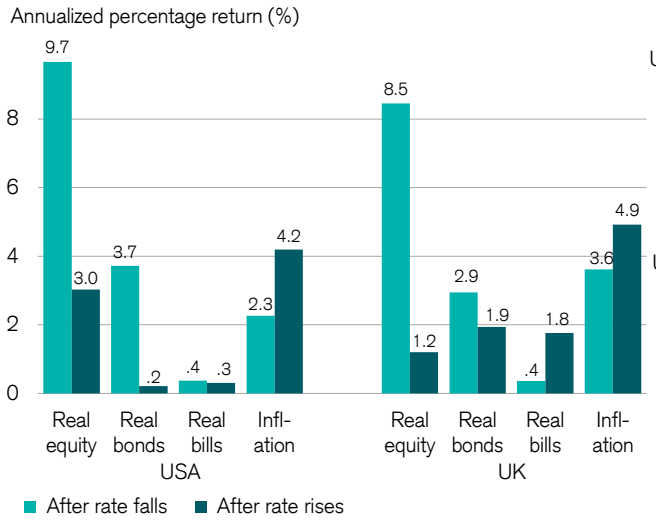

Figure 19: Premiums after rate rises and falls

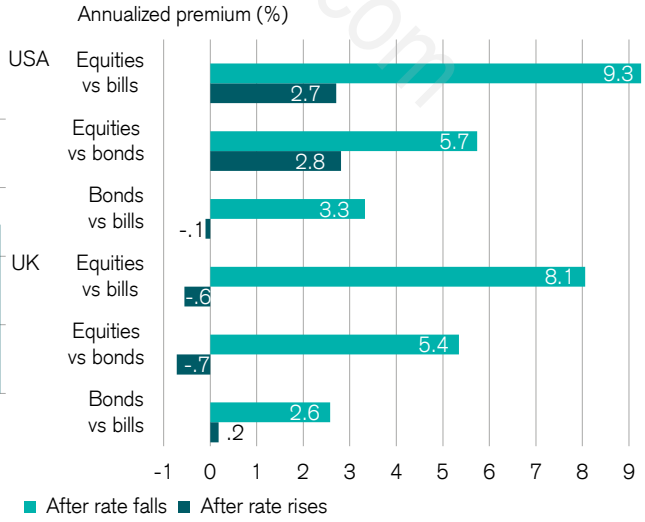

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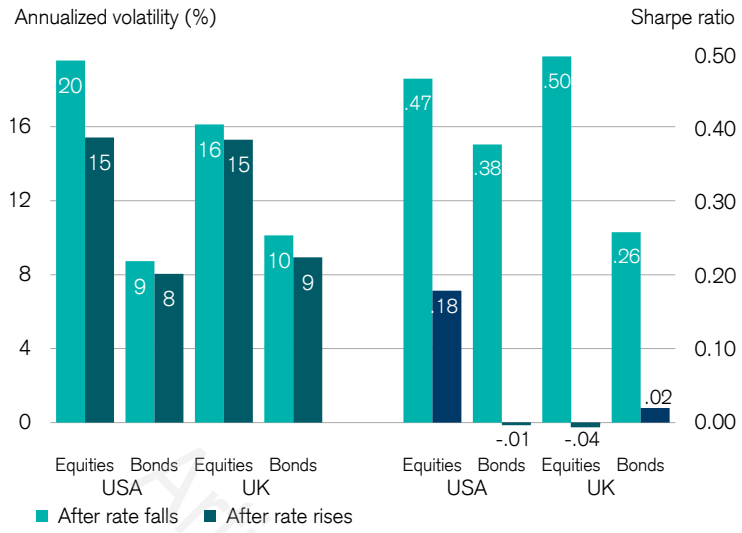
Figure 20: Volatilities and Sharpe ratios; rate rises and falls



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rising rates. The figures for the UK, 0.50 and –0.04, show an even larger gap. US bonds had a Sharpe ratio of 0.38 during easing cycles compared with –0.01 during hiking cycles. UK bonds had a Sharpe ratio of 0.26 during easing cycles and 0.02 during periods of rising rates.

Prospective returns in hiking cycles

Historically, the returns on stocks and bonds have been much lower during hiking than easing cycles. Indeed, Dimson, Marsh and Staunton (2016) report that during hiking cycles, it has historically been hard to identify assets that perform well. On average, periods of interest rate rises have been accompanied by inferior industry returns, smaller rewards from many factor investing strategies, and lower price appreciation for a wide variety of real assets. However, they did find relative outperformance from defensive versus cyclical stocks and from large- versus small-cap stocks. Now that the USA and many other countries appear to be entering a period of rising interest rates, does this imply that prospective asset returns are likely to be low?

While history can undoubtedly provide clues to the future, we should be cautious about any forecasts. The results above are long-term averages spanning many different economic conditions. They conceal considerable differences between cycles. Indeed, during 40% of US hiking cycles, equities performed better than during the easing cycles that preceded them. During the two most recent Fed tightening cycles – from June 2004 to September 2007 and from December 2015 to July 2019 – US and global stocks and bonds performed well.

Furthermore, the prospective rate rises have been well signaled, and should therefore be largely priced in. In addition, central banks and governments will also not wish to choke off the post-pandemic recovery.

Stock and bond returns have been lower during periods of rising interest rates. But these have also been periods of higher inflation. As we saw earlier in this chapter, higher levels of inflation have historically been associated with lower returns from stocks and bonds. It thus remains an open question whether the poorer asset returns during rate hiking cycles are due to the "illness" (inflation) or the "cure" (rate hikes).

Concluding remarks

Real equity returns since 2000 have been acceptable, but below their historical averages, despite the strong recovery since 2009 and the successful weathering of the storm from the COVID-19 pandemic. Three bear markets in just two decades have provided a timely reminder of the considerable risk involved in equity investment. Investors were spoiled by the high returns from the 1980s and 1990s, when equities seemed to guarantee high returns.

In this chapter, we have stressed the importance of taking a long-term view when seeking to understand the nature of risk and return in the world's markets. This is because equity and bond markets are volatile.

We have seen that, over the long run, equity returns have dominated bond and bill returns. Over the 122 years since 1900, equities have outperformed bonds and bills in all 21 countries for which we have a continuous history. For the world as a whole, equities have outperformed bills by 4.6% per year and bonds by 3.2% per year. This provides a reassuring reminder that, over the long run, there has been a reward for the higher risk from investing in stocks. Similarly, riskier bonds have outperformed close-to-risk-free bills, again indicating a reward for risk. In Chapters 4 and 5, we look more closely at these risk premiums and seek to assess how large we can expect them to be in the future.

Chapter 3: Currencies

Global investors are exposed to both foreign assets and foreign currencies. This chapter looks at the long-run behavior of currencies since 1900 and shows that while they have been volatile, parity changes were largely responding to relative inflation rates. This has important implications for long-run investors as it means they are already protected to some extent from currency risk. We examine the merits of hedging and conclude that it may be counterproductive over the long run. Historically, stock-market risk has been reduced more effectively by international diversification than by currency hedging.



Photo: New York, USA; Getty Images, GCShutter

Exchange rates and long-run asset returns

For some 50 years now, investors have been exhorted to diversify internationally so that they can benefit from risk reduction through diversification (see Chapter 8). Even 50 years ago, this idea was not new. Long before the birth of portfolio theory, international diversification was familiar to investors. Over a century ago, when capital flowed freely, London, New York, Amsterdam and Paris facilitated the development of transport systems, utilities, and natural resources around the world. In those days, many currencies were tied directly or indirectly to the gold price and currencies did not seem to be an important element of the risk of investing overseas.

Today, however, exchange rates are volatile and a switch from domestic toward foreign equities introduces exchange rate risk to a portfolio. For investors whose emphasis is on consumption in their home country – individuals, charities, insurance companies, pension funds and the like – it is important to identify the potential risks from currency exposure.

In this chapter, we analyze whether exchange rate changes influence the returns earned by very long-run investors. Over the long haul, we find that currencies have tracked relative inflation rates within a band that is narrow compared to the cross-country variation in stock returns. We examine common currency returns for each market, measured using an investor's home currency. We show that, although the 122-year returns depend on the reference currency, in real terms, the ranking of markets by long-term returns does not vary greatly with the location of the investor.

Long-run exchange rate behavior

Figure 21 compares the exchange rates against the dollar for the 21 countries with continuous asset return histories since 1900. On the left of the graph, we record the dollar value of 5.38 Swiss francs, 0.21 British pounds, and the sums in other currencies that equated, at start-1900, to one dollar. That is, we rebase the exchange rates at start-1900 to a value of 1.0. The vertical axis displays the number of dollars required to purchase one local currency unit (after rebasing). A depreciating currency trends downward, while an appreciating currency trends upward.

The chart shows that, in Germany's 1922–23 hyperinflation and Austria's long period of high inflation and hyperinflation that peaked in 1922, the currencies of these two countries were debased to a value of essentially zero.

Other currencies took longer to move less. By start-2022, the currencies in the diagram had depreciated to the point where the number of Italian currency units (lira, followed by euros) that could be bought for one dollar was 303 times as large as in 1900, the number of yen was 57 times larger, and the number of British pounds was 3.6 times larger.

The strongest currency was the Swiss franc, which had appreciated until (by today) one dollar could buy only 17 rappen (Swiss centimes), which is one-sixth of the number of francs that the dollar could have bought in 1900.

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Figure 21: Nominal exchange rates, 1900–2021, in USD per local currency (1900=1)

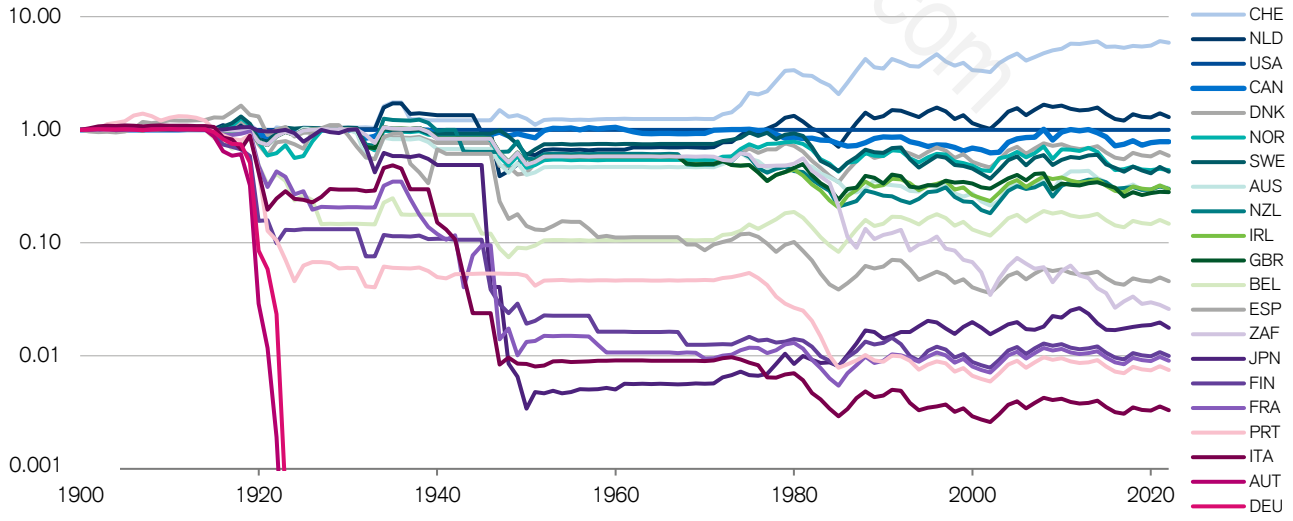

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Table 5 provides exchange rate statistics. The third column shows each country's annualized mean rate of currency appreciation or depreciation in terms of the dollar value of local currency units, measured over the period from the start date shown in column 2 until the end of 2021. A strong currency (e.g. the Swiss franc) is shown by a positive rate of change – more dollars are needed to buy one franc, and a weak currency (e.g. the former Italian lira) has a negative mean – fewer dollars are needed to buy one lira.

Focusing on the top panel of the table, this covers the 21 countries plotted in **Figure 21** for which we have continuous asset return histories since 1900. The standard deviations in the table show the considerable exchange rate variability experienced by each country. Two countries, Switzerland and the Netherlands, had strong and stable currencies relative to the dollar. Several other currencies experienced annualized losses in their dollar value of between –0.2% (Canada) and –2.9% (South Africa).

Seven countries' currencies stand out for their extreme loss of value and high volatility (standard deviation) relative to the dollar: they are Austria, Finland, France, Italy, Japan, Portugal, and Germany (where **Table 5** excludes 1922–23 when there was a complete loss of value). Where volatilities are large, the arithmetic mean substantially exceeds the geometric mean; this is especially clear for Germany and Austria.

The lower panel of the table shows the remaining markets in the DMS 35. These are mostly EMs (and all are either EMs or former EMs). Within this group, there are two currencies that over time have been relatively strong and stable, the Singapore and the Taiwan dollar. There is also a high proportion of countries whose currencies stand out for their extreme loss of value and/or high volatility (standard deviation) relative to the dollar: they are Argentina, Brazil, Chile, Greece, India, Mexico and South Korea.

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Table 5: Nominal exchange rates against the US dollar, 1900–2021

Country	Start year	Geometric mean (%)	Arithmetic mean (%)	Standard error (%)	Standard deviation (%)	Minimum return (%)	Minimum year	Maximum return (%)	Maximum year
Countries and indexes with continuous histories since 1900									
Australia	1900	–1.0	–0.4	1.0	10.9	–39.4	1931	53.4	1933
Austria	1900	–9.1	–3.7	2.0	21.7	–96.2	1922	53.0	1940
Belgium	1900	–1.6	–0.7	1.2	13.1	–41.9	1919	55.8	1933
Canada	1900	–0.2	0.0	0.5	5.8	–20.0	2008	22.3	2003
Denmark	1900	–0.4	0.2	1.0	11.2	–37.6	1946	40.2	1925
Finland	1900	–3.7	–2.2	1.3	14.9	–73.3	1919	54.4	1933
France	1900	–3.8	–1.4	1.7	19.0	–85.3	1946	91.3	1943
Germany*	1900	–2.3	8.3	9.2	100.7	–100.0	1923	1046.3	1948
Ireland	1900	–1.0	–0.4	1.0	10.5	–30.2	1931	53.4	1933
Italy	1900	–4.6	–2.9	1.5	16.4	–64.8	1946	59.1	1933
Japan	1900	–3.3	–0.6	1.5	16.5	–91.7	1945	47.8	1933
The Netherlands	1900	0.2	1.0	1.1	11.7	–59.1	1946	55.1	1933
New Zealand	1900	–1.0	–0.3	1.1	12.2	–36.0	1942	74.2	1933
Norway	1900	–0.7	0.0	1.1	11.7	–30.5	1931	49.5	1933
Portugal	1900	–3.9	–2.7	1.3	14.0	–70.5	1920	52.5	1933
South Africa	1900	–2.9	–1.9	1.3	13.9	–46.0	1985	46.1	1987
Spain	1900	–2.5	–1.1	1.5	16.5	–62.2	1946	99.2	1939
Sweden	1900	–0.7	–0.2	0.9	10.4	–29.2	1931	44.7	1933
Switzerland	1900	1.5	2.0	1.0	10.9	–29.4	1936	56.0	1933
United Kingdom	1900	–1.0	–0.5	1.0	10.7	–30.2	1931	53.4	1933
United States	1900	0.0	0.0	0.0	0.0	0.0		0.0	
Countries/markets with later start dates or discontinuous histories and hence later re-start dates (China and Russia)									
Argentina	1960	–38.5	–26.8	3.8	29.6	–99.5	1989	14.4	2003
Brazil	1951	–37.9	–25.6	3.7	31.2	–96.2	1993	32.7	2009
Chile	1960	–19.7	–15.5	2.9	22.7	–78.0	1972	25.6	2009
China	1993	–0.3	–0.1	1.3	6.9	–31.3	1994	7.0	2007
Greece	1954	–3.3	–2.8	1.2	9.6	–28.7	1983	19.2	2003
Hong Kong SAR	1963	–0.5	–0.4	0.5	3.9	–16.7	1983	12.4	1973
India	1953	–3.7	–3.3	1.2	9.7	–29.6	1991	35.6	1972
Malaysia	1970	–0.6	–0.3	1.0	7.4	–35.0	1997	15.1	1973
Mexico	1969	–13.0	–10.0	2.5	18.4	–83.5	1982	7.6	2012
Russia	1995	–10.7	–8.0	3.6	18.6	–71.3	1998	19.1	2016
Singapore	1966	1.5	1.6	0.7	5.3	–17.0	1997	15.9	1973
South Korea	1963	–3.4	–2.1	2.0	15.1	–50.0	1997	44.4	1965
Taiwan (Chinese Taipei)	1967	0.8	1.0	1.0	7.5	–18.9	1971	25.4	1972
Thailand	1976	–1.1	–0.4	1.6	10.5	–45.2	1997	28.2	1998

* For Germany, the mean, standard deviation, and standard error are based on 120 years, excluding 1922-23. Sources: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

Long-run purchasing power parity

At the start of 1900, the exchange rate between US dollars and British pounds was USD 1 = GBP 0.208 – almost five dollars to the pound. After 122 years, by the end of 2021, the pound had weakened to USD 1 = GBP 0.74 – only 1.35 dollars for each pound – a fall of 1.0% per year. But the strengthening of the dollar against the pound was accompanied by lower inflation in the USA than in the UK; so, to determine the "real" movement in the exchange rate, we must adjust the exchange rate for inflation in the USA relative to Britain.

The inflation-adjusted or real exchange rate is defined as the nominal exchange rate multiplied by the ratio of the two countries' inflation indexes. Over the long run, the real dollar/pound exchange rate moved by much less than the nominal exchange rate and in fact fell by only 0.39% per year.

There has been much debate about the extent to which exchange rates reflect inflation rates. An extreme viewpoint would be that purchasing power parity (PPP) holds absolutely. That is, currency-adjusted prices for goods and services are identical all over the world, and a unit of local currency should therefore have the same purchasing power in all countries.

It is more common to focus on relative PPP, which asserts that an exchange rate will change to reflect movements in the two countries' price levels. This version of PPP asserts that the exchange rate change over a given interval should be equal to the inflation differential over the same period. Let us assume that different countries' inflation indexes are based on the same basket of goods and services and are measured accurately. Then, if relative PPP is maintained over the long haul, we would expect the real exchange rate to remain constant.

Transportation costs, tariffs, trade restrictions, and product differentiation make the strictest version of PPP manifestly false. Nevertheless, at least over the very long run, there is a clear tendency for high-inflation currencies to devalue relative to currencies with lower inflation.

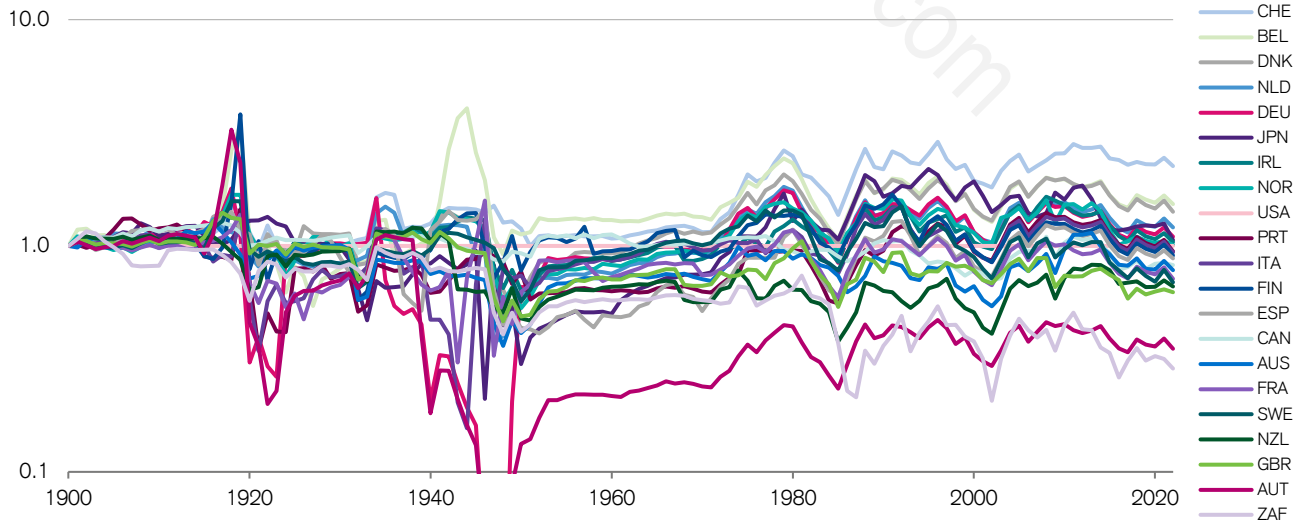
Deviations from purchasing power parity

While most tests of relative PPP support its validity over the long term, departures from parity have often persisted for years. Such misalignments do not necessarily indicate mispricing. In the earlier years, inflation indexes were narrow and non-representative, with much variation across countries in composition and weighting. Parity deviations can easily reflect mismeasurement of inflation. In more recent years, it is hard to believe that, in a world of floating currencies and liquid foreign exchange markets, currencies can remain at a disequilibrium level for years on end.

When deviations from PPP appear to be present, it is likely that exchange rates are also responding to other economic and political factors. For example, an oil-producing nation like contemporary Norway, which becomes wealthier through discovery of new reserves or an increase in the relative price of oil, can expect its currency to appreciate. Changes in productivity differentials, such as Japan's post-war productivity growth in the traded-goods sector, can bring similar wealth effects.

Different weightings in non-traded goods and services – healthcare, education, defense, and so on – can also give rise to misleading and

Figure 22: Real exchange rates, 1900–2021, in USD per local currency (1900=1)



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internationally non-comparable index values. In addition, relative changes in the real interest rate between countries can lead to capital flows and wealth effects. It is therefore striking that real exchange rates have been relatively stable for most countries over the long term, as shown in **Figure 22**.

This chart presents the real exchange rates for the 21 countries with continuous histories of asset returns over the period from 1900. Note that the vertical scale is quite different from the chart of nominal exchange rates (**Figure 21**). As with the dollar/pound rate discussed above, these inflation-adjusted currency values have been comparatively stable over this long interval, albeit with large spikes for countries that emerged from wartime defeat. Consistent with the findings in Taylor (2002), while real exchange rates do not appear to exhibit a long-term upward or downward trend, they are clearly volatile.

Table 6 shows the annual rates of change and the standard deviation of the annual changes in real exchange rates. We focus first on the top panel, which covers the 21 countries plotted in **Figure 22.** The South African rand depreciated in real value by −1.02% per year, while the Swiss franc appreciated by +0.67% per year. All other currencies moved by a smaller margin. There is measurement error in inflation and the real exchange rate involves a ratio of two inflation indexes. Despite these computational drawbacks, every country in the top panel of the table had a real exchange rate that appreciated or depreciated over the long term by no more than around 1% per year.

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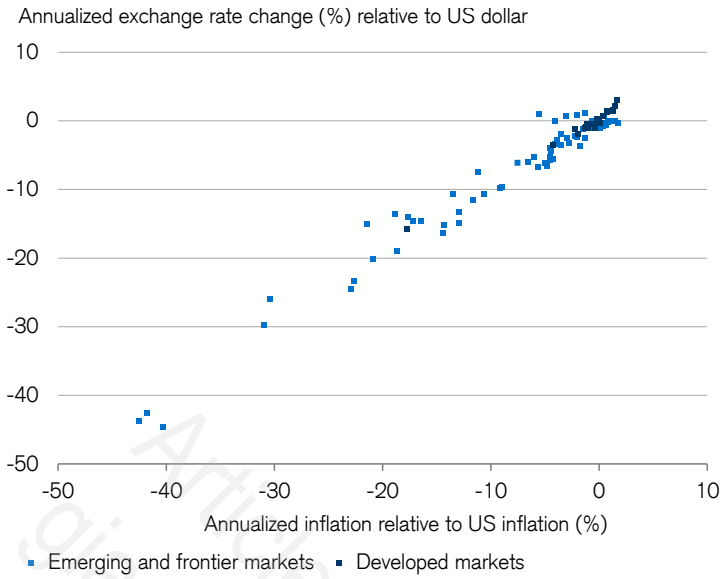
Table 6: Real exchange rates against the US dollar, 1900–2021

Country	Start year	Geometric mean (%)	Arithmetic mean (%)	Standard error (%)	Standard deviation (%)	Minimum return (%)	Minimum year	Maximum return (%)	Maximum year
Countries and indexes with continuous histories since 1900									
Australia	1900	−0.20	0.46	1.0	11.5	−40.1	1931	46.0	1933
Austria	1900	−0.86	2.15	2.1	23.3	−80.4	1919	122.7	1923
Belgium	1900	0.35	2.14	1.7	18.8	−68.5	1919	78.4	1917
Canada	1900	−0.16	0.02	0.5	6.0	−19.2	2008	22.5	2003
Denmark	1900	0.28	0.99	1.1	11.7	−47.5	1946	34.6	1933
Finland	1900	−0.08	1.97	1.9	20.5	−79.3	1919	146.9	1918
France	1900	−0.28	2.19	2.0	22.1	−79.4	1946	136.3	1943
Germany	1900	0.08	12.76	11.1	122.4	−75.0	1945	1298.1	1948
Ireland	1900	0.03	0.62	1.0	10.9	−38.0	1946	53.2	1933
Italy	1900	−0.05	3.51	3.3	36.1	−64.8	1946	334.4	1944
Japan	1900	0.05	2.76	2.7	30.0	−77.9	1945	290.3	1946
The Netherlands	1900	0.15	0.98	1.1	12.2	−61.5	1946	53.9	1933
New Zealand	1900	−0.34	0.44	1.2	12.8	−39.6	1942	65.7	1933
Norway	1900	0.01	0.71	1.1	11.8	−37.4	1946	46.0	1933
Portugal	1900	−0.05	1.25	1.5	16.7	−52.0	1919	90.7	1924
South Africa	1900	−1.02	0.10	1.4	15.2	−38.3	1985	60.5	1987
Spain	1900	−0.10	1.25	1.6	17.6	−56.4	1946	127.6	1939
Sweden	1900	−0.31	0.30	1.0	10.9	−39.1	1919	40.6	1933
Switzerland	1900	0.67	1.23	1.0	10.9	−29.3	1936	51.2	1933
United Kingdom	1900	−0.39	0.24	1.0	11.2	−36.7	1946	52.2	1933
United States	1900	0.00	0.00	0.0	0.0	0.0		0.0	
Countries/markets with later start dates or discontinuous histories and hence later re-start dates (China and Russia)									
Argentina	1960	0.57	10.54	9.1	71.9	−73.7	1989	524.8	1990
Brazil	1951	−1.38	0.08	2.0	17.2	−36.2	1964	36.4	1994
Chile	1960	−1.10	2.02	3.7	29.4	−53.5	1971	179.6	1973
China	1993	0.89	1.06	1.1	6.0	−16.1	1994	14.7	1993
Greece	1954	0.20	0.62	1.1	9.3	−17.5	1983	23.9	1986
Hong Kong SAR	1963	0.48	0.61	0.7	5.2	−11.2	1983	23.8	1973
India	1953	−0.57	0.00	1.3	11.2	−23.7	1959	45.2	1973
Malaysia	1970	−1.20	−0.85	1.1	8.0	−34.2	1997	24.9	1973
Mexico	1969	−0.48	1.39	2.4	17.6	−68.4	1982	64.9	1983
Russia	1995	1.49	3.64	4.0	21.0	−47.9	1998	72.2	1995
Singapore	1966	0.07	0.32	1.0	7.4	−16.7	1997	35.6	1973
South Korea	1963	−0.07	0.97	1.9	14.4	−47.6	1997	52.4	1965
Taiwan (Chinese Taipei)	1967	0.39	0.78	1.2	9.1	−19.3	1971	32.8	1974
Thailand	1976	−0.83	−0.21	1.6	10.8	−42.1	1997	31.7	1998

Sources: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

Figure 23: Exchange rates and inflation for the DMS 90 countries, 1970–2021



Source: Elroy Dimson, Paul Marsh, and Mike Staunton, DMS Database 2022, Morningstar, IMF, Refinitiv. Not to be reproduced without express written permission from the authors.

The lower panel of **Table 6** shows the remaining markets in the DMS 35. The (absolute values) of the geometric means are somewhat larger, showing greater disparities from PPP, albeit over much shorter periods that are typically less than half the 122 years spanned by the countries in the top panel. The largest absolute deviations, all greater than ±1% per year, are for Russia with an annualized real exchange rate of 1.49%, followed by Brazil (–1.38%), Malaysia (–1.20%), Chile (–1.10%) and China (+0.89%).

Does PPP hold in emerging markets?

Most of the countries shown in the upper panel of **Table 6** are DMs. While some have turbulent pasts, these countries have mostly enjoyed considerable stability over the last 70 or so years. Twelve of the 14 countries in the lower panel are EMs. The only EM in the top panel is South Africa, which experienced the largest deviation from PPP. This does raise the question of whether PPP holds somewhat less well in EMs than DMs.

Figure 23 explores the PPP relationship for a much larger range of countries. For each country, it plots the annualized exchange rate change versus the US dollar against its annualized inflation rate differential with the USA. The countries represented in the chart are the 90 countries that comprise the DMS 90 (for a list of the countries, see **Figure 1** in Chapter 1). These countries feature as constituents of our five composite equity indexes (see Chapter 9).

Twenty-four of the 90 countries are DMs, shown by the darker-shaded markers. The remaining 66, shown with lighter-shaded markers, are all developing markets, which, in the Yearbook, we categorize simply as EMs. Note that the major index providers would deem some to be EMs, others to be frontier markets, and yet others to be stand-alone markets or unclassified.

Figure 23 spans the 52-year period from 1970, and hence falls mostly within the post-1972 period when floating exchange rates largely replaced the old Bretton Woods regime. For 50 countries, the start date is 1970, while, for others, the period covered is from the date the country became a (truly) independent sovereign state, or once inflation data became available.

The chart shows a clear relationship between the annualized exchange rate change and the inflation differential. Even in countries that have experienced hyperinflation, the relationship tends to be close. For example, in Brazil, from 1970 to 2021, inflation was 41.8% per annum higher than in the USA, while the exchange rate over the same period fell by 42.6% per annum against the US dollar. When we fit a regression line to the points in the chart, the slope is 1.0. Clearly, PPP holds to a close approximation over the longer run.

The relationship is so strong that the outliers in **Figure 23** – which are clearly EMs – are more likely to be explained by poorly measured inflation rates, and/or deviations in exchange rates from market-determined values. For example, the largest outlier is Venezuela, where the exact magnitude of the current high inflation rate is unclear, as is the true market exchange rate.

Chile provides another interesting example. Based on the official government inflation index, the annualized real exchange rate from 1960–2021 would be –2.0%. However, these official numbers, especially for the 1960s and 1970s are disputed by Chilean economic historians. They argue that they were manipulated downward by the government to reduce salary adjustments. Wagner and Díaz (2008) provide a detailed discussion of the revised measures that have been suggested. The series that they propose, which we have adopted in the Yearbook, almost halves the magnitude of the annualized real exchange rate to –1.1%. It is possible that this still understates the true rate of historical inflation.

Common currency returns across markets

In Chapter 2, we reported the real returns to a domestic equity investor, based on local purchasing power in that investor's home country. For example, over the period 1900–

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2021, the annualized real return to an American buying US equities was 6.69%, and for a Swiss investor buying Swiss equities 4.74%.

However, when considering cross-border investment, we also need to account for exchange rate movements. To illustrate, consider an American buying Swiss equities and a Swiss investor buying US equities. Each investor now has two exposures, one to foreign equities and the other to foreign currency. We need to convert each investor's return into his or her reference currency.

To convert nominal returns, we use changes in the nominal exchange rate. Investors, however, focus on real returns in their local currency. To convert real returns in one currency into real returns in another, we simply adjust by the change in the real exchange rate. Over the period 1900–2021, **Table 6** shows that the real (inflation-adjusted) Swiss franc was stronger than the US dollar by 0.67% per year.

Thus the American who invested in Switzerland had a real return of 4.74% (from Swiss equities) plus 0.67% (from the Swiss franc), giving an overall return of (1+4.74%) × (1+0.67%) – 1 = 5.44% (all numbers rounded). In contrast, the Swiss investor who invested in America had a real return of 6.69% (from US equities) minus 0.67% (from the US dollar), namely (1+6.69%) × (1–0.67%) – 1 = 5.98% (again, rounded).

Instead of comparing domestic returns, an alternative way of making cross-country comparisons is thus to translate all countries' returns into real returns in a common currency using the real exchange rate. For equity returns around the world, **Figure 24** shows the results from translating out of local currency and into the US dollar.

The lighter blue bars show the annualized real domestic currency returns from 1900 to 2021, as presented earlier. The small gray bars, close to the horizontal axis, show the annualized real exchange rate movement over the same period, with positive values indicating currencies that appreciated against the dollar, and vice versa. The dark blue bars are common currency returns in real US dollars from the US investor's perspective.

Figure 24 portrays the adjustment from local currency real returns to dollar-denominated real returns. It simply involves (geometric) addition of the real exchange rate movement. In the case of Switzerland, for example, the domestic real return is 4.74% and the real exchange rate movement is +0.67%. Adding these (geometrically) gives a real dollar return of 5.44% – as in the sample calculation shown above (again, all numbers are rounded). We obtain a similar ranking of equity markets, whether we rank by domestic real returns or real dollar returns. Typically, since we are adjusting for both exchange rate changes and relative inflation rates, the annualized returns in each area of the chart are close to each other.

In **Figure 24**, countries are shown in ascending order of the dark blue bars, which show the annualized real returns to a US investor (returns converted into dollars and adjusted for US inflation). For US investors, their domestic equity market gave a hard-to-beat annualized real return of 6.69%, although Australia was a close runner-up. For comparisons like this, we can use any common currency, e.g. the annualized real returns denominated in UK inflation-adjusted sterling are obtained by adjusting by the real sterling-dollar exchange rate movement.

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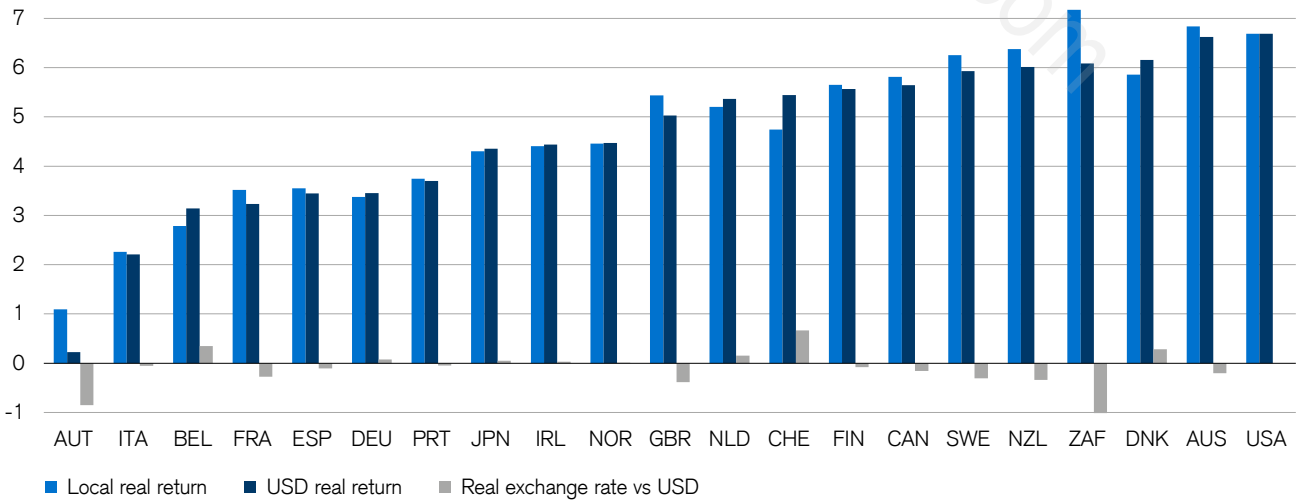
Figure 24: Real annualized equity returns (%) in local currency and US dollars, 1900–2021



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As **Table 6** shows, the latter was –0.39% per year. So the real equity returns to a British investor in British pounds are 0.39% higher than the real dollar returns shown in **Figure 24**. Similarly, the common currency Swiss franc returns to a Swiss investor would be 0.67% smaller than the real dollar returns in **Figure 24**. Note that, although the magnitude of the returns varies, country rankings are the same regardless of which common currency is used.

Table 7 provides statistics on real, common currency (USD) equity returns. The top panel covers the 21 countries for which we have continuous histories since 1900. The geometric means in the third column show the 122-year annualized returns, and these are the figures that were plotted in the dark blue bars of **Figure 24**. The arithmetic means in the fourth column show the average of the 122 annual returns for each country/composite index, while the standard deviation of annual returns is given in the sixth column. The lower panel of **Table 7** shows the remaining 14 markets in the DMS 35.

Should long-run investors hedge?

Currency risk abounds and history reveals that this is the norm. Changes in exchange rates can boost the return from what might otherwise have been a disappointing exposure to foreign assets. But

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Table 7: Real, common currency (USD) equity returns around the world, 1900–2021

Country	Start year	Geometric mean (%)	Arithmetic mean (%)	Standard error (%)	Standard deviation (%)	Minimum return (%)	Minimum year	Maximum return (%)	Maximum year
Countries and indexes with continuous histories since 1900									
Australia	1900	6.6	8.8	2.0	21.8	–52.7	2008	90.9	1933
Austria	1900	0.2	6.3	3.4	37.0	–73.2	1919	189.2	1985
Belgium	1900	3.1	6.0	2.3	25.6	–50.2	2008	126.1	1940
Canada	1900	5.6	7.4	1.8	19.4	–46.5	2008	71.0	1933
Denmark	1900	6.2	8.5	2.1	22.7	–50.5	2008	99.4	1972
Finland	1900	5.6	10.2	2.9	31.8	–76.3	1919	122.0	1999
France	1900	3.2	7.1	2.5	27.8	–77.5	1946	88.4	1985
Germany	1900	3.5	14.8	7.1	78.4	–79.7	1945	717.0	1949
Ireland	1900	4.4	7.3	2.3	24.9	–66.8	2008	97.0	1977
Italy	1900	2.2	6.7	3.0	32.6	–62.6	1920	146.3	1944
Japan	1900	4.4	9.7	2.8	31.1	–91.8	1945	130.0	1952
The Netherlands	1900	5.4	8.1	2.2	24.1	–69.0	1946	128.4	1940
New Zealand	1900	6.0	8.5	2.3	25.0	–49.7	2008	138.2	1933
Norway	1900	4.5	8.1	2.6	29.1	–63.3	2008	150.8	1979
Portugal	1900	3.7	10.1	3.7	40.4	–76.5	1978	201.4	1986
South Africa	1900	6.1	9.4	2.6	29.0	–43.3	2008	183.4	1933
Spain	1900	3.4	6.8	2.5	27.6	–50.8	1936	148.3	1986
Sweden	1900	5.9	8.6	2.1	23.4	–50.4	2008	71.0	1933
Switzerland	1900	5.4	7.3	1.8	20.4	–42.8	1919	96.3	1985
United Kingdom	1900	5.0	7.4	2.1	22.7	–54.0	1974	98.0	1975
United States	1900	6.7	8.6	1.8	19.8	–38.6	1931	55.8	1933
Europe	1900	4.3	6.1	1.8	19.6	–48.0	2008	75.2	1933
World ex-US	1900	4.5	6.2	1.7	18.8	–46.0	2008	79.6	1933
World	1900	5.3	6.8	1.6	17.3	–42.9	2008	67.6	1933
Developed markets	1900	5.4	6.9	1.6	17.4	–41.3	2008	65.1	1933
Emerging markets	1900	3.9	6.5	2.0	22.6	–63.1	1945	91.6	1933
Countries/markets with later start dates or discontinuous histories and hence later re-start dates (China and Russia)									
Argentina	1960	4.3	33.5	21.6	170.0	–71.5	1975	1222.8	1976
Brazil	1951	4.9	15.7	6.0	50.9	–67.7	1990	162.3	1991
Chile	1960	10.6	29.9	16.4	128.8	–60.1	1982	969.8	1973
China	1993	5.2	11.0	6.8	36.8	–52.2	2008	102.2	2003
Greece	1954	4.9	15.0	6.6	54.3	–65.4	2008	250.9	1972
Hong Kong SAR	1963	9.4	15.8	5.1	38.9	–61.3	1974	141.8	1972
India	1953	6.1	10.0	3.6	29.7	–65.1	2008	96.2	2009
Malaysia	1970	5.3	11.6	5.5	39.4	–71.3	1997	164.6	1972
Mexico	1969	8.4	18.6	7.1	51.4	–87.6	1982	255.8	1983
Russia	1995	9.0	29.1	13.2	68.7	–87.2	1998	240.5	1999
Singapore	1966	5.6	9.8	4.2	31.3	–51.6	2008	119.1	1972
South Korea	1963	9.2	17.4	5.6	43.0	–71.1	1997	123.0	1972
Taiwan (Chinese Taipei)	1967	10.6	18.0	5.9	43.9	–57.5	1974	171.5	1987
Thailand	1976	6.4	15.1	6.6	44.8	–74.7	1997	142.2	2003

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exchange rate movements can also erode or reverse the profits from investing in foreign markets that, in local currency terms, performed well.

Investors enjoy gains from investments in countries whose currencies appreciate and suffer losses when currencies depreciate, so they often argue that it is better to invest in countries with strong currencies. But this is true only if one can successfully forecast which currencies will be strong in the future and there is much evidence to suggest that currency movements are hard to predict. All we know for sure is which ones have been strong in the past and yet the evidence suggests that, if anything, it is better to invest after currency weakness (see Chapter 8).

Exchange rates are volatile and impactful – so should investors hedge currency risk? This depends largely on the investor's horizon. Over most investors' horizons, exchange rate changes can have a big impact. For example, since the start of 2000, Swiss equities have given a nominal return of 223% to local investors, but 465% to unhedged US investors.

Often, investors think of hedging in terms of "taking a view." They hedge currencies they are hesitant about and accept exposure where they feel confident about a currency's strength. This, however, is more like speculation than hedging. To be successful, it requires levels of currency forecasting skill that very few investors possess.

Overall, the impact of hedging on returns (as opposed to risk) is a zero-sum game. The profit a German investor makes on Swiss assets if the franc appreciates is offset by the loss the Swiss investor incurs on German assets. In the 2012 Yearbook, we found that averaged over all reference currencies and countries, the mean return advantage to hedging both equities and bonds was zero, both over the long run, and over the post Bretton Woods period since 1972.

True hedging is about moderating risk. While currency risk is mitigated by its low and often slightly negative correlation with real asset returns, it still adds to overall risk, and proportionately more for bonds than equities. If hedging reduces risk without harming returns (after transaction costs), this would be a benefit.

The most common ways of hedging are by selling futures/forward currency contracts or by borrowing foreign currency to fund the investment. Hedging can reduce, but not eliminate risk because future returns are uncertain, so we do not know in advance what amount to hedge. Typically, investors hedge the initial capital over the period until the hedge is rebalanced.

Investors who are concerned about short-term volatility may wish to hedge. However, over longer-run horizons, the fact that PPP holds well – including within EMs, with their more volatile currencies – has important implications for investors. It means that long-run investors are already protected to some extent from currency risk, since longer-term currency fluctuations are less marked than we might expect due to a tendency to converge toward PPP.

While hedging reduces short-term volatility, our research in the 2012 Yearbook found that its benefits have shrunk in more recent periods. The risk reduction from hedging equities is less than half that obtainable from global diversification. In addition, for longer-term investors, the risk reduction benefits of hedging rapidly decline.

This is because currencies tend to converge toward reflecting relative inflation rates. Conceptually, hedging involves taking a short position in foreign interest rates and a long position in the investor's domestic interest rate. While helping to hedge short-term currency risk, this introduces a new form of risk and source of volatility, namely taking a position in real interest rates at home versus abroad. Our research found that, even over relatively brief multiyear horizons, hedging on average led to an increase in the volatility of real returns and thus proved counterproductive.

Concluding remarks

Currency values have fluctuated considerably over the long run. Most currencies weakened against the US dollar, and only a couple (most notably the Swiss franc) proved perceptibly stronger than the US dollar. Yet, over the long haul, parity changes were largely responding to relative inflation rates.

For countries for which we have a 122-year history, real exchange rates against the US dollar changed by no more than around 1% per year. Common currency returns have thus been quite close to, and have a very similar ranking to, real returns expressed in local currency terms.

For investors who are concerned with short-term volatility, there may be scope for hedging currency exposure. For longer-term investors, foreign exchange hedging reduces downside risk by no more than a small margin. Furthermore, while reducing currency risk, it introduces other forms of risk, which increase the volatility of real returns and thus can prove counterproductive. Historically, over the long run, stock market risk has been reduced more effectively by international diversification than by currency hedging.

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Chapter 4: Investment risk

This chapter discusses the risks and variability of returns from investing in equities and bonds. It provides evidence on the magnitude of drawdowns and protracted losses and highlights the extremes of performance – good as well as bad – experienced globally since 1900. For every country, we show just how much an investor could lose. We also present evidence on the speed of recovery, including from the COVID-19 pandemic. The possibility of loss means that assets are priced to offer investors a reward for risk. We quantify the historical equity risk premium and study the risks of fixed income securities. This historical record helps to guide projections of future investment performance.



Photo: Sydney, Australia Getty Images, Alan Cookson - Liverpool

Risk matters

Investment in equities has proved rewarding over the long run, but has been accompanied by correspondingly greater risks. Bonds similarly beat cash, but were again more volatile. Our focus in this chapter is on equity risk and the equity risk premium, although we also provide evidence on long-term bonds. We begin by examining the historical variation of stock market returns, giving particular attention to downside risks – the bad times for investors.

How volatile are stock and bond returns? **Figure 25** is a histogram displaying the range of realized annual returns in the US stock market over the years since 1900. The returns include reinvested dividends and are adjusted for US inflation. The histogram shows not only the distribution of historical returns, but also the precise years in which returns of various magnitudes occurred. The more heavily shaded years are for the 21st century, with the most recent year highlighted in extra heavy shading. Investment outcomes for the 20th century are more lightly shaded. In an average year, the real return on US equities was 8.6%. The worst performance over a single year was in 1931; the best in 1933.

Figure 26 presents a similar overview of the volatility of real equity returns – this time focusing on the United Kingdom. In an average year, the real return on UK equities was 7.2%. The worst performance was in 1974; the best in 1975. For both countries, stock-market returns typically averaged around 0%–10% in real terms. They were below –20% in only ten out of 122 years in the USA (**Figure 25**), and in only seven out of 122 years in the UK (**Figure 26**). As we reported in **Table 1** of Chapter 2, for many countries, the distribution of real equity returns was wider than in the USA or UK. In brief, annual equity returns are volatile.

Figure 27 shows a similar chart for real returns on long-term US government bonds. As before, the shading of the cells indicates the century in which a particular return occurred. In an average year, the real return on US government bonds was 2.5%. The worst performance was in 1917; the best in 1982. The distribution for the UK (not displayed graphically) is similar, although with a wider range of returns. On average, the real return on UK government bonds was 2.7% with the worst performance being in 1974 and the best in 1921. The distribution of annual real bond returns was narrower than for real equity returns in both the USA and UK. In fact, the dispersion of real bond returns was less than that of real equity returns in every country within the DMS 35, except for Austria.

Figure 25: US equity real returns, 1900–2021

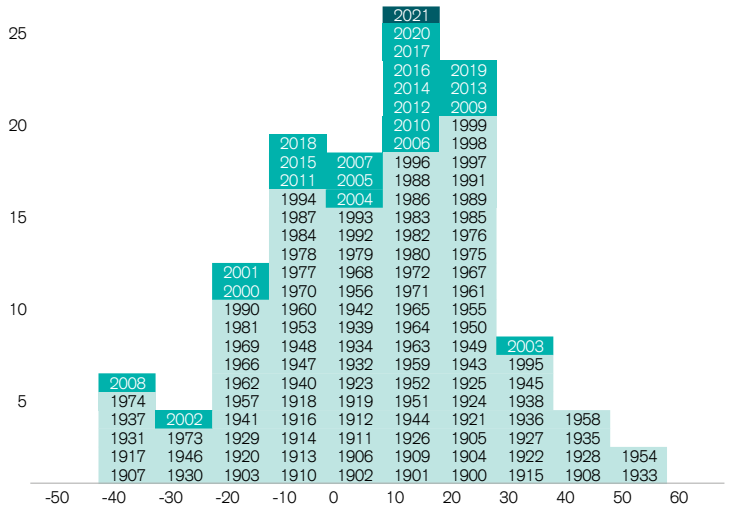


Figure 26: UK equity real returns, 1900–2021

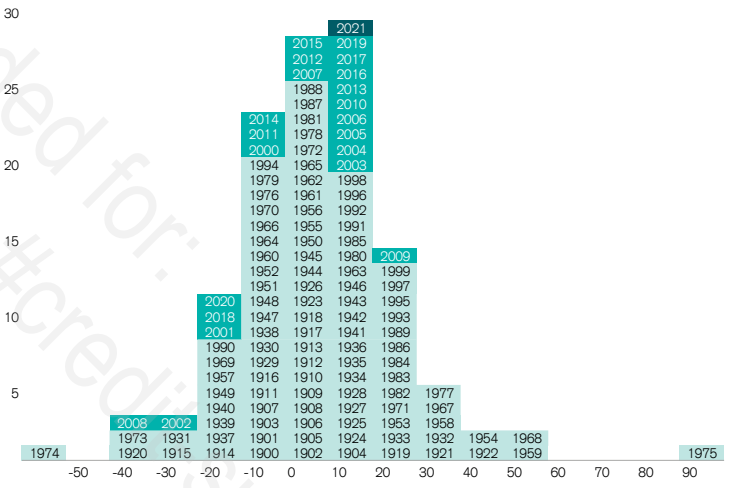
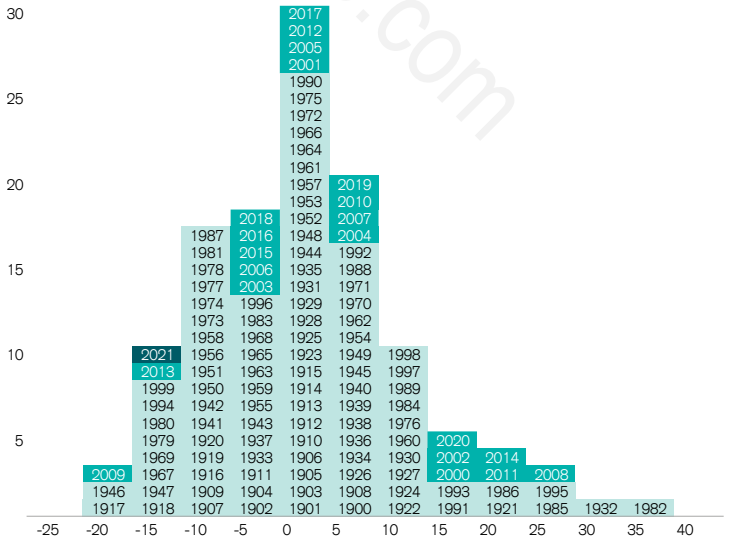


Figure 27: US government bond real returns, 1900–2021



Source Figures 25–27: Elroy Dimson, Paul Marsh, and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

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Extremes of equity market history

It is informative to examine the extreme returns represented by the "tails" in **Figures 25 and 26**. Equities are risky, and so we start by looking at the downside in terms of the investment performance of this asset class.

The bad times

The upper panel of **Table 8** highlights notable episodes of world political and economic turmoil since 1900. The table reports real equity returns over the six worst episodes for equity investors in five of the world's largest markets and in the world as a whole. These are of interest not just because of their economic importance, but because they represent some of the most extreme returns in our database – exceeded only by the total value loss in Russia and China, following their communist revolutions.

The six worst episodes for global equity investors comprise the two world wars and the four great bear markets: the Wall Street Crash and Great Depression, the first oil shock and world recession of 1973–74, the 2000–02 bear market that followed the internet bubble, and the Global Financial Crisis that was centered in 2008.

While the world wars were in aggregate negative for equities, there were relative winners and losers, corresponding to each country's fortunes in war. Thus, in World War I, German equities performed worst (–66%), while Japanese stocks fared the best (+66%) as Japan was a net gainer from the war (see discussion below). In World War II and its aftermath, Japanese and German equities were decimated, with real rates of return of –96% and –88% respectively, while both US and UK equities enjoyed small positive real returns.

Table 8 shows that the world wars were less damaging to world equities than the peacetime bear markets. From 1929 to 1931, during the Wall Street Crash and ensuing Great Depression, the world index fell by 54% in real US dollar terms, compared with 31% during World War I and 12% in World War II. For the USA, Germany and France, this was the most severe of the three great bear markets and, from 1929 to 1931, the losses in real terms were 61%, 59% and 44%, respectively. From peak to trough, the falls were even greater. The table records calendar-year returns, but the US equity market did not start its decline until September 1929, reaching its nadir in June 1932 when it had fallen 80% (in real terms) below its 1929 peak.

UK and Japanese investors suffered greater losses in 1973–74 during the recession after the first OPEC oil squeeze, than in the 1930s. In 1973–74, the real returns on UK, US, Japanese and world equities were –70%, –52%, –49% and –47%, respectively. The penultimate row of the upper panel shows that the world equity index fell by almost as much (44% in real terms) in the bear market of 2000–02. The table shows calendar-year returns, but, from start-2000 until the trough of the bear market in March 2003, the real returns on US, UK, Japanese and German equities were even lower at –47%, –44%, –53% and –65%, respectively.

Finally, the bottom row of the upper panel shows real equity returns during the Global Financial Crisis in 2008. Again, these are calendar year returns, and from peak (end-October 2007) to trough (9 March 2009), the real return on the world index was –58%. This compares with our peak-to-trough estimate of –65% for the world index during the Wall Street Crash, leaving the latter's grisly record intact as the worst period ever for equities.

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Table 8: Real equity returns (%) in the bad times, 1900–2021

Period (calendar years)		USA	UK	France	Germany	Japan	World
				The six worst episodes			
1914–18	World War I	–18	–36	–50	–66	66	–31
1929–31	Wall Street Crash	–61	–31	–44	–59	11	–54
1939–48	World War II	22	34	–41	–88	–96	–12
1973–74	Oil shock/recession	–52	–70	–40	–26	–49	–47
2000–02	Internet "bust"	–42	–38	–45	–58	–49	–44
2008	Global Financial Crisis	–38	–33	–41	–43	–41	–43
				Periods with the lowest returns			
1 year	(%)	–39	–57	–41	–91	–86	–43
	Dates	1931	1974	2008	1948	1946	2008
2 years	(%)	–54	–70	–53	–90	–95	–47
	Dates	1930–31	1973–74	1944–45	1947–48	1945–46	1973–74
5 years	(%)	–46	–63	–78	–93	–98	–58
	Dates	1916–20	1970–74	1943–47	1944–48	1943–47	1916–20

Source: Elroy Dimson, Paul Marsh, and Mike Staunton, The Worldwide Equity Premium: A Smaller Puzzle, in R. Mehra (Ed.), Handbook of the Equity Risk Premium, Elsevier, 2007, and subsequent research; DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

On a strict calendar-year basis, 2008 was the worst year on record for the world index. In its two-decade life, the 21st century already has the dubious honor of hosting two of the four worst bear markets in history.

The lower panel of **Table 8** shows the returns for, and dates of, the one-, two-, and five-year periods during which each country and the world index experienced their lowest returns. The picture that emerges reinforces the discussion above, as in nearly all cases, the worst periods are drawn from, and are subsets of, the episodes listed in the upper panel.

The Wall Street Crash of 1929 was followed by a long period during which stocks were underwater. But sometimes recovery can be fast and the damage from shocks is just transitory. During Black Monday on 19 October 1987, the Dow Jones Industrial Average fell by 508 points (22.6%) in one day, but recovered 102 points the next day and 187 points on 22 October. The Flash Crash of 6 May 2010 was a trillion-dollar stock market decline that started at 2:32 pm EDT and lasted for only 36 minutes. The COVID-19 bear market began on 20 February 2020, hit its nadir of –35% one month later, and then fully recovered within five months. So bad news can be followed by good.

The good times

The real returns over four "golden ages" for stock market investors are summarized in **Table 9**. The 1990s, which we highlighted in Chapter 2 as a period of exceptional performance, was the most muted of the four, with the world index showing a real return of 114%. While the 1990s was an especially strong period for the US market (276% real return), the world index was held back by Japan.

The world index rose by appreciably more during the 1980s (247% in real terms) and the two post-world war recovery periods (171% in the decade after World War I and 383% from 1949–1959). During the latter period, a number of equity markets enjoyed extraordinarily high returns. The upper panel of the table shows that during these nascent years of the German and Japanese "economic miracles," their equity markets rose in real terms by 4,373% (an annualized 41.3%) and 1,565% (an annualized 29.1%), respectively.

The lower panel of **Table 9** shows the returns for, and dates of, the one-, two-, and five-year periods during which each country and the world indexes experienced their highest returns. Mostly, the best periods are drawn from, and are subsets of, the episodes in the upper panel.

Comparing **Tables 8 and 9**, we note that the spread between best returns and worst returns is very wide. For the world, the 1-year real returns range from –43% (lower panel of **Table 8**) to +68% (lower panel of **Table 9**). Similarly, the 1-year ranges are –39% to +56% (USA), –91% to +155% (Germany) and –86% to +121% (Japan). Five-year real returns extend from –58% to +185% (world), –46% to +235% (USA), –93% to +652% (Germany) and –98% to +576% (Japan).

These estimates understate the possible range of returns for several reasons. We are looking at large markets chosen with hindsight and likely to have been among the more successful. We focus on complete years, but investors may invest or disinvest at any time. And we ignore the wider range of experiences of other markets – an omission that we rectify shortly.

Table 9: Real equity returns (%) in the good times, 1900–2021

Period (calendar years)		USA	UK	France	Germany	Japan	World
				The four best episodes			
1919–28:	Post–WWI recovery	376	234	171	18	30	171
1949–59:	Post–WWII recovery	430	197	269	4373	1565	383
1980–89:	Expansionary 80s	176	360	297	220	431	247
1990–99:	Nineties/tech boom	276	198	218	154	–42	114
				Periods with the highest returns			
1 year	(%)	56	99	66	155	121	68
	Dates	1933	1975	1954	1949	1952	1933
2 years	(%)	92	106	123	187	245	90
	Dates	1927–28	1958–59	1927–28	1958–59	1951–52	1932–33
5 years	(%)	235	176	270	652	576	185
	Dates	1924–28	1921–25	1982–86	1949–53	1948–52	1932–36

Source: Elroy Dimson, Paul Marsh, and Mike Staunton, The Worldwide Equity Premium: A Smaller Puzzle, in R. Mehra (Ed.), Handbook of the Equity Risk Premium, Elsevier, 2007, and subsequent research; DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

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Bond returns over the long run

While bonds have generally been much less volatile than equities, they have experienced some protracted periods of very low or high returns. **Figure 28** shows the real returns on bonds over a selection of extreme periods. The bars on the left show that wars have generally proved very bad for bonds. Investors in the world bond index lost 45% of their real wealth during World War I, and 46% from 1939 to 1948 in World War II and its immediate aftermath. While wars are bad, deflation has proved good news for bond investors. In fact, the chart shows that, during the deflationary period from 1926 to 1933, the real return on the world bond index was 198%, equivalent to 14.6% per annum.

Predictably, the worst periods for bond investors were episodes of very high inflation or hyperinflation. The extreme case was German hyperinflation in 1922–23, but Austria also experienced hyperinflation after World War I, while bond investors in France, Italy, and Japan suffered disastrous returns during the extremes of inflation following World War II. More recently, the chart shows that UK bond investors lost half their real wealth in the inflationary period from 1972 to 1974. During the 1970s, many other countries suffered strong inflationary pressures.

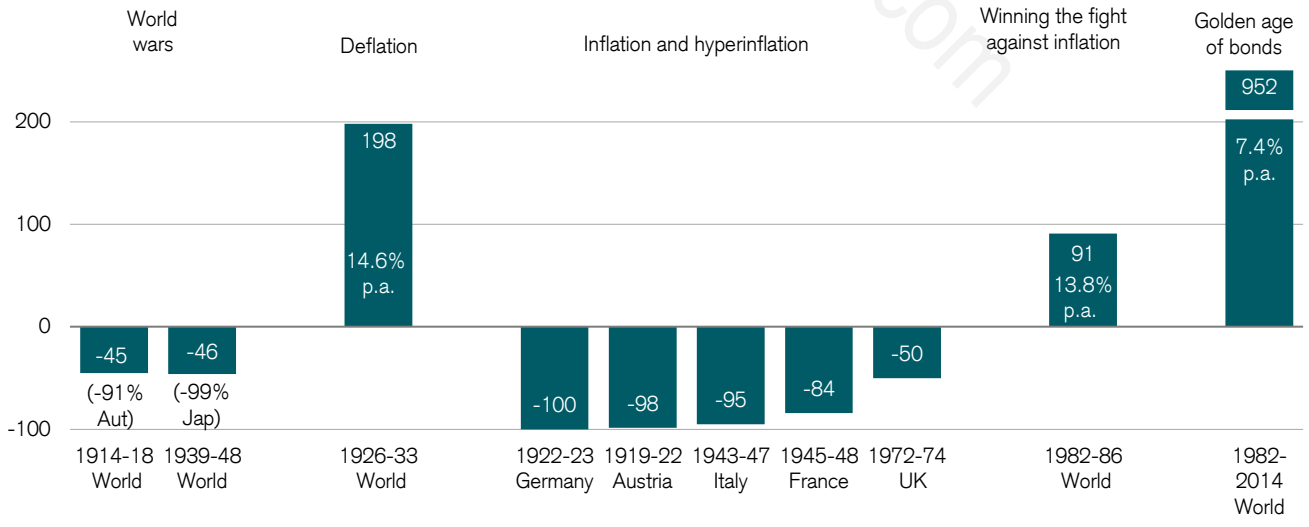
From the late 1970s, governments tackled inflation using short-term interest rates as a policy instrument. This initially hurt bond returns, but, by 1982, inflation, inflationary expectations and the reward demanded for inflation risk were all declining, giving a strong boost to bond prices.

Figure 28 shows that, from 1982 to 1986, the world bond index rose by 91% in real terms, equivalent to an annualized return of 13.8%.

The final bar of the chart shows that this was the start of a golden age that lasted for more than three decades. From 1982–2014, the world bond index provided a real return of 7.4% per annum. There were obviously setbacks, but world bonds gave positive real returns in 28 of the 33 years. The average annualized real return was 6.9% across the 21 countries for which we have 122-year histories. It was 7.3% in the USA and 7.5% in the UK. Switzerland, which has enjoyed impressive bond returns over the full period since 1900, had the lowest return of 4.0%. Swiss bonds failed to benefit on the same scale, as Switzerland had no material inflationary problem to solve. Annualized real returns were 5% or more in every other market except for Portugal (4.8%) and South Africa (4.9%).

These high returns partly reflect the higher real interest rates since 1982 (see Chapter 2). However, over this period, bonds beat bills in every country – the average difference between the annualized bond and bill returns was 4.2%, so there were clearly other factors at work. The bull market began with the successful fight back by governments against inflation. Real interest rates then fell from their high levels in the early to mid-1980s, giving a further boost to bond prices. During the two major bear markets of the early 21st century, the Eurozone crisis and the COVID-19 pandemic, bonds benefited from their perceived safe-haven status and from policy interest rates being kept low to support national economies.

Figure 28: Real returns on bonds (%) during extreme periods, 1900–2021



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The lengthy period of strong bond returns contrasts sharply with the 122-year record reported in Chapter 2. Since 1900, the average annualized real bond return across the 21 countries was just 1.0% per year, with disappointing returns in many countries. Yet, by the 2010s, world bonds were level-pegging with world equities over the previous 3–4 decades, giving very similar annualized real returns.

Bonds have thus been admirable performers since the early 1980s. They have produced equity-like performance, but with much lower volatility in an apparent violation of the law of risk and return. These high returns arose from factors that could continue indefinitely. Since 2014, the annualized return on the world bond index has been 1.6% after a poor return of −10.2% in 2021. Long government bonds in most developed markets are now selling on real yields that are close to zero or even negative. Future real bond returns are likely to be far lower than over the last 30–40 years.

As we argued in Chapter 2, this is another example of the importance of looking at very long periods of history to understand markets. Even periods as long as three or four decades can be quite misleading if naively extrapolated.

Time-variation in stock market risk

Our discussion above highlights the important fact that market volatility varies over time. We therefore look in detail at the volatility of the stock market from the beginning of 1900 to date. While in **Tables 8 and 9** we have focused on yearly returns, we switch here to looking at daily returns.

We estimate stock market volatility for each month, using daily index return data for the USA and for the UK. Our data runs from start-1900 for the USA and from start-1930 for the UK, and finishes at end-2021.

We compute the standard deviation of equity market returns as the root mean squared daily returns over all the trading days within each month (typically 21 days). We annualize these volatility estimates by scaling them by the square root of the number of trading days in each year.

Of course, volatility fluctuates greatly over time. In the USA, the annualized standard deviation of daily equity returns has varied from a low of 3.7% (in February 1964) to a high of 110% (in March 2020, during the COVID-19 shock). In the UK, the annualized standard deviation of equity index returns has varied from a low of 1.4% (January 1944) to a high of 82% (again in March 2020 during the COVID-19 shock).

The time series of monthly volatility estimates for the USA since 1900 and for the UK since 1930 are plotted in **Figure 29**. The chart shows that volatility appears to be mean-reverting, with long periods of subdued stock fluctuations and occasional bursts of extreme volatility. The latter are associated with economic or market shocks that come as a surprise to the market. Examples are the Wall Street Crash, the 1970s Oil Shock, Black Monday in October 1987, and the Global Financial Crisis. Shocks, by definition, are hard to anticipate, but the chart shows that subsequent volatility has historically dampened down quite rapidly. We return to this theme when we examine the time-variation of risk premiums in Chapter 5.

Figure 29: Annualized standard deviations of US and UK daily equity returns, monthly observations 1900–2021

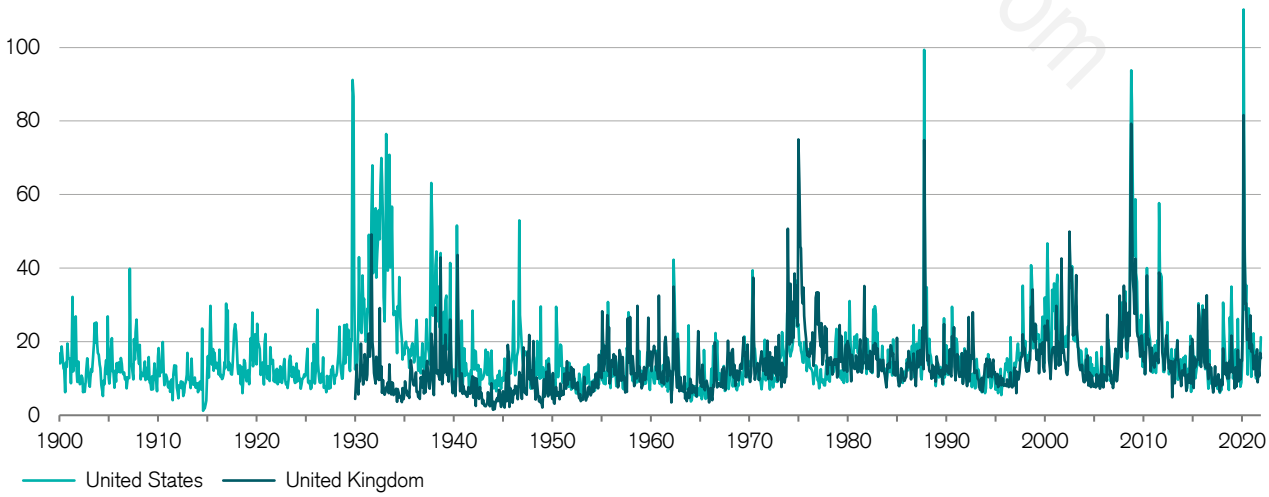

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Figure 30: Real drawdown: US equities and bonds, 1900–2021

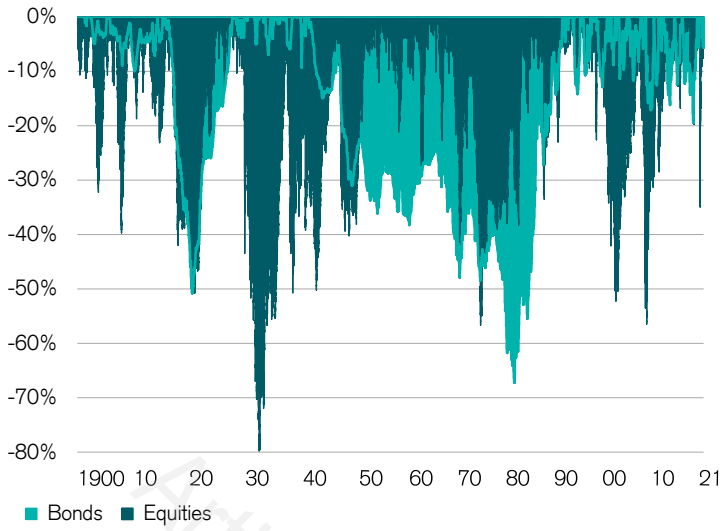


Figure 31: Post-crash recoveries in the US equity market

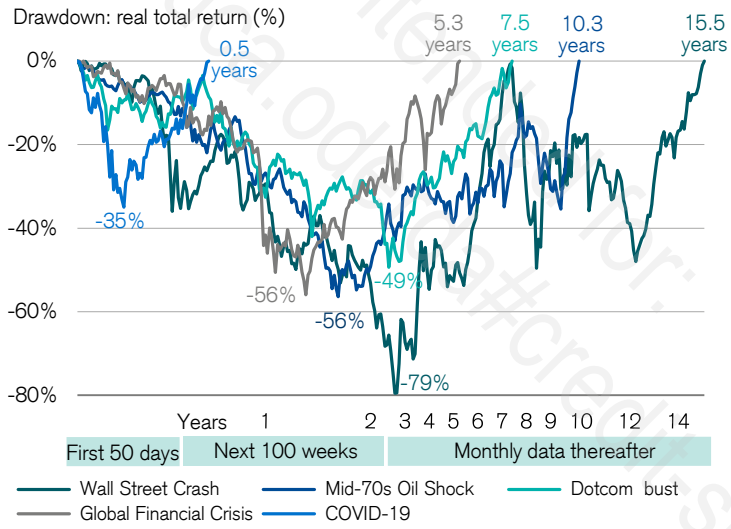
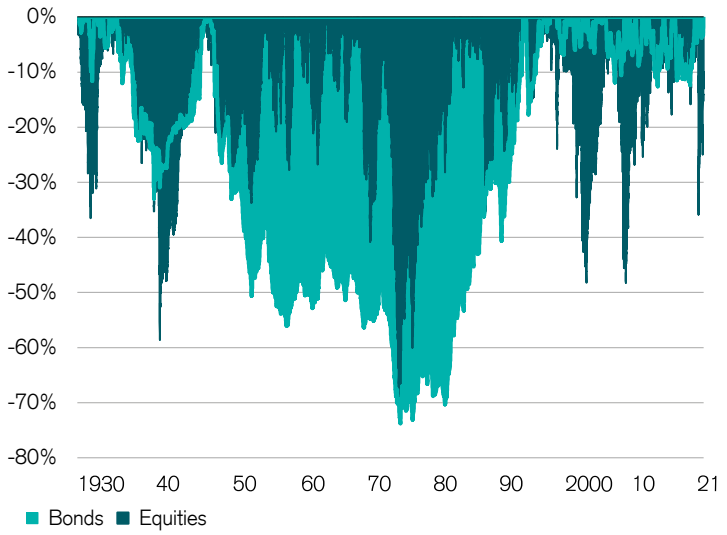


Figure 32: Real drawdown: UK equities and bonds, 1930–2021



Source Figures 30–32: Elroy Dimson, Paul Marsh, and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

Fear of the downside

Financial asset prices at the time of writing are high. Investors are concerned about buying at the top and then suffering a dramatic fall in the value of their purchase. One way to examine this in a historical context is to evaluate a portfolio's drawdown in value, relative to its prior high-water mark. Drawdown is defined as the difference between the portfolio's value on a particular date and its high-water mark. The interval from the date of the high-water mark to breaching the high-water mark again is the recovery period. The investment is underwater from the date of the high-water mark to the end of the recovery period.

A crucial question is how deep portfolio drawdowns can be, and then how long it takes to recover. To investigate this, we compute the cumulative percentage decline in real value from an index high to successive subsequent dates. This indicates just how bad an investor's experience might have been if they had the misfortune to buy at the peak. Although equities have outperformed bonds, they can experience deeper drawdowns – yet there have also been long intervals of extreme drawdowns for bonds. All returns include reinvested dividends and are in real (inflation-adjusted) terms.

Equity drawdowns

We look first at drawdowns for US equities, using daily data since 1900. **Figure 30** shows that US equities (shown in darker shading) have suffered large extremes of performance. After the Wall Street Crash, US stocks fell to a trough in July 1932 that was 79% below their September 1929 peak in real terms. Despite briefly flirting with recovery in 1937, stocks fell again and recovery took until February 1945. This deep drawdown and long recovery period – in total fifteen and a half years – sets contemporary stock market fluctuations in a historical context.

Figure 30 shows that the next large equity drawdown was from January 1973 until October 1974. Over this period, the US market fell by 48% in nominal terms and 56% in real terms. It took only 26 months to recover the nominal high; however, in real terms, equities were underwater until April 1983.

After the tech-bubble burst in March 2000, US equity prices again collapsed and, by October 2002, had fallen 52% in real terms. The full drawdown and recovery period lasted seven and a half years until July 2007. Just months later, the market fell again, with the Global Financial Crisis reaching its nadir in February 2009, down 56% in real terms. The market recovered by February 2013. The final big drawdown shown in **Figure 30** began in February 2020 when US

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stocks fell 35% in real terms due to the COVID-19 pandemic. Their rapid recovery was remarkable.

Figure 31 helps place the COVID-19 pandemic in its historical context. The initial crash was triggered by the virus spreading across the world and causing economic shutdowns in most developed countries, including the USA. The stock market's plunge into bear market conditions was the most rapid in history, apart from the October 1987 crash. The market fell 35% in just 23 trading days.

Recovery, however, in the USA and many other markets was swift. Just five months later, US investors were no longer underwater. The recovery was fueled by massive fiscal and monetary stimulus, then later in the year markets were driven higher by news of vaccines. The market's recovery was astonishingly fast, especially when contrasted with the other major drawdowns highlighted in **Figure 31**.

After the meltdowns of 1973–74, 2000–02 and 2007–09, investors were left with between 44% and 48% of their peak-level real wealth. But this was still more than twice as much as those who endured the 1929 crash. Recovery in real terms can take a long time – even ignoring costs and taxes. COVID-19 was an exception.

The UK experience, shown in **Figure 32,** was similar. Our daily data for the UK starts in 1930. Compared to the USA, UK equities suffered greater extremes of poor performance. After October 1936, the approach and arrival of war led to a real-terms decline of 59% by June 1940, though recovery was complete by October 1945.

Before the oil crisis, the equity market had hit a high in August 1972, but UK equities entered 1975 down from that peak by 74% in real terms, and recovery took till February 1983. The technology crash in March 2003 generated a real loss of 49%, which was recovered by October 2006. After June 2007, the financial crisis hit the UK hard, and by March 2009 equities were down by 47% in real terms. Finally, UK stocks fell 36% in the COVID-19 crash, close to the US experience. However, the recovery has been less swift, and even by the end of 2021, UK equities remained in drawdown, albeit by less than 2%.

Bond drawdowns

The scope for deep and protracted losses from stocks makes fixed-income investing look to some like a superior alternative. But how well do bonds protect an investor's wealth? In **Figures 30 and 32**, we plot in lighter shading the corresponding drawdowns for government bonds. For those who are seeking the safety of real returns, these charts are eye-opening.

Historically, bond market drawdowns have been larger and/or longer than for equities.

In the US bond market, there were two major bear periods. Following a peak in August 1915, there was a decline in real bond values until June 1920, by which date they had fallen by 51%; bonds stayed underwater in real terms until August 1927. That episode was dwarfed by the next bear market, which started from a peak in December 1940, followed by a fall in real value of 67%; the recovery took from September 1981 to September 1991. The US bond market's drawdown, in real terms, lasted for over 50 years.

The UK had a similar experience. The first bond bear market started in January 1935 and, by September 1939, the real value of bonds had fallen by 33%; the recovery took until April 1946. But, in October 1946, bonds began to slide again in real terms, having lost 73% of their value by December 1974. UK government bonds were underwater, in real terms, for 47 years until end-1993. While bonds can appear less risky in nominal terms, their real value can be destroyed by inflation.

Dispersion and the investment horizon

We now examine the range of real returns from investing over various time horizons in the stock and bond markets. **Figures 33 and 34** display the dispersion of real equity returns in the USA and Japan. **Figure 35** presents a similar analysis of real returns for US bonds, which we will discuss shortly. In each chart, the vertical axis measures the real return, annualized over intervals of all possible length from ten to 122 years. We depict the range of real returns that could be computed if data were used as at any year-end between 1909 and 2021.

The horizontal axis shows the number of years used to compute the real return. For instance, at the left-hand side of the chart, located against a holding period of ten years, is the range of 10-year real returns. This part of the chart is based on 113 estimates of the historical real return. The estimates comprise performance statistics over the following overlapping intervals, each with a duration of one decade: 1900–09, 1901–10, and so on to 2012–21. Similarly, with a holding period of 20 years, the chart is based on 103 estimates of the real return over the following overlapping intervals, each with a duration of two decades: 1900–19, 1901–20, and so on to 2002–21.

The shaded areas run from the maximum (100th percentile) all the way down to the minimum (the 0th percentile) of the distribution of estimated real returns. The depth of the shading denotes

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Figure 33: US real equity returns; periods of 10–122 years

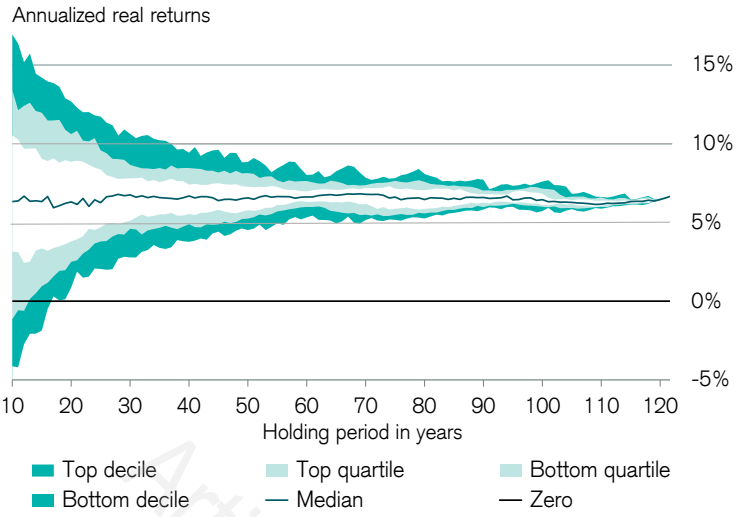


Figure 34: Japan real equity returns; periods of 10–122 years

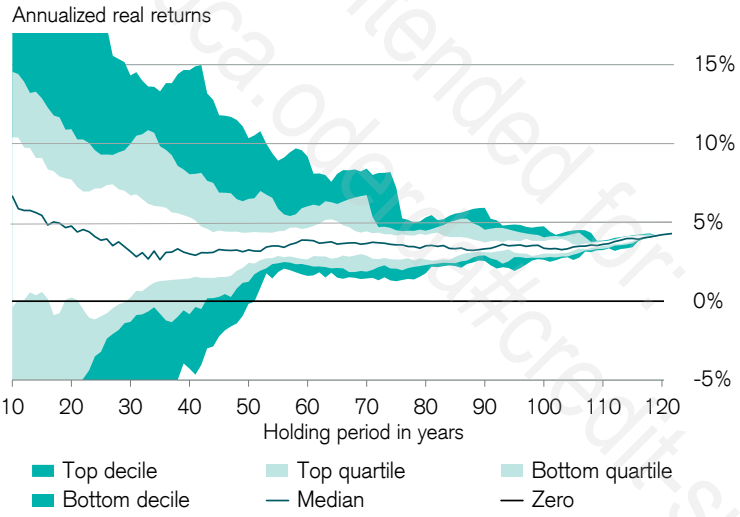
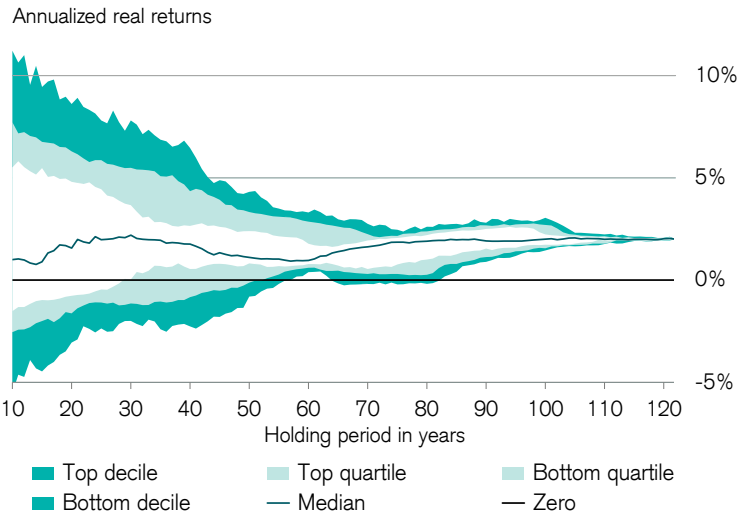


Figure 35: US real bond returns; periods of 10–122 years



Source Figures 33–35: Elroy Dimson, Paul Marsh, and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

five components of the distribution of returns. The top decile (the darker-shaded area) represents favorable returns that occur one-tenth of the time. The top quartile (the lighter- and darker-shaded areas, taken together) represents favorable returns that occur one-fourth of the time. The interquartile range (the unshaded area in the middle of the chart) represents the middle half of the distribution.

The bottom quartile (the lighter- and darker-shaded areas, taken together) represents unfavorable returns that occur a quarter of the time. The bottom decile (the darker-shaded area) represents unfavorable returns that occur one-tenth of the time. The thicker line in dark turquoise at the center of the interquartile range shows the median, which is out- or under-performed one-half of the time. More details are in Dimson, Marsh, and Staunton (2004a).

Equities and the investment horizon

Charts like this enable us to answer questions such as: what is the longest drawdown of cumulative real returns? Restricting ourselves just to the USA, the longest such period lasted for 16 years. To verify this, look in **Figure 33** at the horizontal axis and note the point where the holding period is 16 years. You will see that for holding periods above 16 years, the dark area is consistently above the line labeled 0%.

There were no sub-zero real returns over investment periods of 17 or more years, as can be seen in the chart. Even that 16-year drawdown period in which real returns were negative was long ago (it was 1905–20). This finding for the USA supports the widely cited claim that stock market investors have historically enjoyed a positive real return as long as they held a diversified portfolio of US shares for at least 20 years. The observation that stocks have been "safe" over the long run was first made by Wharton School professor Jeremy Siegel.

However, the USA was fortunate. Many other markets were less so. **Figure 34** shows the equivalent chart for the Japanese equity market. As noted in Chapter 2, Japanese equities underperformed US stocks, while at the same time being more volatile. Putting these two factors together, it is no surprise that there were lengthy periods when Japanese stocks were underwater in real terms. Indeed, over the course of the 20th and 21st centuries, the minimum investment horizon to be sure of a non-negative real return from Japanese equities would have been over 51 years.

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Bonds and the investment horizon

If equities can impose such a large downside on investors, default-free bonds might seem a safer alternative. Unfortunately, this is not the case as the likelihood of a substantial and protracted negative real return has been greater in the bond market. We have already seen this in the drawdown charts above, which showed that bond markets had long periods during which investors who bought at the "wrong" time failed to achieve a real return.

Figure 35 focuses on US government bonds. The long-run investment returns from government bonds were substantially lower than equities (see the right of the trumpet-shaped chart), which intersects the vertical axis at a lower level than the prior two exhibits. This repositions the area in **Figure 33** lower on the graph, which amplifies the likelihood of a negative real return. A positive real return from US government bonds was assured only if the investor had a horizon of 57 years. Anything less, and the investor may have suffered a sub-zero real return. So there is a price to be paid for the safety of government bonds. In terms of inflation-adjusted returns, there is a high chance of disappointment.

Time underwater

We have undertaken the same analyses as **Figures 33–35** for all countries with a 122-year financial market history. In addition to the USA, only five other countries reliably provided real equity returns above zero within a time frame of 20 years. **Figure 36** shows the longest drawdown period for real equity returns in each country. For seven countries, the shortest investment horizon that would have assured a positive real equity return was longer than a half-century.

Figure 37 shows that, historically, almost all bond investors required a holding period of more than half a century to be confident their real returns would at some point exceed zero. We already know that long-term bond returns were everywhere lower than equity returns. In addition, a comparison of **Figures 36 and 37** shows that, although equities were far from "safe" over the long run, bond investors were exposed to larger and more prolonged drawdowns than equity investors.

Figure 36: Longest drawdown of real equity returns, 1900–2021

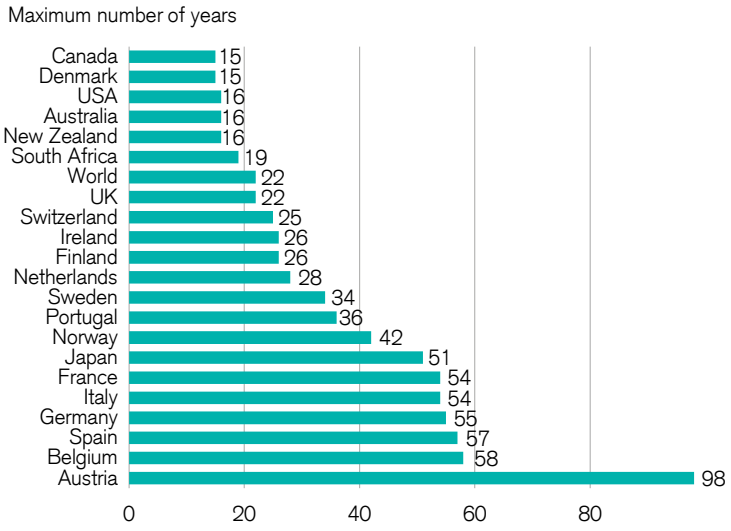


Figure 37: Longest drawdown of real bond returns, 1900–2021

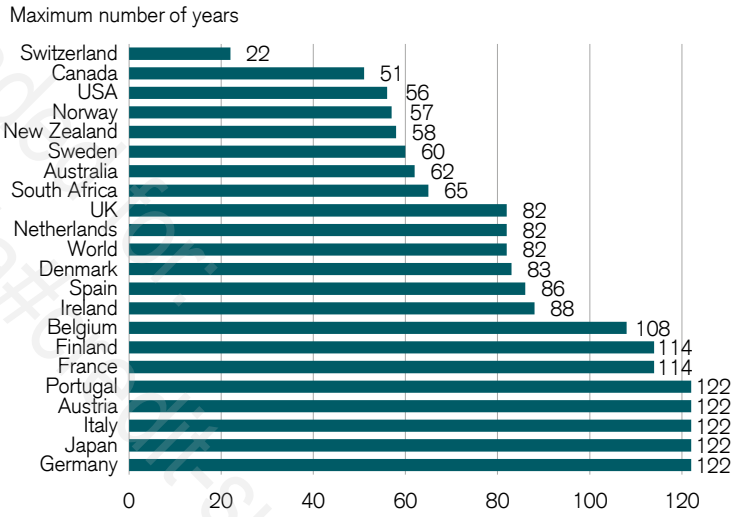
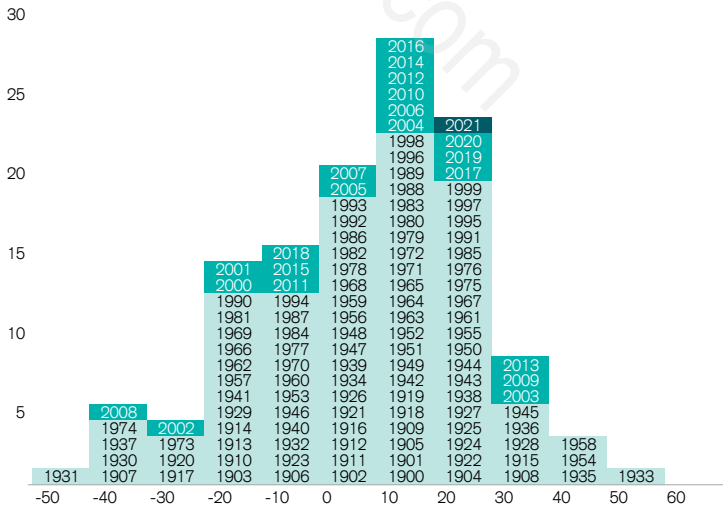


Figure 38: US equity risk premium versus bills, 1900–2021



Source Figures 36–38: Elroy Dimson, Paul Marsh, and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

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The historical reward for risk

In Chapter 2, we summarized the historical returns on the main asset categories, and we have now presented long-term evidence on the risks of holding stocks and bonds. Investors expect a reward for exposure to such risks. This is the risk premium, which we measure relative to the returns on Treasury bills. The premium is also sometimes measured relative to bonds. To calculate the premium, we estimate the geometric difference between the realized return on an asset and the risk-free rate of return that was available over the same period.

Figure 38 shows the year-by-year US historical risk premium relative to bills. The distribution of outcomes was wide, with the lowest and highest premiums being realized, as might be expected, in the worst and best years for stocks. The lowest premium was –45% in 1931, when equities returned –44.3% and Treasury bills 1.1%; the highest was 57% in 1933, when equities gave 57.0% and bills 0.3%. The chart shows that the distribution of annual premiums was roughly symmetric, resembling a normal distribution. The arithmetic mean is 7.8% and the standard deviation is 19.4%. On average, therefore, US investors received a reward for exposure to equity market risk that was positive and quite large.

Because the range of year-to-year premiums is broad, it can be misleading to label them as "risk premiums." Investors clearly cannot have expected, let alone required, a negative risk premium from equities as otherwise they would simply have avoided them. All the negative and many of the very low premiums shown in the chart must therefore reflect unpleasant surprises.

Equally, investors could not have "required" huge premiums, such as 57% in 1933. Such numbers are implausibly high as a required reward for risk, and the high realizations must therefore reflect pleasant surprises. To avoid confusion, we should probably refer to "excess returns" – namely returns in excess of (or under) the risk-free interest rate.

To make sensible inferences about the risk premium, we need to examine intervals much longer than a year. Over extended horizons, we might expect good and bad luck to cancel one another out. However, long needs to be long indeed as, even over intervals of a decade or more, there can be big performance surprises.

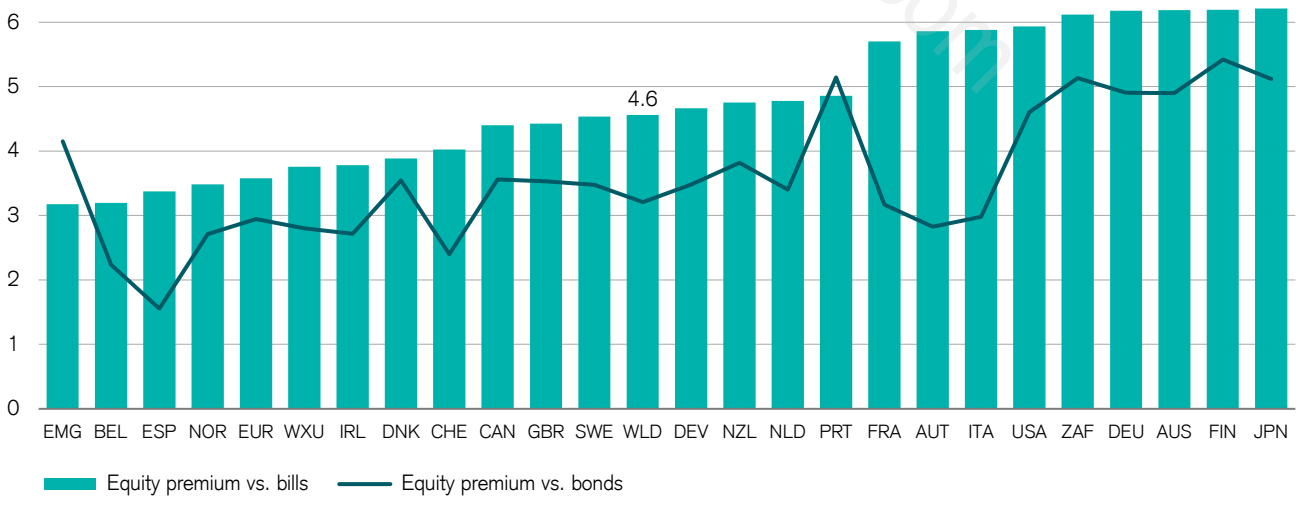
For example, there have been several lengthy periods, including the opening decade of the 21st century, as well as intervals in the 1970s and early 1980s when the realized US risk premium was negative. We require many decades to infer investors' expectations about the reward for risk. Even then, inference can be problematic as we will see in the next chapter. Over the full 122 years, the annualized US equity risk premium relative to bills was 5.9%.

The worldwide equity premium

Before our series of studies, most of the long-term evidence on the historical equity premium had been for the US market, which today is the world's largest stock market. As we noted in Chapter 2, estimates for that country are therefore susceptible to success bias. We therefore now look at worldwide evidence.

The annualized equity premiums for the 21 countries and five composite indexes with continuous investment histories since 1900 are shown in **Figure 39**. Countries are ranked by the equity premium measured relative to bills, displayed as bars. The line-plot shows each country's risk premium measured relative to

Figure 39: Worldwide annualized equity risk premium (%) relative to bills and bonds, 1900–2021



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bonds. Over the entire 122 years, the annualized equity risk premium, relative to bills, was 5.9% for the USA and 4.4% for the UK. Averaged across the 21 countries, the risk premium relative to bills was 4.9%, while the risk premium on the world equity index was 4.6%.

Relative to long government bonds, the premiums are similar, but naturally tend to be smaller. The annualized US equity risk premium relative to bonds was 4.6% and the corresponding figure for the UK was 3.5%. Across the 21 markets, the risk premium relative to bonds averaged 3.7%, while for the world index it was 3.2%.

These estimates are lower than frequently quoted historical averages such as the former Morningstar/Ibbotson SBBI Yearbook figures for the USA. The differences partly arise from omission of returns during the earlier part of the 20th century. Prior estimates for non-US markets have also been influenced by the success of the USA. Our global focus gives rise to lower estimated risk premiums than were previously assumed.

Table 10 provides statistics on the worldwide equity risk premiums relative to bills. The top panel covers the 21 countries for which we have continuous histories from 1900 to 2021. The geometric means in the third column show the 122-year annualized premiums, and these are the numbers that were used to plot the bars in **Figure 39**.

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Table 10: Worldwide equity risk premiums relative to bills, 1900–2021

Country	Start year	Geometric mean (%)	Arithmetic mean (%)	Standard error (%)	Standard deviation (%)	Minimum return (%)	Minimum year	Maximum return (%)	Maximum year
Countries and indexes with continuous histories since 1900									
Australia	1900	6.2	7.5	1.5	16.2	-44.4	2008	49.2	1983
Austria*	1900	5.9	10.5	3.4	36.7	-60.8	2008	223.9	1919
Belgium	1900	3.2	5.6	2.1	23.7	-49.7	2008	125.0	1940
Canada	1900	4.4	5.8	1.5	16.8	-34.7	2008	49.1	1933
Denmark	1900	3.9	5.8	1.9	20.5	-50.3	2008	95.3	1983
Finland	1900	6.2	9.7	2.7	29.5	-54.0	2008	159.2	1999
France	1900	5.7	8.2	2.1	23.7	-43.1	2008	85.7	1941
Germany*	1900	6.2	9.8	2.8	30.9	-44.7	2008	131.4	1949
Ireland	1900	3.8	6.0	1.9	21.2	-66.9	2008	72.0	1977
Italy	1900	5.9	9.6	2.8	30.9	-48.6	1945	150.3	1946
Japan	1900	6.2	9.3	2.4	27.0	-48.3	1920	108.6	1952
The Netherlands	1900	4.8	6.9	2.0	22.0	-51.4	2008	126.7	1940
New Zealand	1900	4.8	6.3	1.6	17.8	-58.3	1987	97.3	1983
Norway	1900	3.5	6.2	2.3	25.4	-55.0	2008	157.1	1979
Portugal	1900	4.9	9.3	3.0	33.0	-75.1	1978	141.2	1986
South Africa	1900	6.1	8.1	1.9	21.3	-33.9	1920	106.2	1933
Spain	1900	3.4	5.4	1.9	21.2	-39.3	2008	98.1	1986
Sweden	1900	4.5	6.5	1.8	20.4	-41.8	2008	64.6	1999
Switzerland	1900	4.0	5.7	1.7	18.5	-37.0	1974	54.8	1985
United Kingdom	1900	4.4	6.1	1.7	19.3	-54.6	1974	121.8	1975
United States	1900	5.9	7.8	1.8	19.4	-44.9	1931	56.6	1933
Europe	1900	3.6	5.3	1.7	19.0	-48.7	2008	76.0	1933
World ex-US	1900	3.8	5.4	1.7	18.3	-46.8	2008	80.4	1933
World	1900	4.6	6.0	1.5	16.9	-43.7	2008	68.4	1933
Developed markets	1900	4.7	6.1	1.5	17.1	-43.1	1931	65.9	1933
Emerging markets	1900	3.2	5.7	2.0	22.6	-62.4	1945	92.5	1933
Countries/markets with later start dates or discontinuous histories and hence later re-start dates (China and Russia)									
Argentina	1960	8.3	42.5	24.2	190.3	-78.8	1984	1297.2	1976
Brazil	1951	8.3	17.4	5.9	49.9	-69.3	1990	188.1	1983
Chile	1960	16.1	43.9	27.9	220.0	-48.1	1981	1723.8	1973
China	1993	3.5	8.7	6.5	34.8	-56.8	2008	100.5	2003
Greece	1954	3.9	12.0	5.8	47.9	-65.0	2008	240.9	1972
Hong Kong SAR	1963	9.7	16.2	5.1	39.1	-61.7	1974	139.5	1972
India	1953	6.4	9.4	3.1	25.5	-60.2	2008	85.3	2009
Malaysia	1970	5.8	11.3	5.2	37.7	-57.8	1997	156.5	1972
Mexico	1969	6.9	12.0	4.9	35.9	-47.9	1982	122.3	1983
Russia	1995	7.6	22.7	13.0	67.5	-72.5	2008	287.1	1999
Singapore	1966	5.0	8.9	4.0	30.1	-51.9	2008	112.7	1972
South Korea	1963	7.0	11.6	4.2	32.4	-54.2	2000	123.7	1972
Taiwan (Chinese Taipei)	1967	9.3	15.7	5.2	38.6	-61.6	1974	119.2	1987
Thailand	1976	5.2	12.1	6.0	40.9	-58.8	1997	123.0	2003

* For Austria and Germany, statistics are based on 120 years, excluding 1921–22 for Austria and 1922–23 for Germany. Sources: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

The equity risk premium is often quoted as an arithmetic mean. The arithmetic means are shown in the fourth column of the table. As already noted, the arithmetic mean premium will always, by definition, be higher than the annualized (geometric mean) premium. The more volatile the returns, the greater the amount by which the arithmetic mean exceeds the geometric mean. This is verified by the sixth column of **Table 10**, which shows the standard deviation of each market's premiums.

Table 11 provides corresponding statistics on the worldwide equity premiums relative to bonds. The top panel again covers the 21 countries for which we have continuous histories from 1900 to 2021. The geometric means in the third column show the numbers that were used for the line plot in **Figure 39**.

Equity risk premiums are frequently used for estimating discount rates and the cost of capital, typically using the Capital Asset Pricing Model (CAPM). We advocate using equity premiums relative to bills, rather than bonds, for this purpose. In the next chapter, we propose a way of converting historical premiums relative to bills into forward-looking estimates of return.

The reason for favoring measuring the equity premium relative to bills is that the CAPM requires the risk premium to be estimated relative to a risk-free rate. Sovereign bonds

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Table 11: Worldwide equity risk premiums relative to bonds, 1900–2021

Country	Start year	Geometric mean (%)	Arithmetic mean (%)	Standard error (%)	Standard deviation (%)	Minimum return (%)	Minimum year	Maximum return (%)	Maximum year
Countries and indexes with continuous histories since 1900									
Australia	1900	4.9	6.4	1.6	17.9	–53.3	2008	66.3	1980
Austria*	1900	2.8	21.0	13.7	150.3	–81.1	1924	1571.8	1945
Belgium	1900	2.2	4.3	1.9	20.9	–53.9	2008	80.1	1940
Canada	1900	3.6	5.2	1.6	18.2	–40.5	2008	48.6	1950
Denmark	1900	3.5	5.2	1.7	18.6	–55.0	2008	76.6	1972
Finland	1900	5.4	9.0	2.7	30.2	–55.5	2008	186.5	1999
France	1900	3.2	5.4	2.0	22.4	–49.3	2008	84.3	1946
Germany*	1900	4.9	8.2	2.6	28.1	–51.5	2008	116.6	1949
Ireland	1900	2.7	4.7	1.8	19.7	–66.8	2008	83.2	1972
Italy	1900	3.0	6.3	2.6	28.9	–48.1	2008	152.2	1946
Japan	1900	5.1	9.0	2.9	31.8	–45.1	2008	193.0	1948
The Netherlands	1900	3.4	5.7	2.0	21.9	–56.4	2008	107.6	1940
New Zealand	1900	3.8	5.3	1.6	17.5	–59.7	1987	72.7	1983
Norway	1900	2.7	5.5	2.5	27.1	–57.8	2008	192.1	1979
Portugal	1900	5.1	9.2	2.8	30.9	–69.8	1978	145.7	1980
South Africa	1900	5.1	6.8	1.7	19.2	–36.1	2008	70.9	1979
Spain	1900	1.6	3.5	1.9	20.4	–43.7	2008	69.1	1986
Sweden	1900	3.5	5.7	1.9	21.3	–50.6	2008	84.4	1999
Switzerland	1900	2.4	3.9	1.6	17.4	–41.3	2008	51.9	1985
United Kingdom	1900	3.5	4.9	1.5	17.1	–38.4	2008	80.8	1975
United States	1900	4.6	6.7	1.9	20.5	–50.9	2008	57.1	1933
Europe	1900	2.9	4.2	1.4	15.7	–48.5	2008	54.6	1923
World ex-US	1900	2.8	3.9	1.3	14.3	–49.0	2008	35.6	1919
World	1900	3.2	4.4	1.4	15.1	–48.7	2008	36.2	1958
Developed markets	1900	3.5	4.8	1.5	16.1	–48.6	2008	40.3	1958
Emerging markets	1900	4.1	7.3	3.0	33.1	–55.5	2008	297.7	1949
Countries/markets with later start dates or discontinuous histories and hence later re-start dates (China and Russia)									
Argentina	1992	8.4	17.1	10.3	56.4	–28.6	2015	202.4	2002
Brazil	1995	–0.1	6.4	7.8	40.5	–51.1	2008	120.2	2006
Chile	1993	3.7	6.2	4.3	23.4	–29.0	2008	46.0	2003
China	1993	1.8	8.2	7.1	38.3	–62.8	2008	98.5	2003
Greece	1993	–10.7	–4.8	6.2	33.6	–61.9	2008	83.3	1999
Hong Kong SAR	1994	0.9	5.8	6.2	32.6	–60.3	2008	95.5	2009
India	1953	6.4	9.8	3.3	27.1	–66.4	2008	104.9	2009
Malaysia	1970	2.1	7.3	5.0	36.0	–55.2	1997	154.4	1972
Mexico	1995	–1.8	0.8	4.4	23.1	–41.4	1998	39.6	2009
Russia	1995	2.7	9.3	6.8	35.4	–70.5	2008	105.0	1997
Singapore	1988	1.5	5.3	5.0	28.9	–56.8	2008	86.0	2009
South Korea	1963	0.6	5.5	4.2	32.1	–59.4	2000	86.4	1999
Taiwan (Chinese Taipei)	1995	1.2	5.6	5.6	29.2	–50.4	2008	83.8	2009
Thailand	1980	0.1	8.1	7.2	46.5	–60.4	2000	182.4	1989

* For Austria and Germany, statistics are based on 120 years, excluding 1921–22 for Austria and 1922–23 for Germany. Sources: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

cannot be regarded as risk free. They are risky in real terms because of their exposure to future changes in both inflation and the real interest rate, especially the former. In this chapter, we have seen that, historically, even US bonds have experienced periods of significant loss and protracted drawdowns. The risk premium should therefore be measured relative to bills, since this is the closest thing we have to a risk-free asset.

The lower panels of **Tables 10** and **11** show the historical equity risk premiums for the remaining 14 markets in the DMS 35. In **Figure 40**, we plot the annualized premiums relative to bills from the third column of **Table 10**. Most of these markets are EMs (and the two that are not are former EMs). So for comparison, we show the equity risk premium versus bills for the DMS Developed Markets index in lighter shading.

Most of these markets had a higher historical risk premium than the DM index. However, as we have seen in Chapter 2, these markets were substantially riskier. In addition, the periods covered differ for each market (see the second column of **Table 10**). Furthermore, in five of these markets, the real bill return was negative, so the equity risk premium was higher than the real local equity return. This substantially elevated the historical equity risk premium for Argentina, Brazil and Chile.

These equity premium estimates are historical. We emphatically do not advocate using them as indicators of a country's prospective equity risk premium. Some markets enjoyed good luck, while others were less fortunate. Similarly, these historical premiums were impacted by real bill returns that are not representative of expected future bill returns. These comments apply equally to the figures from the upper panel of the tables and in **Figure 39**, which relate mostly to DMs. The estimation of the prospective risk premium is the topic of the next chapter.

Concluding remarks

In this chapter, we have discussed the risks from investing in equities and bonds. We have described the variability of returns and presented evidence on the extremes of performance experienced globally since 1900. We have included here the good times as well as the bad, but since our focus here is on risk, we have dwelt mostly on the potential downside.

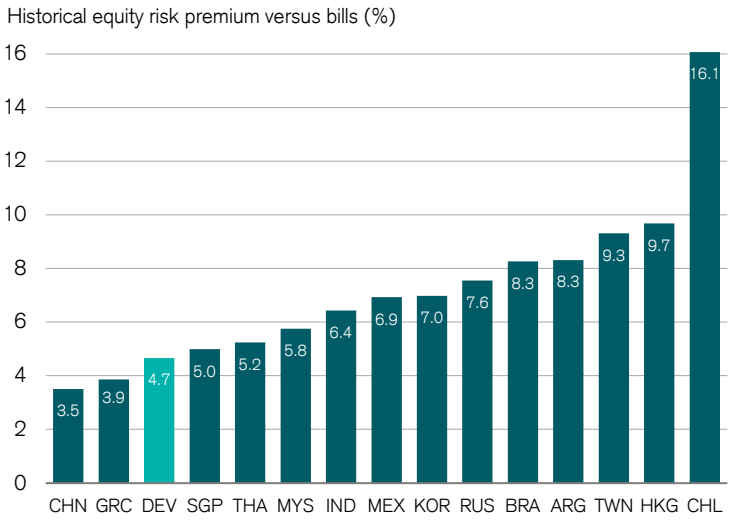
We have looked at drawdowns and protracted losses. Historically, these have sometimes been enormous, such as the 80% loss of real wealth by US equity investors in the Wall Street Crash period. Over that period of the deepest and longest drawdown in history, it took investors fifteen-and-a-half years to recover their pre-crash wealth in real terms.

We have also seen that government bonds have been far from risk-free. The USA, one of the world's most successful markets, experienced a bond drawdown that in real terms lasted for half a century. Clearly, the real value of bonds can be destroyed by inflation. Some drawdowns, of course, have been short-lived as was the case for many countries during the COVID-19 pandemic. But the abiding message of history is that markets are volatile, volatility varies greatly over time, and that losses can be large and prolonged.

Investors expect a reward for exposure to such risks. For equities, this is the equity risk premium. We have presented evidence on the historical equity premium for 21 countries and for our composite indexes, including our World index, estimated over 122 years. Our estimates, including those for the USA and UK, are lower than frequently quoted historical averages.

The differences arise from the omission of estimates based on shorter estimation periods, biased index designs, and reliance on narrower and less global indexes than we employ in this Yearbook. The historical equity premiums that we have emphasized here are annualized (or geometric mean) estimates. In the next chapter, we use this long-term record to make an informed projection of the future equity risk premium that builds on the historical record.

Figure 40: Historical risk premiums for other markets from start-year for each market until end-2021



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Chapter 5: Projected returns

We turn from risk to the reward from financial assets. We look at what investors today can expect in the future, spotlighting the equity risk premium. We examine the components of long-term returns, how they vary over time, and how they can be used to project future risk premiums. We also consider bond returns. Although real bond yields have increased recently, they remain low and close to zero. We conclude with projections of the returns on stocks and bonds that the next generation can expect. These are much lower than previous generations have enjoyed.

Article intended for: graphics@derda#credit-suisse.com



Photo: Tokyo, Japan; Getty Images, MarsYu

The prospective equity risk premium

Equities have proved to be a rewarding investment over the long run, but as noted in the previous chapter, equity investment has been accompanied by risks. Similarly, we saw that, over the long run, bonds outperformed cash, but again at the cost of higher volatility.

Investors do not like volatility – at least on the downside – and will be prepared to invest in risky assets only if they are compensated in terms of higher expected returns. We can measure the reward for risk achieved in the past by comparing the return on risky assets, such as equities or bonds, with the return from investments widely considered risk-free, such as Treasury bills.

For stocks, the difference between equity and bill returns is known as the equity risk premium. For long-term government bonds, the difference between bond and bill returns is known as the maturity premium. This is because the additional risk from holding long bonds arises from uncertainty about future inflation and interest rates over the life of the bond.

In Chapter 4, we documented the historical equity risk premium. In this chapter, we look forward and ask what premiums and returns we can expect in the future. Our main focus is on the equity risk premium, though we also consider the maturity premium. Of the two, the equity premium is harder to forecast, while at the same time being an extremely important economic variable. An estimate of the future equity premium is central to investment projections, asset allocation, cost of capital estimation, company valuation, investment appraisal, dispute resolution, and setting allowable returns for regulated businesses.

The equity risk premium is the incremental return that investors require from holding risky equities rather than risk-free securities. It is thus a forward-looking concept, but its likely future magnitude is typically inferred from historical data. Indeed, the historical premium, thanks to its measurability, has been by far the most influential variable in conditioning expert opinion about what the future premium might be. It is frequently assumed that, if the measurement interval is long enough, the historical premium will provide an unbiased estimate of the future premium.

We explore and challenge this view. First, we split the equity premium into constituent parts and show the extent to which the historical premium has arisen from dividend payments, dividend growth, and re-rating. Second, we use this decomposition to estimate the future equity premium. Finally, we discuss how the equity premium changes over time. We also examine the magnitude of the maturity premium and conclude with a brief summary.

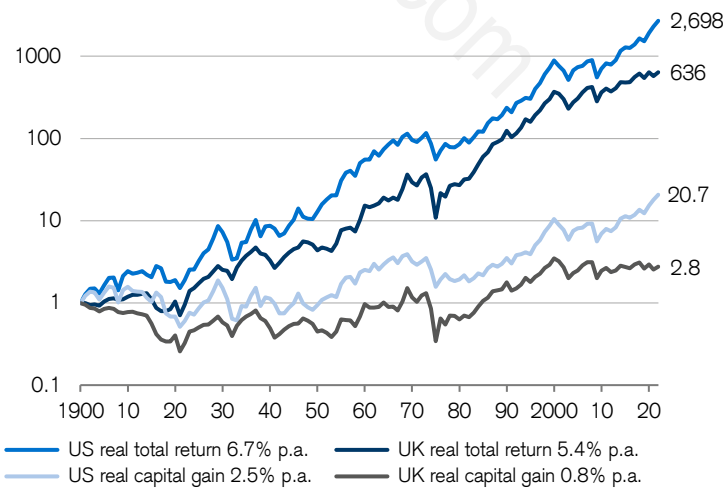
The four components of expected return

Is the historical equity premium a reasonable guide to what we can anticipate for the future? Many people argue that it is on the grounds that, over the long run, we should expect good luck to balance out bad luck. If so, then the average premium investors received should be close to the premium they required and "priced in" before the event. But, even over a period as long as 122 years, we cannot be sure of this. It is possible that investors enjoyed more than their share of good luck, making the past too good to last. If so, the historical premium would reflect "the triumph of the optimists" and overstate what we could expect in future.

An alternative approach is to infer what investors were on average expecting in the past. We decompose the equity premium into components that correspond to investor expectations, and elements of non-repeatable good or bad luck. It is easy to show that we can subdivide the equity premium into four parts: the (geometric) mean dividend yield, plus the annualized growth rate of real dividends, plus the annualized expansion over time in the price/dividend ratio, plus the annualized change in the real exchange rate, minus the real interest rate. We examine each component in turn.

Of these components, the dividend yield has been the dominant factor. This may seem surprising since investors tend to focus largely on capital appreciation, i.e. share price and market movements. Indeed, over a single year, equities are so volatile that most of an investor's performance is determined by price movements. Dividends add a small amount to

Figure 41: Impact of reinvested dividends on cumulative US and UK real equity returns, 1900–2021



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each year's capital gain or loss. However, while performance over a year is driven by capital gains, long-run returns are heavily influenced by reinvested dividends. Real growth in dividends can be negative, the price/dividend ratio can shrink, and exchange rates can change. But dividends are never negative and, as **Figure 41** on the previous page shows, over the long haul, reinvested income is a crucial contributor to long-term wealth.

Component 1: Dividend income

Figure 41 shows that the difference in terminal wealth arising from reinvested income is large. The top line shows the total real return from a policy of investing one dollar in US equities at the start of 1900 and reinvesting all income. After 122 years, by the start of 2022, the initial investment would have grown in purchasing power by 2,698 times.

The light blue line shows the real capital gain from a hypothetical index fund that pays out all its income, rather than reinvesting dividends. It shows that the USD 1 initial investment would have grown in purchasing power by just 20.7 times by start-2022, a real capital gain of 2.5% per year. Thus a portfolio of US equities with dividends reinvested would have grown to 130 times the value it would have attained if dividends had been spent. The graph also shows that a UK index fund with dividends reinvested would have grown to more than 231 times the value without dividend reinvestment: the annualized real capital gain in the UK was just 0.8%.

The longer the investment horizon, the more important dividend becomes. For the very long-term investor, the value of a portfolio corresponds closely to the present value of dividends. The present value of the (eventual) capital appreciation dwindles in significance.

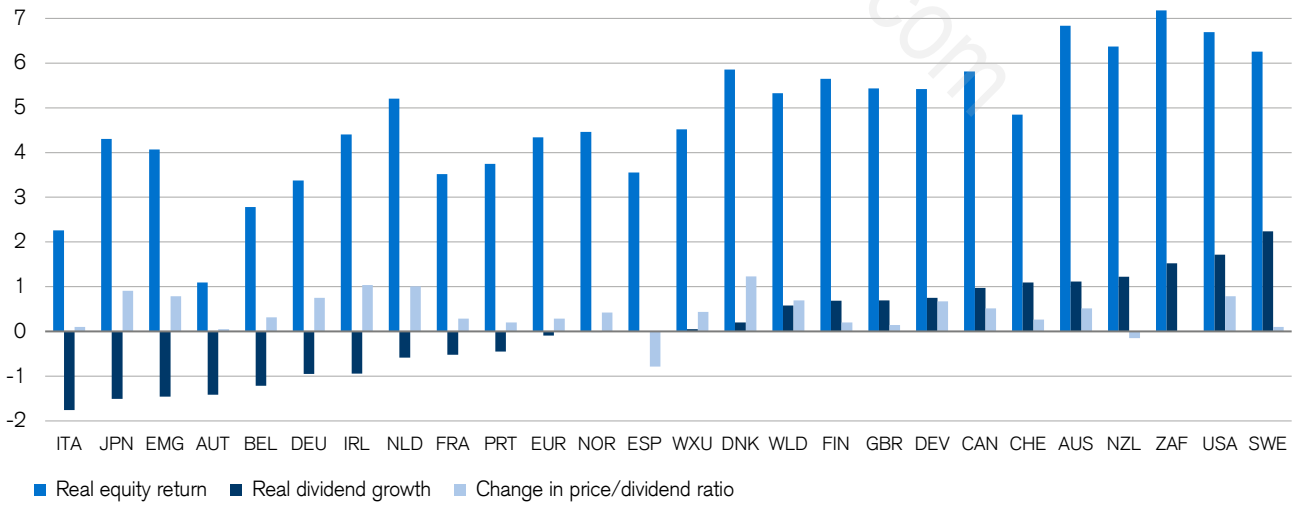
Component 2: Real dividend growth

The second component of the equity risk premium is real dividend growth. The availability of total returns as well as capital gains data allows us to construct long-run dividend indexes for each country, which we adjust for inflation. **Figure 42** shows the annualized real dividend growth rates for each country and the world index over 1900–2021. Countries are ranked in order of real dividend growth (plotted as dark blue bars). It is apparent that real dividend growth has been lower than is often assumed.

Based largely on US history, some commentators say that nominal dividends can be expected to grow faster than inflation. In fact, we see that ten out of 21 countries and two of the composite indexes have recorded negative real dividend growth since 1900, and only six countries enjoyed real dividend growth of 1% or more per year. The equally weighted average real dividend growth across the 21 countries was 0.10%, while the annualized real dividend growth on the world index was 0.58%, bolstered by the heavy weighting of the USA. Dividends, and probably earnings, barely outpaced inflation.

Growth rates varied from +2.24% (Sweden) to −1.76% (Italy). Real dividend growth was lower in the first half of the last century, when real dividend growth on the world index was −1.61% per year. During 1900–49, only three countries had positive real dividend growth: the USA, Australia, and New Zealand. But during 1950–2021, real dividend growth was positive everywhere except Italy and New Zealand. Real dividends for the world grew by 2.1% per year.

Figure 42: Real dividend growth around the world, 1900–2021



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Over lengthy intervals, higher equity returns are likely to be associated with higher corporate profits, which in turn are likely to lead to higher dividends. We would therefore expect to find a positive relationship between a country's stock market performance and its real dividend growth. This is confirmed in **Figure 42** by comparing the real return on equities with real dividend growth. There is a strong correlation (of 0.85) between the two.

The top seven countries in terms of real dividend growth include six of the best-performing markets (but with a somewhat different ranking). Many of the worst-performing markets, such as Austria, Italy, Belgium, Germany and France, had negative real dividend growth. There are partial exceptions, however. Dutch equities had above average real returns, despite a negative real dividend growth rate of –0.59% per year. Similarly, Japan had the second-lowest dividend growth rate of –1.51% among the 21 countries, but was by no means the worst-performing equity market.

Component 3: Multiple expansion

The third component of the equity risk premium is expansion in price/dividend ratios. Superior stock market performance and the magnitude of the historical equity risk premium may be partly attributed to the expansion of valuation ratios, but the importance of this can be overstated.

The light blue bars in **Figure 42** summarize the extent to which price/dividend ratios have changed over time. The height of the bars shows the annualized change in the price/dividend ratio from 1900 to 2021. Over the entire 122-year history, price/dividend ratios have risen (dividend yields have fallen) in every country except Spain and New Zealand. Over the total period, the price/dividend ratio of the world index grew by 0.69% per year.

Table 12 reports the components of the equity premium for each country over the period 1900–2021. The second column shows the geometric mean dividend yield for each market. Across all 21 countries, the average was 4.25%, while for the USA it was 4.07%. Compared to component 1 (dividend income), the impact of component 2 (real growth) and component 3 (multiple expansion) was small. This can be seen in the pre-penultimate row (average) and final row (world) of the table, where the yield component is about an order of magnitude larger than the real-growth or multiple-expansion components.

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Table 12: Decomposition of the historical risk premium, 1900–2021 (% p.a.)

Country	Geometric mean dividend yield	plus* Growth rate of real dividends	plus Expansion in the P/D ratio	plus Change in real exchange rate	minus US real interest rate	equals Equity premium for US investors
Australia	5.11	1.12	0.52	–0.20	0.72	5.86
Austria	2.49	–1.41	0.05	–0.86	0.72	–0.49
Belgium	3.73	–1.22	0.32	0.35	0.72	2.41
Canada	4.26	0.97	0.51	–0.16	0.72	4.89
Denmark	4.36	0.20	1.23	0.28	0.72	5.40
Finland	4.72	0.69	0.20	–0.08	0.72	4.81
France	3.77	–0.52	0.28	–0.28	0.72	2.50
Germany	3.59	–0.95	0.75	0.08	0.72	2.72
Ireland	4.31	–0.94	1.04	0.03	0.72	3.70
Italy	3.99	–1.76	0.10	–0.05	0.72	1.48
Japan	4.95	–1.51	0.91	0.05	0.72	3.61
The Netherlands	4.77	–0.59	1.01	0.15	0.72	4.62
New Zealand	5.25	1.22	–0.15	–0.34	0.72	5.26
Norway	4.03	–0.02	0.42	0.01	0.72	3.73
Portugal	4.00	–0.45	0.20	–0.05	0.72	2.96
South Africa	5.57	1.52	0.00	–1.02	0.72	5.33
Spain	4.37	0.00	–0.79	–0.10	0.72	2.71
Sweden	3.83	2.24	0.10	–0.31	0.72	5.18
Switzerland	3.44	1.09	0.26	0.67	0.72	4.80
United Kingdom	4.56	0.69	0.14	–0.39	0.72	4.28
United States	4.07	1.71	0.79	0.00	0.72	5.93
Average	4.25	0.10	0.38	–0.11	0.72	3.89
Standard deviation	0.70	1.17	0.47	0.37	0.00	1.62
World (USD)	4.00	0.58	0.69	0.00	0.72	4.58

* Premiums are relative to US bills. Summations and subtractions are geometric. Source: Elroy Dimson, Paul Marsh, and Mike Staunton, The Worldwide Equity Premium: A Smaller Puzzle, in R. Mehra (Ed.), Handbook of the Equity Risk Premium, Elsevier, 2008, and subsequent research; DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

Component 4: The real exchange rate
The last component of the historical equity risk premium is the change in the real exchange rate. To examine the equity premium from the perspective of a global investor located in a specific home country, such as the USA, we need to convert from real local-currency returns to real common-currency returns. The fifth column of **Table 12** shows that the annualized change in our 21 countries' real exchange rate averages –0.11% per year, and that every country's real exchange-rate change was within the range ±1%, except for South Africa, which was just outside at –1.02%. We discussed real exchange rates in Chapter 3.

Combining the four components

The historical equity premium comprises the sum of the four factors discussed above, minus the real interest rate. The final column of **Table 12** reports these historical equity premiums for each country from the perspective of a US investor. They averaged 3.89% with a cross-sectional standard deviation of 1.62%. The historical premiums vary across markets, reflecting the reward for risk and the impact of good or bad luck. Investors in 1900 probably underestimated the likelihood of world wars, not to mention the ultimate value of economies like the USA.

Interpreting history
National returns probably had more to do with unexpected outcomes than with the expected premium, and averaging mitigates the impact of noise. We therefore focus on the world index. For a US-based investor, the world equity premium relative to bills, reported in the bottom-right corner of **Table 12**, was 4.58% per year. This is the annualized historical risk premium relative to bills on a globally diversified equity portfolio. Based on geometric averaging, it comprises 3.26% for the amount by which annual dividends exceeded the real risk-free rate, 0.58% from real dividend growth, and 0.69% from re-rating (expansion in the price/dividend ratio). By considering separately, each component of this decomposition, we can return to the question of whether 4.58% was what investors anticipated. We conclude that part of their reward was simply good luck in the past.

The second column of **Table 12** shows that, over the 122 years, the geometric mean dividend yield in the average country was 4.25%, compared with 4.00% for the world index (4.07% for the USA). The dividend yield on the world index at the end of 2021 was only 1.9%. The third column confirms that, over the 122 years, dividend growth in the average country was 0.10% above inflation. In the world index, dividends outpaced inflation by an annual 0.58%, bolstered by the heavy weighting of the USA, where real dividends grew by 1.71%.

We noted above that this 122-year annualized figure of 0.58% real dividend growth concealed a game of two halves. The 20th century opened with much promise and only a pessimist would have believed that the next 50 years would involve widespread international and civil wars, the Wall Street Crash, Great Depression, episodes of hyperinflation, the spread of communism, and the start of the Cold War. During 1900–49, the annualized real return on the world equity index was 2.7%. By 1950, only a rampant optimist would have dreamt that over the next 50 years, the annualized real return would be 8.6%.

Yet the second half of the 20th century was a period when the optimists were correct. There was no third world war, the Cuban missile crisis ended, the Berlin Wall fell, the Cold War ended, productivity and efficiency rose, technology progressed and governance improved. The 8.6% annualized real return on world equities from 1950–99 almost certainly beat expectations and more than compensated for the poor first half of the century. The second half of the 20th century was so favorable for the world equity market that the 1950–2021 real return of 7.2% was more than two-and-a-half times the pre-1950 real return.

Looking ahead
So what level of real dividend growth can be projected for the future? Arguably, we should expect a figure below the 0.58% historical average on the grounds that the "good luck" post-1950 more than outweighed the "bad luck" of the first half of the 20th century. Alternatively, one could argue for a higher level of dividend growth, while expecting the average level of dividend income in the future to be lower than in the past. It would be unreasonable to anticipate the same level of dividend income, coupled with indefinite real growth in dividends at the post-1950 level of 2.1% per year.

The fourth column of **Table 12** reports that, over the last 122 years, price/dividend ratio expansion was 0.38% per year for the average country, and 0.69% for the world index. This modest re-rating of equities over 122 years reflects, at least in part, reduced investment risk.

In 1900, most investors held a limited number of domestic stocks from a few sectors; railroads dominated. As the century evolved, new industries emerged, diversified funds were launched, liquidity and risk management improved, and institutions and wealthy individuals invested globally. As equity risk became more diversifiable, the required risk premium is likely to have fallen. This will have driven stock prices higher, but it would be perverse to interpret this

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rise as evidence of an increased risk premium. Furthermore, insofar as stock prices rose because of improved diversification opportunities, this is non-repeatable and we should not anticipate further such re-rating.

The fifth column of **Table 12** indicates that, historically, American investors in non-US markets lost (and others gained) from the slight rise in the real value of the US dollar. However, this pattern should not be extrapolated. In the long run, exchange rates tend to follow fluctuations in relative purchasing power (see Chapter 3). We therefore assume that, looking forward, the exchange-rate change will reflect relative inflation. The consensus forecast for long-term changes in the real exchange rate is hence zero.

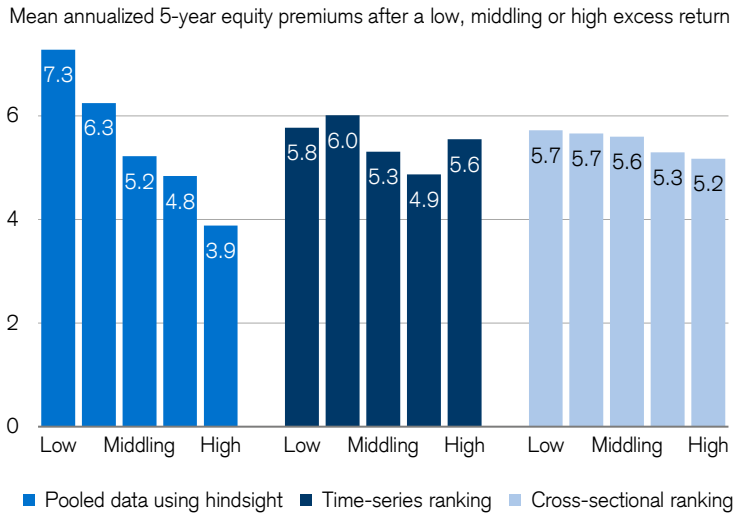
Forward-looking projections

Forward-looking estimates cannot be precise. However, a long-term projection of the annualized equity premium might, at the very least, involve adjusting the historical record for components of performance that cannot be regarded as persistent. First, the expected change in the real exchange rate may be assumed to be zero, which implies a very small downward bias of –0.11% in the cross-sectional average of the country equity premiums. Second, the historical expansion in the price-to-dividend ratio cannot be extrapolated and might be assumed to be zero, which implies an upward bias of 0.38% in the cross-sectional average and of 0.69% in the world index. These two adjustments attenuate the average country equity premium from 3.89% to 3.65%.

When the same adjustments are made to the world index, the world equity premium shrinks from 4.58% to 3.87%. We noted above that the end-2021 yield on the world index was 1.9%, well below the long-run historical average. If we assume that the historical real growth rate of dividends on the world index was at least partly attributable to past good fortune, then the prospective premium on the world index declines to 3½% per year. (We report this as 3½% rather than 3.5% as a reminder that our estimate is imprecise.)

After adjusting for non-repeatable factors, we infer that investors expect an annualized long-run equity premium (relative to bills) of around 3½%. The corresponding arithmetic mean risk premium would be around 5%. This is our estimate of the expected long-run equity risk premium for use in asset allocation, stock valuation, regulatory, and capital budgeting applications. Our estimate is below the long-run historical premium and well below the premium in the second half of the 20th century. Some investment books still cite figures as high as 7% for the geometric, and 9% for the arithmetic, mean. We believe investors who rely on such numbers are likely to be disappointed.

Figure 43: In- and out-of-sample ERP persistence, 1910–2021



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Does the equity premium change over time?

The equity premium can be expected to persist because investors are averse to risk. Our estimate of the future geometric mean equity premium of around 3½% is a long-run expectation. Over time, the short-run expected premium will sometimes be above and sometimes below this. The risk premium can be viewed as the price per unit of risk. It should be higher at times when market prospects are more uncertain and/or when investors are more risk averse. In **Figure 43**, we use our long-run global dataset to examine the evidence on equity premium persistence.

We adopt three approaches, each of which involves analyzing whether the equity risk premium (ERP) relative to bills in a particular year can help us to forecast the annualized ERP over the next five years. Since one of the approaches requires ten years of historical data before it can be implemented, we start all three approaches at start-1910 for comparability. Since we are focusing on the subsequent 5-year ERP, the last year we include is 2016, together with the subsequent 5-year period 2017–21. We examine all 21 countries for which we have a continuous 122-year history. For reasons already explained, we omit Austria and Germany over all periods that span 1921–22 and 1922–23, respectively.

In-sample evidence

The first approach involves computing the ERP for every country for each year after 1909, together with the corresponding annualized ERP over the subsequent five years. We then sort the entire pooled sample of country-years by the initial year's ERP. We divide the sample into

quintiles, ranging from the "low" quintile, which contains the country-years with the lowest prior-year premium, through to the "high" quintile which comprises the country-years with the highest prior-year premium. For each quintile, we compute the arithmetic mean of the annualized ERPs over the following five years.

The quintile returns are on the left of **Figure 43**. They show a marked pattern of mean reversion, with a low current ERP followed, on average, by a high subsequent ERP, and vice versa. However, this does not demonstrate that ERP can be forecast, as this approach uses hindsight. The ranking is carried out at the end of 2021 once all the outcomes are known. This is not an investment strategy that could have been followed in real life as the quintile boundaries and the nature of the relationship could not have been known until 2022.

Out-of-sample evidence

In the rest of **Figure 43,** we study two other approaches that do not require foresight. They require information that was available at the time; they are strategies that could have been implemented in practice, in real time.

First, we classify countries on a time-series basis, according to whether their realized 1-year ERP was unusually low or high relative to all previous premiums for the same country since 1900. Starting at end-1909, we record the rank of that year's realized premium as a percentile. We then cluster countries so that group 1 contains those that had the lowest rank/percentile for their prior-year premium, through to group 5, which contains countries with the highest-ranked prior-year premium. Within groups, we invest an equal amount in each country and hold the resulting portfolio for five years. We re-rank countries annually until end-2016, reconstruct groups, and compute a sequence of annualized 5-year ERPs, which run from 1910–14, through 1911–15 and so on to 2017–21.

Second, we also classify countries cross-sectionally, according to whether their 1-year equity premium was low or high relative to other countries. Starting at end-1909, we rank the ERPs achieved over the prior year. We assign countries to quintiles as follows: group 1 contains countries with the lowest prior-year premium, through to group 5, which contains countries with the highest prior-year premium. Within groups, we invest an equal amount in each country and hold the resulting portfolio for five years. We re-rank countries annually until end-2016, reconstruct groups, and compute a sequence of annualized 5-year equity premiums, which again run from 1910–14 to 2017–21.

Short-term ERP forecasts

In **Figure 43**, we display the average of the 108 post-ranking returns for time-series groups 1–5 (central set of bars) and for cross-sectional groups 1–5 (on the right). The pattern revealed by these two sets of bars is far less clear-cut than for the bars on the left of the chart. For both the time-series and cross-sectional groupings, there is only a small difference between the subsequent 5-year ERP for the high prior ERP group and the low prior ERP group. Furthermore, it makes little difference if we lengthen the holding period, delay purchase by one or two years after ranking, or start the ranking in 1900. However, if we shorten the holding period to only one or two years, we find that performance after a low excess return is slightly poorer.

For strategic asset allocation, we learn little (and nothing statistically significant) from recent annual performance. Therefore, the extent to which we can forecast future ERP is extremely limited. This is further confirmed by our research, reported in the 2013 Yearbook, in which we investigate dynamic asset allocation based on the Shiller P/E ratio or CAPE model. While the latter works in-sample, it disappoints when used for market timing purposes because false signals are costly. While we would make a lot of money if we managed to invest at the bottom and sell at the top of the market, we are sadly able to identify the bottoms and the tops only with hindsight.

Mean reversion

In principle, knowledge of current and recent market conditions should be informative about expected returns. Based on the research reported above, long-term investors are unlikely to improve their ERP forecasts compared to an estimate that the future premium will resemble the average over the (long-term) past.

Some investors have a shorter horizon, however, and may wish to trade on near-term forecasts. **Figure 44** plots the VIX index, which measures the annualized standard deviation implied by S&P option prices. The VIX has varied from a low of 9.1% to a high of 150.2%, with an average of 19.9%. During the Global Financial Crisis, the VIX implied volatility peaked at 80.9%, but by end-2010 it had fallen back to 17.6%, below its long-run average. It hit its all-time low of 9.1% on 9 November 2017. During 2018 volatility spiked in February, and then again in December when markets corrected. But volatility then damped down and was generally low, until it spiked again at 82.7% in March 2020, thanks to the COVID-19 pandemic. The COVID-19 peak was thus higher even than the maximum attained during the Global Financial Crisis.

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Figure 44: VIX index of implied volatilities (% per annum) on the US equity market, 1986–2021



Source: Elroy Dimson, Paul Marsh, and Mike Staunton, using data from Chicago Board of Exchange; prior to 1990, the VIX index has been chain-linked to its predecessor index, the VXO. Not to be reproduced without express written permission from the authors.

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Figure 44 spans 36 years during which there were 15 major spikes in the Volatility Index (VIX), each associated with an economic or political crisis which we have labeled on the chart. Visually, from its peak in each crisis, volatility has rapidly reverted toward the long-term mean of 19.9% (see the dark turquoise horizontal line). Indeed, the average time from crisis peak back to long-run mean was 95 trading days, or about four and a half months. The longest reversion time so far was during the COVID-19 pandemic, when the VIX index took 252 trading days (exactly a year, from 16 March 2020 until 16 March 2021) to return to its mean. This was a month longer than it took to recover from peak volatility during the Global Financial Crisis.

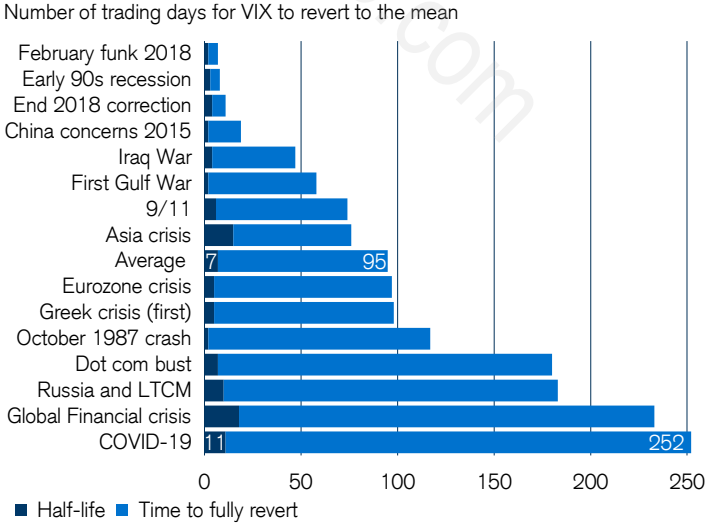
Short-lived spikes in volatility

The time (in days) for the VIX to revert from a peak shown in **Figure 44** to the long-term average is plotted in **Figure 45**. For the volatility spikes depicted in **Figures 44 and 45**, regression to the mean averages 95 trading days. The chart also shows how long it has taken for the VIX to revert from a peak half-way back to the long-term mean. On average, it takes only seven days for half the spike in risk to have evaporated. In the case of the record-breaking COVID-19 spike, it took just 11 days. Caution is obviously needed in interpreting these figures, since one knows only with hindsight when peak volatility has been achieved. But even with this caveat, it is evident that not only is volatility mean reverting, but also that the mean reversion process is quite rapid.

We noted earlier that the equity premium should be higher at times when the equity market is more hazardous and/or when investors are more risk averse. Yet we have seen that periods of extreme market variability tend to be brief, thereby elevating the equity premium for only a short period. But the premium may also reflect changes in risk aversion, which will naturally vary across individuals and institutions, and will be tied to life cycles as well as wealth levels. The linkage between wealth levels and risk aversion suggests that there will be periods when risk aversion deviates from the long-run mean.

After sharp market falls, investors in aggregate will not only be poorer, but they will also be more risk averse. At such times, markets are typically more volatile and highly leveraged, and investors will demand a higher risk premium, driving

Figure 45: **Time for volatility to mean-revert, 1986–2021**



Source: Elroy Dimson, Paul Marsh, and Mike Staunton, using data from Chicago Board of Exchange; prior to 1990, the VIX index has been chain-linked to its predecessor index, the VXO. Not to be reproduced without express written permission from the authors.

markets still lower. Stocks are then priced to give a higher future expected return. On average, we should find that achieved returns are higher after market falls. The reverse logic applies following bull markets when investors are richer and the anticipated equity premium becomes lower.

We might therefore expect equity markets to exhibit mean reversion, with higher returns typically following market falls, and lower returns, on average, following market rises. If there is marked mean reversion, then a timing strategy based on, say, buying equities after large stock price falls (or when dividend yields are high or earnings multiples are low) and selling after significant rises should generate superior returns. This rational explanation for mean reversion is based on time varying equity premiums and discount rates (see Chapter 4).

Rational and behavioral interpretations

The more widely held view among investment practitioners is that equity markets exhibit mean reversion for behavioral reasons, namely, that markets overreact. It is believed that in down-markets, fear and excessive pessimism drive prices too low, while in up-markets, irrational exuberance and over-optimism cause markets to rise too high. In both cases, there will eventually be a correction, so that equity markets mean revert.

A key difference between the rational economic and behavioral views is that, if the former is correct, investors simply expect to earn a fair reward for the risks involved at all times. Thus, although market timing strategies might seem to increase achieved returns, the ex-ante risk-adjusted returns remain constant. Put another way, the good news is that short-term expected returns are likely to be higher after market falls. The bad news is that risk/risk aversion is correspondingly higher, and higher returns are needed to compensate for this. Loading up on equities at these risky times may take courage, but if subsequent returns prove to be higher, this is a reward for risk, not timing skill.

The debate on return predictability

A challenge for both the rational and behavioral views is that the evidence for return predictability is unclear. Mean reversion implies that the equity premium is to some extent forecastable, that risk over the long run is less than short-run volatility suggests, and that investors with a long horizon should favor equities compared with short-horizon investors.

Yet the debate over return predictability is not settled. As highlighted in Dimson, Marsh, and Staunton (2004a) and as formalized by Pástor and Stambaugh (2012), mean reversion does not imply that equities are safer in the long run. This is because three aspects of long-term risk pull in the opposite direction: an investor does not know what the average market return is going to be, nor what today's premium is, nor what the other parameters of the return process are. All three components of uncertainty get bigger as the horizon lengthens and, looking forward, stocks are riskier over the long run.

To sum up, we should expect the equity premium to vary over time. Market volatility fluctuates and risk appetites also vary over time. Sharply lower (or higher) stock prices may have an impact on immediate returns, but the effect on long-term performance will be diluted. Moreover, volatility does not usually stay abnormally high for long and sentiment also mean reverts. For practical purposes, estimates of the equity premium should build on the longest history available at the time the forecast is being made.

Bond risk premiums

Much of the performance of fixed-income portfolios can be attributed to two variables: a maturity factor that describes the incremental return from investing at the long end of the maturity spectrum, and a credit factor that describes the premium generated by potential default risk relative to risk-free bonds. The maturity premium, namely the geometric difference between the return on long government bonds and the return on Treasury bills, is the reward for bond duration. We present evidence on maturity premiums first.

One might think that there is no rationale for a maturity premium, since some investors will view short bonds as riskier than long bonds, while others will say the opposite. Bondholders with long liabilities will prefer to match them with long bonds rather than reinvest on a regular basis with uncertainty over the reinvestment rate. In contrast, investors with short-term liabilities will view long bonds as riskier since there is uncertainty about the price at which they could sell their bonds.

However, these arguments fail to address inflation uncertainty. Inflation has seriously affected long-run investment performance and investors should be concerned with the purchasing power of their future wealth. With inflation uncertainty, short-term bonds become the lower risk option, even for investors with long-term (real) liabilities.

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Long-run maturity premiums

The long-term evidence is summarized in **Figure 46**, which shows the bond maturity premiums achieved around the world since 1900 for the 21 countries and five composite indexes for which we have a continuous history.

The bond maturity premium is defined as 1+ Long bond rate of return, divided by 1+Treasury bill rate of return, minus 1. Over the 122 years, the bond maturity premium has been positive in every country except Portugal (the premium for Germany excludes 1922–23). The premium for the Emerging markets index is low because emerging market bonds have performed poorly (see Chapter 8), and the maturity premiums for our composite indexes are measured relative to US Treasury bills.

Table 13 provides more information. The top panel covers the 21 countries for which we have continuous histories since 1900. The second column of the top panel shows the geometric mean maturity premiums depicted in **Figure 46**. The remaining columns show the arithmetic mean, standard deviation, and minimum and maximum maturity premiums for each market.

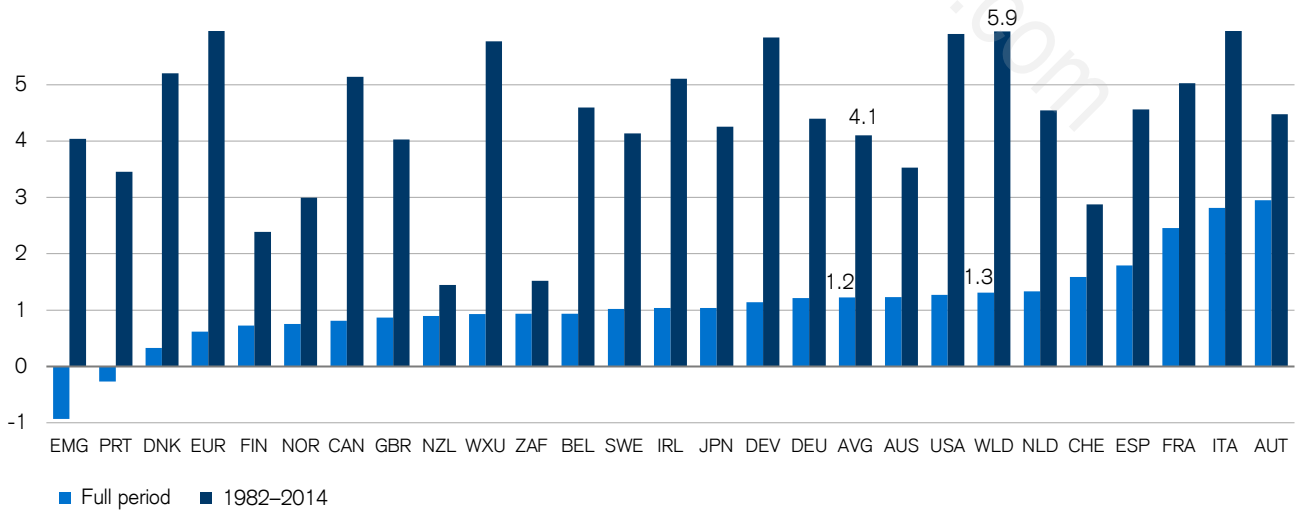
Given the wide range of maturity premiums that we observe on an annual basis, it is a little misleading to label these annual figures as "maturity premiums." For example, US bond investors obviously did not expect the negative maturity premium of –15% that they received during 2009, otherwise they would have shunned long bonds. Outcomes such as this and, indeed, all negative maturity "premiums" must therefore reflect unpleasant surprises – typically, an increase in inflationary expectations or in the anticipated future real interest rate.

Equally, US bond investors could not reasonably have "required" a maturity premium as large as the 27% that they obtained in 2011. Very high realizations such as this must have been pleasant surprises – typically good news on the inflation front, or a fall in the expected level of real interest rates, plus perhaps a flight to safety. Strictly speaking, therefore, we should refer to the annual maturity premiums simply as "excess returns," i.e. long bond returns in excess of the bill rate.

Over long-enough periods, it might be argued that we should expect the pleasant and unpleasant surprises to cancel out, providing us with an estimate of investors' ex ante required maturity premium. Once again, however, we need to examine very long periods before we can place confidence in this approach and, as with the equity premium, we need to analyze and interpret history. This is especially true as the 122-year averages shown in **Table 13** conceal very different subperiod premiums.

During the first half of the 20th century, the average maturity premium across the 21 countries was 0.4%. From 1950 to 2021, the average premium was 1.8%. From 1982 to 2014, a period of 33 years, bonds enjoyed a golden age, with mostly unprecedented favorable conditions (see the discussion in Chapters 2 and 4). The corresponding maturity premiums over this period, plotted in **Figure 46** as dark blue bars, averaged 4.1%. This figure is large and implausible as an estimate of the maturity risk premium.

Figure 46: Bond maturity premiums (% per annum), full period (1900–2021) and "golden age" (1982–2014)



Premiums for Austria and Germany omit 1921–22 for Austria and 1922–23 for Germany. Sources: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

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Extrapolating the bond returns and maturity premiums from this golden age into the future would be fantasy. An alternative would be to take the long-run 122-year historical maturity premium on the world bond index of 1.3% per year as a guide to our estimate of the future maturity premium (or the equally weighted long-run average premium across the 21 countries, which has a similar value of 1.2% – see **Figure 46**).

However, even these long-run averages are distorted by the "golden age" of bonds. During this period, the high excess return of bonds over bills reflected factors such as declining inflation and falling real interest rates, rather than being risk premiums. In forecasting the future maturity premium, we therefore recommend that investors instead seek guidance from the current term structure of interest rates.

Credit risk

In addition to maturity risk, the other key factor affecting the performance of fixed-income portfolios is credit risk. The credit risk of a bond refers to the probability of, and potential loss arising from, a credit event such as defaulting on scheduled payments, filing for bankruptcy, restructuring, or a change in credit rating. Over the long term, one would expect exposure to default risk to be rewarded with a premium that fully captures the expected return difference between bonds with potential to default and risk-free bonds.

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Table 13: Worldwide bond maturity premiums, 1900–2021

Country	Start year	Geometric mean (%)	Arithmetic mean (%)	Standard error (%)	Standard deviation (%)	Minimum return (%)	Minimum year	Maximum return (%)	Maximum year
Countries and indexes with continuous histories since 1900									
Australia	1900	1.2	1.8	0.9	10.5	–23.3	1973	48.2	1932
Austria*	1900	3.0	10.0	4.7	51.0	–94.2	1945	442.3	1926
Belgium	1900	0.9	1.4	0.9	9.8	–19.6	1914	34.0	1958
Canada	1900	0.8	1.2	0.7	8.3	–26.4	1915	24.1	1982
Denmark	1900	0.3	0.9	1.0	10.7	–18.8	1915	53.8	1983
Finland	1900	0.7	0.9	0.6	6.1	–17.4	1920	22.7	2014
France	1900	2.5	2.8	0.7	8.0	–19.2	1994	27.8	2014
Germany*	1900	1.2	1.7	1.0	10.4	–38.6	1948	48.3	1921
Ireland	1900	1.0	1.7	1.1	11.8	–26.4	1974	37.2	1932
Italy	1900	2.8	3.3	0.9	10.2	–21.5	1994	52.3	1944
Japan	1900	1.0	1.9	1.2	13.0	–45.6	1953	63.0	1954
The Netherlands	1900	1.3	1.6	0.7	8.1	–18.9	1939	29.2	2014
New Zealand	1900	0.9	1.2	0.6	7.1	–25.2	1984	32.2	2021
Norway	1900	0.8	1.1	0.7	8.1	–30.4	1918	37.3	1940
Portugal	1900	–0.3	0.6	1.3	14.3	–38.9	1976	82.6	1986
South Africa	1900	0.9	1.2	0.7	7.9	–18.3	1994	30.4	1933
Spain	1900	1.8	2.3	0.9	10.4	–27.0	1920	46.5	1942
Sweden	1900	1.0	1.4	0.8	9.3	–34.1	1939	30.4	2014
Switzerland	1900	1.6	1.8	0.6	6.1	–13.4	1919	24.1	1922
United Kingdom	1900	0.9	1.4	1.0	10.7	–26.6	1974	36.6	1932
United States	1900	1.3	1.6	0.8	8.7	–15.0	2009	27.0	2011
Europe	1900	0.6	1.7	1.3	14.6	–48.6	1919	73.0	1933
World ex-US	1900	0.9	1.7	1.2	13.1	–41.5	1919	77.1	1933
World	1900	1.3	1.7	0.8	9.3	–25.9	1919	47.2	1933
Developed markets	1900	1.1	1.5	0.8	9.1	–26.1	1919	35.3	1933
Emerging markets	1900	–0.9	0.9	1.6	17.5	–77.1	1949	87.1	1933
Countries/markets with later start dates or discontinuous histories and hence later re-start dates (China and Russia)									
Argentina	1992	–0.2	4.9	6.2	34.1	–58.5	2008	126.7	2009
Brazil	1995	0.0	2.3	4.1	21.5	–46.3	2006	52.4	2002
Chile	1993	–0.9	–0.6	1.4	7.3	–20.8	2021	16.2	2019
China	1993	1.6	2.0	1.6	8.6	–17.2	2004	22.7	2005
Greece	1993	6.9	9.8	4.7	25.3	–57.4	2011	98.5	2012
Hong Kong SAR	1994	2.8	3.3	1.9	10.1	–15.0	2013	23.8	1998
India	1953	0.0	0.5	1.3	10.4	–13.7	1995	37.0	2002
Malaysia	1970	3.6	3.9	1.2	8.6	–11.3	1973	28.6	1977
Mexico	1995	3.8	4.2	1.6	8.1	–11.9	2021	17.6	2019
Russia	1995	4.7	10.5	8.1	41.9	–58.1	1998	182.9	1999
Singapore	1988	3.0	3.3	1.2	6.7	–11.4	2021	20.3	2002
South Korea	1963	6.3	7.0	1.7	12.7	–11.1	2005	49.6	1982
Taiwan (Chinese Taipei)	1995	3.3	3.5	1.1	5.5	–7.5	2007	12.8	2008
Thailand	1980	4.2	4.9	1.9	12.6	–22.7	1989	40.1	1986

* For Austria and Germany, statistics are based on 120 years, excluding 1921–22 for Austria and 1922–23 for Germany. Sources: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

At the height of the Global Financial Crisis, credit spreads were exceptionally large, even on high-grade corporate bonds, suggesting that investors believed significant defaults were likely. However, they fairly rapidly returned to more normal levels. Similarly, default risk premiums had also declined for sovereign bonds for governments that had borrowed in currency (notably euros) that the issuer cannot create.

From 1900 to 2021, long-term high grade US corporate bonds provided an annualized premium of 0.73% relative to government bonds of the same maturity. The premium for credit risk on high grade bonds has thus been modest. However, this seems reasonable historically, given their relatively low rates of default.

Furthermore, even this seemingly small credit risk premium had an appreciable impact on terminal wealth. **Figure 10** in Chapter 2 showed that a one-dollar investment at the start of 1900 in 20-year US Treasuries rolled over at the start of each year so that it was always invested in 20-year Treasuries would have become USD 364 by the end of 2021. An equivalent investment in high-grade US corporate bonds of the same maturity would have become USD 880, 2.4 times as much.

The low-return world

We conclude this chapter by examining the low-return world we now live in, and by estimating the returns we can project into the future.

The real interest rate on Treasury bills represents the inflation-adjusted return on an asset that is essentially risk-free. The expected return on equities needs to be higher than this as investors require some compensation for their higher risk exposure. If real equity returns are equal to the real risk-free rate plus a risk premium, it follows that when the real interest rate is low, subsequent real equity returns will also be low. This applies not only to equities but also to bonds.

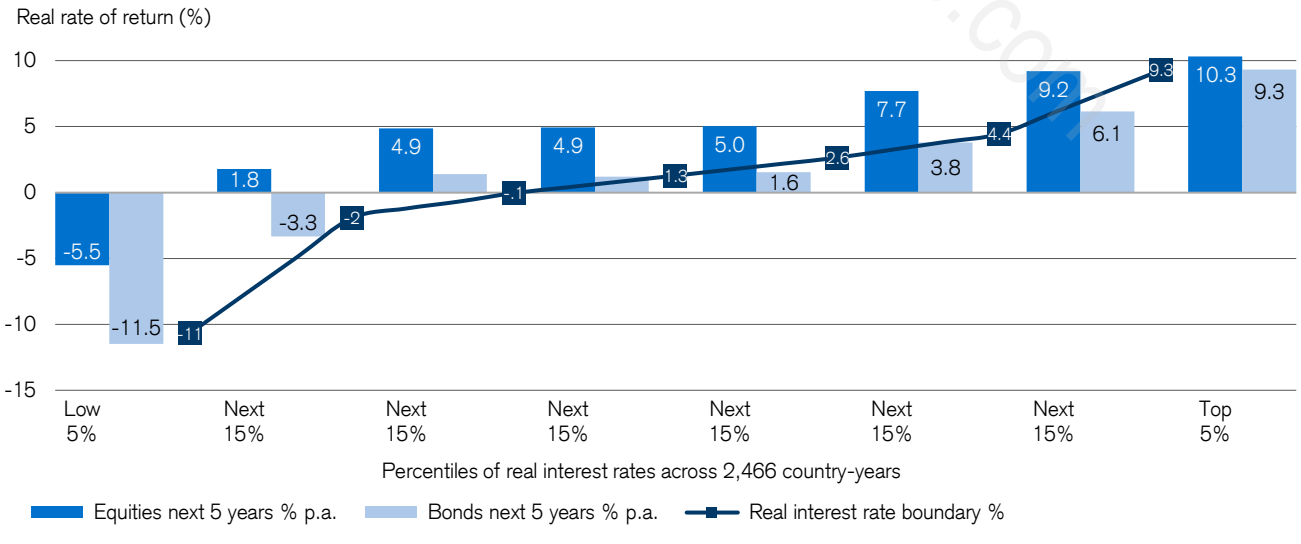
Interest rates and financial returns

Does history bear out this relationship between lower real equity returns and lower real interest rates? **Figure 47** provides evidence based on the full range of markets for which we have a complete history since 1900. We compare the real interest rate in a particular year with the real return from an investment in equities and bonds over the immediately following five years. After excluding periods that span the German and Austrian hyperinflations, we have a total of 2,466 observations of (overlapping) 5-year periods. We rank country-years by their real interest rates and allocate the sample to bands containing the 5% lowest and highest rates, with 15% bands in between. The line plot shows the boundaries between each band.

The bars are the average real returns on bonds and equities, including reinvested income, over the next five years. For example, the first pair of bars shows that, during years in which a country had a real interest rate below –11%, the average annualized real return over the next five years was –5.5% for equities and –11.5% for bonds.

The first three bands comprise 35% of all observations and relate to real interest rates below zero. Negative real interest rates were experienced in around one-third of all country-years. Thus, although today's nominal short-term

Figure 47: Real asset returns versus real interest rates, 1900–2021



Source: Elroy Dimson, Paul Marsh, and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

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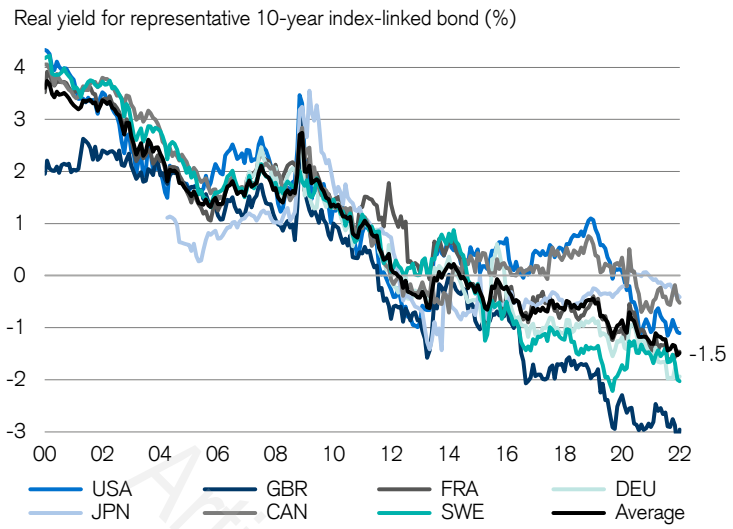
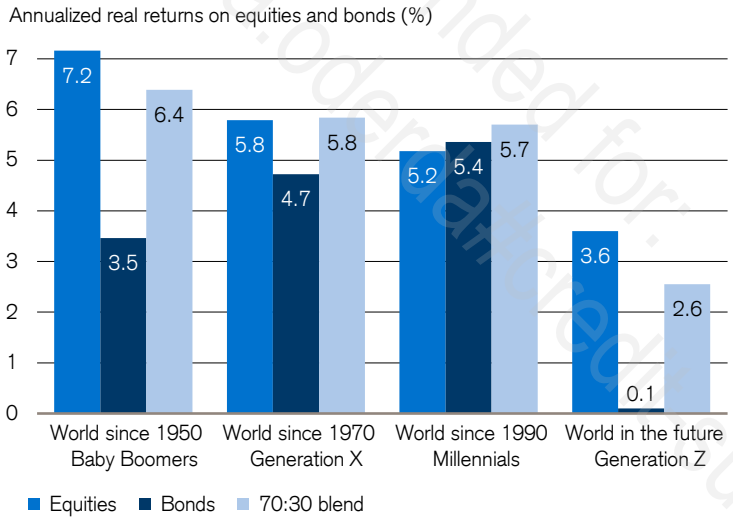
Figure 48: Real yields on inflation-linked bonds, 2000–2021



Source: Elroy Dimson, Paul Marsh, and Mike Staunton using underlying data from Refinitiv. Not to be reproduced without express written permission from the authors.

Figure 49: Return experiences across generations



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interest rates remain very low by historical standards, real rates are not. Note, however, that low real rates typically arose in inflationary times, unlike today's – until recently – relatively low-inflation environment.

There is a clear relationship between the current real interest rate and subsequent real returns for both equities and bonds. Regression analysis of real interest rates on real equity and bond returns confirms this, yielding highly significant coefficients. Note also that in every band depicted in **Figure 47**, equities provided a higher return than bonds.

When real interest rates are low, expected future risky-asset returns are also lower. However, during periods when real interest rates fall unexpectedly, this will tend to provide an immediate boost to asset prices and hence returns, even though prospective returns will have been lowered. These patterns were prevalent during the 21st century.

The race to zero and beyond

Figure 48 plots the real yields on inflation-linked bonds (ILBs) with a maturity of ten years. These securities are the equivalent in other countries to the Treasury Inflation-Protected Security (TIPS) issued by the United States. **Figure 48** shows the real yields at which ILBs traded in seven countries that issued such securities (most, but not all, having first been issued before 2000).

The black line in **Figure 48** is the average of the ILB yields for the individual countries. In 2000, the average real yield was almost 4% (it was fully 4% if the UK is ignored). Within just over two decades, the average yield on these linkers had collapsed by some five percentage points to –1.5% by the end of 2021.

Although real yields have risen quite sharply in early 2022, they remain very low by historical standards. At the time of writing, 10-year US TIPS are yielding –0.6%, while even 30-year US TIPS offer just 0.1%. When we add an equity premium to the real risk-free rate, we get an estimate of the expected real return on equities. The 21st century decline in real rates therefore has a big impact on capital-market projections.

Return projections

Investors' views of the future are conditioned by past experience. These past experiences differ across generational cohorts that are loosely defined by birth year, not by current age. Baby boomers (born 1946–64) were the post-war generation; Generation X (born 1965–80) and Millennials (born 1981–96) followed. Demographers and social scientists report major differences in the tastes, habits and expectations of each cohort. However, their capital market experiences have been similar.

In the first three blocks of **Figure 49,** we report the returns they may have observed. In each block, we show the investment performance of world equities, world bonds, and a balanced portfolio (a 70:30 blend of the two). These real returns are very high. All three generations enjoyed excellent returns from equities, especially the Baby boomers. The bond returns, particularly since 1970 and 1990, are extremely high, and based on current yields, seem quite unsustainable.

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Generation Z (born 1997–2012) faces a different future. The block on the right of the chart uses current long bond yields to indicate future real bond returns and adds our estimated equity premium to make a projection of real equity returns for the next generation.

The balanced portfolio now offers a risky return of around 2.6% in real terms – well under half the real return enjoyed by the previous three generations. Many savers, investors, pension plans, endowments and institutions are likely to be challenged by the lower expected-return world in which we continue to live.

Concluding remarks

This chapter has built on our estimates of the equity risk premium in order to look to the future. We use a building block approach to decompose past returns. After adjusting for non-repeatable factors that favored equities in the past, we infer that investors can expect an equity premium (relative to bills) of around 3½% on a geometric mean basis and, by implication, an arithmetic mean premium of approximately 5%. We have also examined risk premiums for fixed-income investing – both the maturity premium and (in less detail) the credit premium.

We have examined the historical record to gain insights into the financial market risks that should command a return premium. We have shown how expected returns can be inferred from current yields and have estimated the portfolio returns that, at the current time, can be anticipated in the future. In the next two chapters we build on these findings by studying the rewards for exposure to a wider range of risk factors.

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Chapter 6: Investing with style

Style investing remains in vogue as investors seek to enhance their investment returns by taking advantage of premiums uncovered by academic research. We estimate the historical returns from style investing over periods of up to 122 years, and across many markets. We report on the profitability of following strategies based on company size, value versus growth, dividend yield, stock-return momentum and low-volatility investing. We conclude with an overview of the Fama-French multi-factor models in the USA and in developed and emerging markets.

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Photo: Rome, Italy; Getty Images, John Harper

Investment style

Equity portfolios are typically analyzed according to the investment style followed by the portfolio manager. The style may be a quantitative description of how a fund is managed or it may be an indication of the benchmark that is appropriate for the fund.

Since the 1960s, researchers have sought to identify factors that explain variation in the value of a portfolio, and in particular, attributes associated with superior returns. In the 1970s, this evolved into identifying the characteristics of portfolio holdings and aggregating this information to a portfolio level. In the 1980s, Sharpe (1988) introduced returns-based style analysis. Holdings- and returns-based style analysis are often used to identify exposure to characteristics believed to be associated with superior returns.

In this chapter, we examine the long-term performance from portfolio exposure to five equity characteristics: company size, value versus growth, dividend yield, stock-return momentum and low volatility. All five have been associated with superior historical returns, both over the long-run and across many countries. In Chapter 7, we assess whether these factors generate predictable risk premiums for investors.

The size effect

The size effect first came to prominence in the USA, where Banz (1981) showed that the smallest companies quoted on the New York Stock Exchange had provided the highest long-term returns. Banz found that there was a substantial return premium when the smallest and largest 50 NYSE stocks were compared, with a return advantage to smaller companies of 1% per month. These findings were subsequently confirmed for other markets. The longest study was for the UK based on our paper (Dimson and Marsh, 1986). This research spans 66 years from 1955 and is updated annually (Evans, Marsh and Dimson (2022)).

The Center for Research in Security Prices (CRSP) at the University of Chicago's Booth School of Business provides a long-term history of size-ranked stock indexes from 1926 (which precedes Banz's sample period) to the present. In **Figure 50**, we use this as a guide to the size effect in the USA. The left-hand chart shows the long-term performance since 1926 of US large-, small-, and micro-cap stocks. Large caps are defined as the constituents of CRSP NYSE deciles 1–5, small caps as CRSP deciles 6–8 and micro-caps as deciles 9–10.

While a dollar invested in 1926 in larger companies, with dividends reinvested, grew in value to USD 10,514, a similar investment in small caps gave a terminal value almost six times greater at USD 60,746. Micro-cap stocks did best of all, with an end-2021 value of USD 93,275. The returns on large-cap stocks were an annualized 10.1%, while small- and micro-cap stocks achieved 12.2% and 12.7%, respectively.

The relative progress of small caps, however, was not consistent and steady. There were prolonged intervals of underperformance. The left-hand chart in **Figure 50** shows that they initially performed poorly, especially in the Great Depression, and did not catch up with large caps until the early 1940s. By 1975, although micro-caps were ahead, small caps were still only marginally beating large caps.

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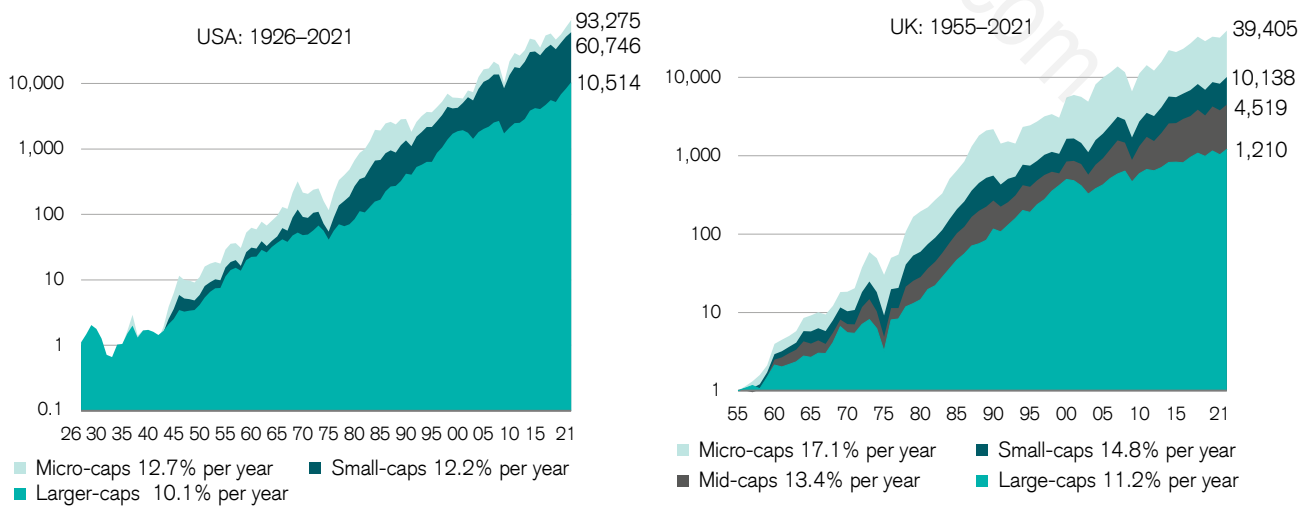
Figure 50: Long-run cumulative performance of stocks in different size bands in the USA and UK



Source: Elroy Dimson, Paul Marsh and Mike Staunton; US CRSP capitalization decile returns are from Morningstar. UK size-based returns are from Evans, Marsh and Dimson (2022) and are for the Numis Smaller Companies indexes ex investment companies. Not to be reproduced without express written permission from the authors.

During 1975–1983, small caps raced ahead. If this period were omitted, Siegel (2014) notes that large caps would have beaten small caps from 1926 to the late 1990s. As we report below, this patchiness of small-stock returns is also apparent over the last two decades.

It may well have been the excellent performance of small caps from 1975 that drew Banz's attention as a (then) Chicago PhD student and persuaded him to research the size effect. The publication of his work led to considerable interest in small caps among US investors, which was helped by their strong outperformance starting in 1975. This spurred the launch of many investment vehicles specializing in smaller companies. The honeymoon period lasted for about two years until the end of 1983 and, during this period, US small caps continued to outperform.

Then, as we reported in Dimson and Marsh (1999), US small caps began to underperform, becoming a victim of Murphy's Law. Over a long period, 1984–1997, the small-cap premium was negative; although, ironically, after we highlighted the demise of the size effect, US small caps performed very well over the first decade of the 21st century in both relative and absolute terms. Our 1999 warning on reversal of factor premiums was followed in the 2010s by a spate of papers reporting similar findings for other factor-driven strategies, a topic to which we return later.

UK evidence

For the UK, the long-term evidence is similar. Our analysis is based on the Numis Smaller Companies Index (NSCI), which comprises the lowest tenth by value of the UK equity market, the Numis Mid Cap Index, which covers the lowest 20% by value, excluding the smallest 5% of the market and the Numis Large Cap Index, which covers the top 80% of the market by value. These indexes have a well-documented history spanning 67 years (see Evans, Marsh and Dimson (2022)). The right-hand chart of **Figure 50** plots these three indexes, together with our MicroCap index. The latter tracks the bottom 1% by value of the UK market, on an ex-investment company basis.

The chart shows that one pound invested in UK large caps at the start of 1955, with dividends reinvested, would have grown to GBP 1,210 by end-2021, giving an annualized return of 11.2%. The same sum of money invested in the Numis Mid Cap index would have generated GBP 4,519, while the NSCI would have generated GBP 10,138, more than eight times as much as large caps.

However, an investment in micro-caps would have yielded GBP 39,405, nearly four times as much as from the NSCI, and equivalent to an annualized return of 17.1%. These returns are gross of tax and before transaction costs. While the latter would obviously be higher for small caps and especially for micro-caps, there has been a marked size premium over the long run in the UK, with the very smallest stocks doing best.

The NSCI went live at the start of 1987 and, despite its impressive back-history, it did not prove to be the road to instant riches. As noted in Dimson and Marsh (1999), soon after the US size premium went into reverse, the same thing happened in the UK and virtually all other markets around the world. Much of the 1990s proved to be the era of the large-cap stock, and scrutiny of both the left-hand and right-hand charts in **Figure 50** reveals that the gap in cumulative returns narrowed over this period – although not to the point of eroding all the accumulated performance that had built up previously.

Even in years when small caps underperformed, however, the size effect lived on in the sense that small caps still deviated in their performance from large caps. Thus, in most years, portfolio size exposure remains an explanatory variable that is helpful for understanding fund performance.

Global research

With the discovery of the size premium in the USA and then the UK, researchers set out to investigate whether this also occurred in other countries. Dimson (1988), Hawawini and Keim (2000), Schwert (2003) and Dimson, Marsh, and Staunton (2002) summarized these studies. It became clear that the size premium was not restricted to the USA and UK. It had been present in almost every country that researchers studied. Furthermore, in most countries, researchers concluded, like Banz, that the size premium could not be explained away by risk. The pervasiveness and magnitude of the small-cap premium meant that it rapidly became recognized as the premier stock market anomaly of its day.

In the periods immediately following those studied by the various researchers, however, the size premium was on average smaller, more often negative, and more volatile than in the earlier research period. To gain a full picture of the entire record, including recent data, we estimate each country's long-run small-cap premium. We do this by taking the results obtained from the various research studies and updating them to the present day using commercially available small- and large-cap index series.

Full references to the earlier research studies, and the indexes used to update them, are given in Dimson, Marsh, and Staunton (2004b). Since 2004, the MSCI small- and large-cap indexes have been used to update the size premium in all countries except the USA and UK, where, for consistency, size premiums have been defined as in **Figure 50**.

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The results of this long-run cross-country comparison are shown by the lighter-colored bars in **Figure 51**, which plots the average difference between small- and large-cap returns for the DMS 35 countries (except Argentina, where we have no size premium data). The period covered averages just over 41 years and is the longest possible for each country, beginning at the start date of the earliest research into that country's size effect. The DMS 35 countries in **Figure 51** are a mix of 22 developed and 12 emerging markets.

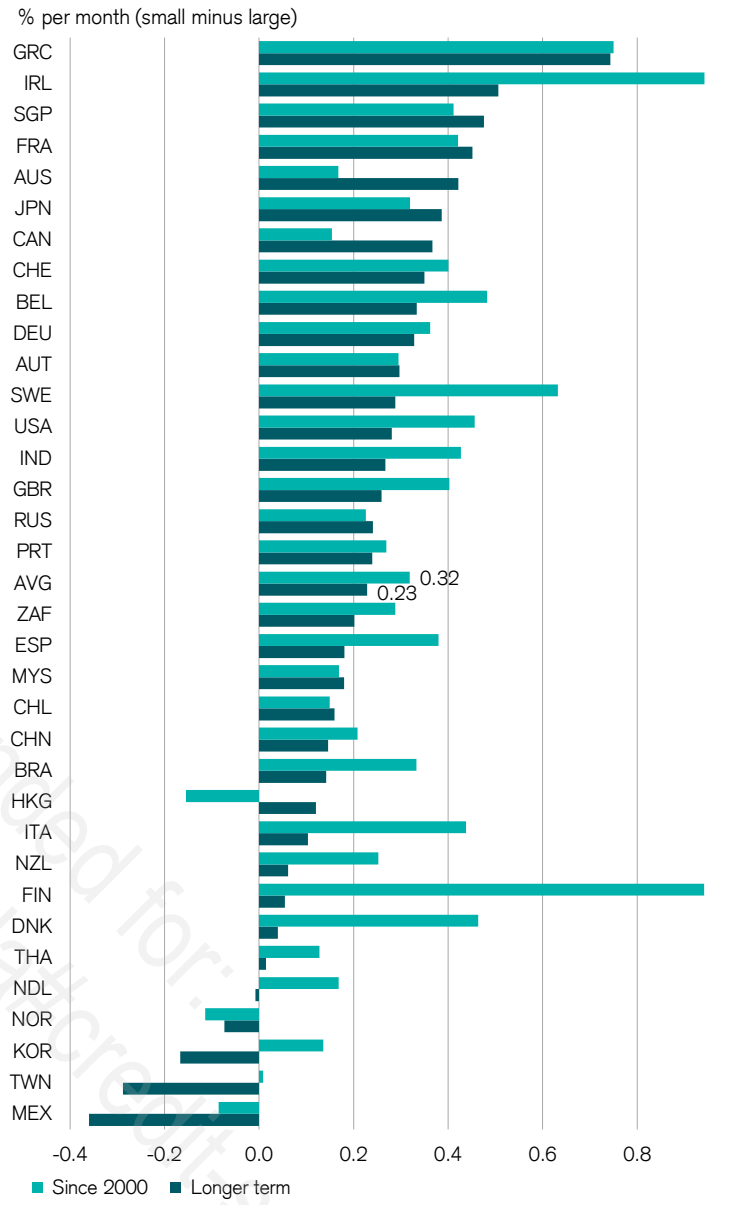
Viewed internationally, we can see that smaller companies have provided a modest long-run premium relative to large companies, averaging 0.23% per month from inception of the small-cap series. While this contrasts with the much higher premiums that were reported in the initial research studies, the out-of-sample 21st century premiums (compare the dark and lighter colored bars labeled AVG) are larger than those during the 20th century, averaging 0.32% per month.

The size premium still has the capacity to surprise. Just when many investors gave up on small caps during the 1990s after a decade of poor relative performance, the size premium re-asserted itself. The darker bars in **Figure 51** show the average premium over the 22 years of the 21st century to date. This period included some difficult times for equity markets, but that was mainly due to the disappointing performance of large caps. Small caps performed well, yielding positive returns in almost all markets. Apart from Hong Kong SAR, Norway and Mexico, the size premium was positive in every country shown, averaging 4.4% on an annualized basis.

Despite the record since 2000, if researchers were investigating the long-run returns on smaller companies for the first time, they would today recognize the small-firm effect (the tendency of small caps to perform quite differently over time from large caps) and would note that there had been a modest small-firm premium. But the magnitude of the premium would command less attention than in the past and would not suggest there was a major benefit from investing in small caps. The size premium would no longer be deemed the premier anomaly.

Nevertheless, small caps continue to perform very differently from large caps, and the small-cap effect (the tendency of small caps to perform differently) lives on, even if the small-cap premium (the tendency for small caps to outperform) has proved lower in practice than in initial discovery. Furthermore, there is no doubt that portfolios tilted toward or away from the market's average size exposure are taking on significant risk relative to the market as a whole. Prudent long-horizon investors should plan on no more than a normal

Figure 51: Small-firm premium in 34 markets, to end-2021



Sources: Elroy Dimson, Paul Marsh and Mike Staunton, Low-cap and low-rated companies, Journal of Portfolio Management, 2004 and updates using MSCI indexes, CRSP deciles for the USA and the Numis index series for the UK. Not to be reproduced without express written permission from the authors.

reward for the risk, illiquidity and management costs associated with running a portfolio of low-capitalization stocks. However, we can see no case for underweighting smaller companies.

The value premium

In addition to the size effect, there has historically been a relationship between the value or growth orientation of an investment strategy and its long-run performance. Value stocks sell for relatively low multiples of earnings, book value, or dividends. They may be mature businesses with an unexciting future or they may have a depressed share price that reflects or anticipates setbacks. Growth stocks sell for relatively high

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valuation ratios, reflecting favorable prospects for the business, and their shares anticipate cash flows that are expected to grow in the future. There is extensive literature documenting that, over the long run, value and growth investing have given rise to substantially different records of long-term performance. A large body of US evidence shows that value stocks have outperformed growth stocks.

Style-based indexes assign stocks to value or growth (or a middle group) based on accounting data and estimated growth rates, usually in conjunction with a measure of company size. FTSE Russell uses a composite of cash flow yield, earnings yield and country relative sales/price ratios. S&P uses three factors: the ratios of book value, earnings and sales to price. Wilshire looks at six factors: projected price/earnings ratio, projected earnings growth, price/book ratio, dividend yield, trailing revenue growth and trailing earnings growth. MSCI uses three factors: book/price ratio, 12-month forward earnings/price and dividend yield. Overall, value strategies typically emphasize stocks with a high book/price ratio.

The United States

The performance of value versus growth stocks in the USA is shown in the left-hand chart of **Figure 52**. This is based on the Fama-French index series, the longest available US history, with a 1926 start date. Fama and French classify stocks into value, middling, and growth based on their book-to-market ratio and compute monthly returns that are compounded over time. The performance of value (high book-to-market) stocks is superior over this long time period and growth stocks are inferior. For US companies, the graph shows that, over the longest available period (end-1926 to end-2021), the (geometric) difference between the annualized returns on the Fama-French value and growth indexes is 2.5%.

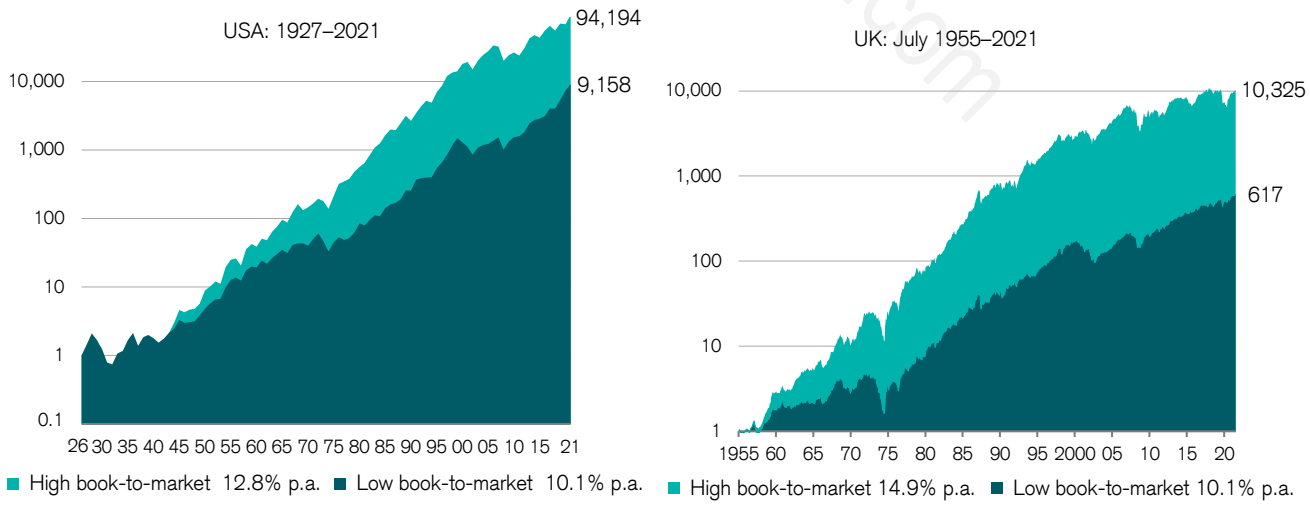
The United Kingdom

As with the size effect, research on the value premium has been replicated in many other countries. After the USA, the country with the longest recorded history of the value effect is the UK. Dimson, Nagel and Quigley (2003) examined the UK value effect since 1955, and we have updated their results to the end of 2021 using their methodology. Value is again measured by the ratio of the book value of equity to the market value of equity. UK stocks are sorted into growth (the 40% with the lowest book-to-market ratio), medium, or value (the 40% with the highest book-to-market ratio).

The right-hand chart of **Figure 52** compares the long-run performance of the low and high book-to-market portfolios. A one-pound investment in the growth index in 1955 would have grown in nominal terms to GBP 617 by the end of 2021, an annualized return of 10.1%. The same initial investment allocated to the value index would have generated GBP 10,325, more than 16 times as much, and equivalent to an annualized return of 14.9%. Value investing paid off.

Value investing was a profitable strategy in the period covered by the key research studies, but, as in other areas of investing, the subsequent outcome was for several years the opposite of what history had led investors to expect. The 1990s were mostly the era of growth stocks, and value strategies fared poorly. After March 2000, value investing came back into its own, with value stocks performing especially well in the early years of the 21st century. However, growth stocks again moved well ahead from

Figure 52: Long-run cumulative performance from high versus low book-to-market stocks in the USA and UK



Sources: Elroy Dimson, Paul Marsh and Mike Staunton; US data is from Professor Kenneth French, Tuck School of Business, Dartmouth (website). UK data is from Dimson, Nagel and Quigley, 2003, updated by Elroy Dimson, Paul Marsh and Mike Staunton using the London Share Price Database. Not to be reproduced without express written permission from the authors.

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2007 onward and value performed very poorly from then until the COVID-19 recovery period in the second half of 2020.

To provide a global perspective, we document the value premium observed in all the Yearbook countries. We update the estimates of the value premium reported by Dimson, Marsh, and Staunton (2004b), who in turn had drawn on Capaul, Rowley, and Sharpe (1993), Chan, Hamao, and Lakonishok (1991), Fama and French (1998), and Rosenberg, Reid, and Lanstein (1985).

Value and growth around the world

We compute the annualized value premium for each country as the geometric difference between the MSCI Investable Value and Growth indexes from inception (1975 in a majority of countries) to date. MSCI constructs these indexes using eight historical and forward-looking fundamental variables for every security. They define value using a combination of book value-to-price, earnings-to-price, and dividend yield, while they define growth based on a combination of variables measuring short- and long-term growth in EPS and sales per share. They place each security into either the Value or Growth Indexes, or partially allocate it to both.

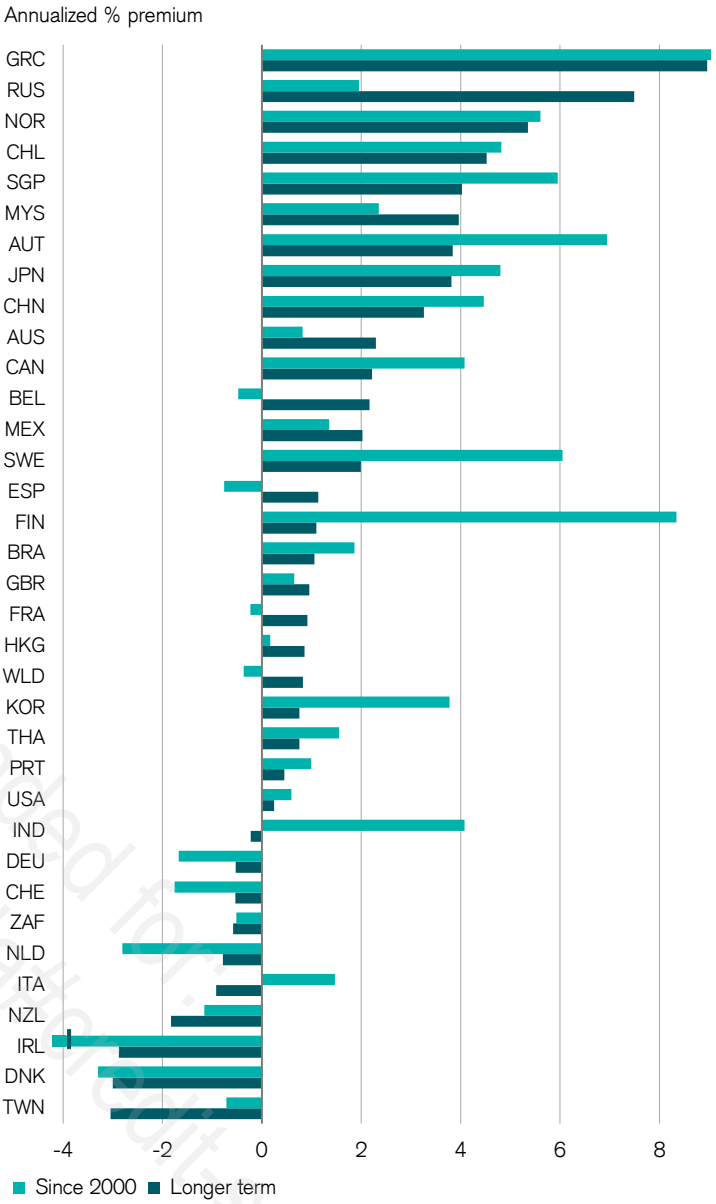
The lighter bars in **Figure 53** show the value premium for the DMS 35 countries (except Argentina) over the 47 years from 1975 to 2021, or over the longest possible interval to the end of 2021 for those countries where the series start later. The DMS 35 countries in **Figure 53** are a mix of 22 developed and 12 emerging markets.

Taking a global and long-term perspective, **Figure 53** shows that value investing mostly outperformed growth investing. The value premium was positive in 23 countries, negative in nine and close to zero in two. For the world index, the value premium was 0.8% per year.

The superior returns from value stocks arrived erratically, however, with considerable year-to-year variation. Furthermore, as noted above, value performed less well in the periods after researchers first documented the effect, while the 1990s was a poor decade for value stocks. After the tech crash, value stocks returned to favor. The darker bars in **Figure 53** show that, since 2000, there were positive value premiums in 23 DMS 35 countries, and an annualized value premium of –0.4% on the world index. From 2007 until the second half of 2020, growth stocks outperformed in most countries, while value performed poorly.

There is still controversy over the source of the value premium. Dimson, Marsh, and Staunton (2004b) review some of the old debates, and

Figure 53: Value premium in DMS 35 countries, 1975–2021



Sources: Elroy Dimson, Paul Marsh and Mike Staunton: MSCI Value and Growth indexes are used for all countries except the USA and UK. US data is from Professor Kenneth French, Tuck School of Business, Dartmouth (website). UK data is from Dimson, Nagel and Quigley, 2003, updated by Elroy Dimson, Paul Marsh and Mike Staunton using the London Share Price Database. Not to be reproduced without express written permission from the authors.

Fama and French (2021) examine the predictability of the premium, an issue to which we return. The fundamental issue, of course, is whether value will return to superiority over the long run and, if so, whether it entails higher risk.

Income and yield

Since the 1970s, US researchers have documented a marked historical return premium from US stocks with an above-average dividend yield. We first look at US data from Kenneth French of Dartmouth College over the period since end-June 1927. Stocks are ranked at the start of each year by their dividend yield and divided into the highest- and lowest-yielding 30%

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of dividend-paying companies, the middle 40%, and stocks that pay no dividends. **Figure 54** shows that, over this 94.5-year period, the annualized return from the non-dividend payers was 9.3%, while low-yield stocks returned 9.8% and high-yielders provided 11.2%.

The longest study of the yield effect is our 122-year research on the UK equity market. Prior to the start of each year, we rank the 100 largest UK stocks by their dividend yields and divide them 50:50 into higher-yielding and lower-yielding stocks. We calculate the capitalization-weighted returns over the following year, and then repeat this procedure each year. The right-hand chart of **Figure 54** shows that an investment of GBP 1 in the low-yield strategy at the start of 1900 would have grown to GBP 10,103 by end-2021, an annualized return of 7.9%. However, the same initial investment allocated to high-yield stocks would have generated GBP 180,708, which is nearly 18 times greater, and equivalent to an annualized return of 10.4% per year.

Figure 55 (overleaf) shows that the yield effect has been evident in most countries. The data again comes from Ken French and covers 21 of the DMS 35 markets. For most markets, the period covered is the 47 years from 1975 to 2021, with a few countries starting later. The premium is based on the highest- and lowest-yielding 30% of dividend-paying stocks. For the USA and UK, we take the yield premiums from the much longer studies reported above.

The bars in **Figure 55** show the annualized yield premium, defined as the geometric difference between the returns on high- and low-yielders. The darker bars show the premiums over the longest period available for each country. High-yielding stocks outperformed low-yielders in every country except Denmark and Ireland, which are both small markets. Across all 21 countries, the average premium was 2.7% per year.

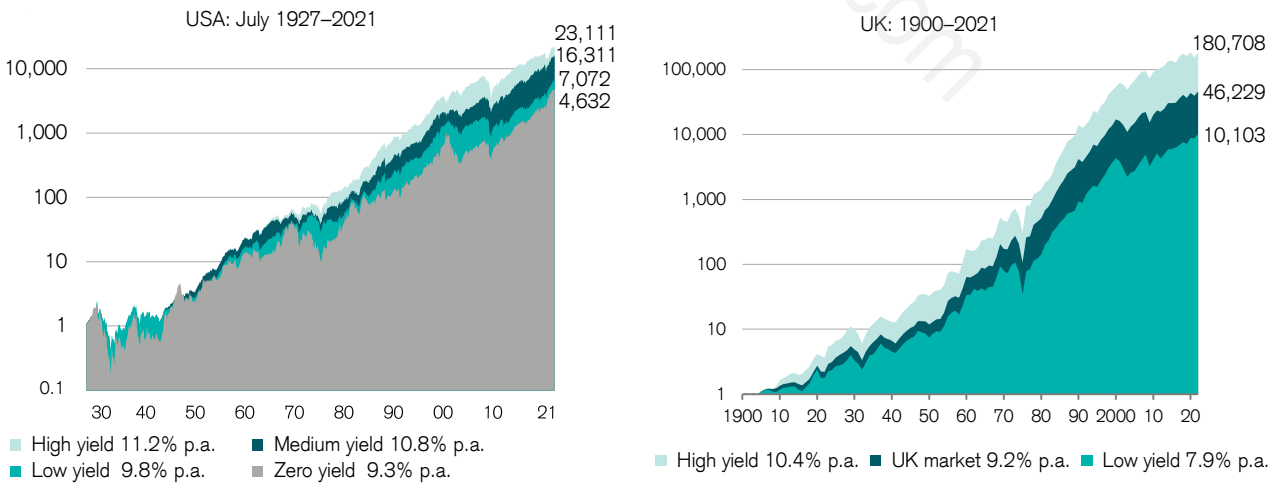
The darker bars in **Figure 55** show the yield premium over the first 22 years of the 21st century. The premium was positive in all but five countries, and averaged 3.1%, a larger premium than the level for the longer-term period reported above. This period embraces the dot-com bust, when technology, media and telecoms stocks (which were typically zero- or low-yielders) fell sharply from their heights as investors re-engaged in stocks with strong fundamentals, including dividends. It also spans the Global Financial Crisis. This explains the negative premiums for Ireland and Belgium, both of which were heavily exposed to high-yielding banks that subsequently performed poorly.

Explanations for the yield premium

The yield premium is now widely viewed as a manifestation of the value effect that we discussed in the previous section, since high-yielders are stocks that sell for low multiples of a fundamental variable, namely dividends. In the context of yield, value stocks or high-yielders may be mature businesses or else dividend payers with a depressed share price that reflects recent or anticipated setbacks. Growth stocks, in contrast, often pay low or no dividends since the companies wish to reinvest in future growth. They sell on relatively high valuation ratios because their stock prices anticipate these growing cash flows (and dividends).

Why have high-yielders outperformed low- and zero-yielders? There are four possibilities. First, it may simply be by chance and hence unlikely to

Figure 54: Long-run cumulative performance from low- and high-yielding stocks in the USA and UK



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recur. However, this is hard to sustain as, while there have been long periods when the effect fails to hold, it has nevertheless proved remarkably resilient both over the long run and across countries.

A second possibility is that we are observing a tax effect since many countries' tax systems have favored capital gains, perhaps causing growth stocks to sell at a premium. The impact of tax is controversial, but tax alone seems unlikely to explain the premium. In the UK, there was a yield premium pre-1914, when income tax was just 6%. Also, if tax were the major factor, alternative definitions of value and growth stocks would work less well than dividend yield as an indicator of subsequent performance. We have analyzed the most commonly used alternative measure, book-to-market (see above) based on the same markets and time periods, and it performs almost as well as yield.

A third possibility is that investors become enthused about companies with good prospects and bid the prices up to unrealistic levels, so growth stocks sell at a premium to fundamental value. Arnott, Li, and Sherrerd (2009) provided evidence for this in a study entitled Clairvoyant Value and the Value Effect. They analyzed the constituents of the S&P 500 in the mid-1950s, comparing the stock prices at the time with what they termed "clairvoyance value." This was the price investors should have paid if they had then had perfect foresight about all future dividends and distributions.

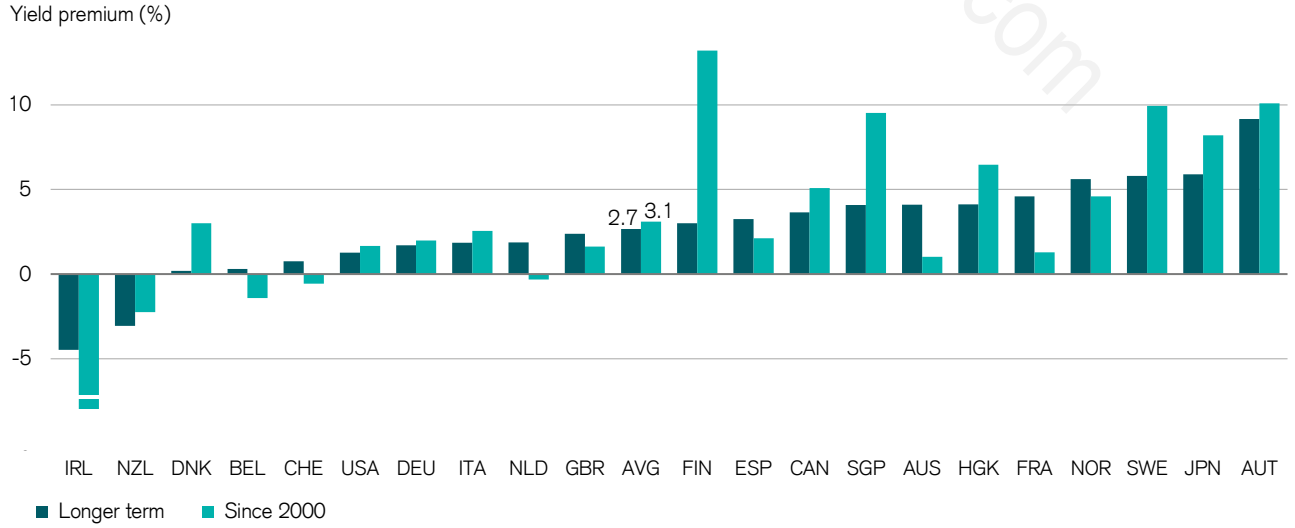
Arnott et. al. classified growth stocks as those selling at a premium, i.e. on a lower dividend yield or at a higher ratio of price-to-earnings, price-to-book or price-to-sales. They found that the market had correctly identified the growth stocks, in that they did indeed exhibit superior future growth. However, they concluded that investors had overpaid for this growth by up to twice as much as was subsequently justified by the actual distributions to shareholders.

The final possibility is that the outperformance of value stocks is a reward for risk. This could explain Arnott's findings if the discount rates used to compute "clairvoyance value" had failed to cater adequately for risk differences. However, many investors believe the opposite, namely that high-yielders are less risky. Perhaps this reflects the view that a bird in the hand (a dividend banked) is more secure than two in the bush (future returns). If so, this reflects confusion. If investors wish to maintain their desired weighting in stocks, they must reinvest their dividend income, which then re-exposes them to equity risk. While cash is safer than stocks, investors should have factored this in when establishing their desired exposure to equities.

Investors may also perceive high-yielding stocks to be lower risk because of sector membership. Utilities tend to have higher yields and are typically of lower risk. However, investors may well once have thought the same about bank shares. Furthermore, many high-yielding stocks are "involuntary" high-yielders. They have acquired their high yield because their stock price has fallen. They may be struggling or distressed and their forward-looking prospects for generating dividends may be far from assured.

In the 2011 Yearbook, we examined the risks from investing in higher-, lower-, and zero-yielders, and an index investment in each of the 21 countries covered in **Figure 55**. We found that higher-yield strategies were less volatile

Figure 55: The yield effect around the world, 1975–2021, % per year



Sources: Elroy Dimson, Paul Marsh and Mike Staunton, computed from data provided by Professor Kenneth French, Tuck School of Business, Dartmouth (website).
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than lower- and zero-yield portfolios. In addition, the average standard deviation of returns from investing in high-yielders was only marginally above that from an index fund, despite the latter being far more diversified. We also looked at beta, which measures systematic risk, or the contribution to the risk of a diversified portfolio. We found that the higher-yield strategy had a lower average beta (0.89) than the beta of the market (1.0) and the beta of the lower- and zero-yield strategies.

Finally, we examined the historical Sharpe, or reward to variability, ratios. The Sharpe ratio of the higher-yield strategy was 0.42, almost twice that of the lower-yield and almost triple that of the zero-yield strategies. It was also appreciably higher than the average Sharpe ratio from investing in the country index funds. It is hard to explain the superior performance of higher-yielders in terms of risk, when, on conventional measures, they have lower volatility and betas.

Momentum

In well-functioning markets, it should not be possible to earn consistently superior returns from the naïve strategy of buying past winners and selling losers. Yet there is extensive evidence across time and markets that momentum profits have been large and pervasive. The evidence is so strong that Fama and French, the world's leading experts on stock returns, describe momentum as the "premier anomaly" – a generous tribute as they were not its discoverers.

From the earliest days of research into market efficiency, it appeared that stock returns were not reliably persistent, at least over short horizons. However, in the late 1980s, Conrad and Kaul (1988) and Lo and MacKinlay (1988) reported trends in weekly stock returns that persist for short intervals, although they were hard to exploit. Then, in a seminal study of US stock returns over 1965–89, Jegadeesh and Titman (1993) found that, over an intermediate time horizon, past winners tend to achieve superior performance and past losers suffer inferior performance.

While the short-term returns of individual stocks were unpredictable, returns on momentum portfolios over an intermediate horizon (say up to 12 months) were persistent and of a magnitude that appeared to exceed transaction costs. A strategy of buying stocks that did well over the prior year (winners) and selling those that did poorly (losers) typically generated monthly profits of around 1%. These profits were significant within small, medium and large firms, and across beta-based sub-samples, and were attainable because performance was attributable mainly to the long, rather than the short side of the portfolio.

Jegadeesh and Titman's work sparked off numerous other studies. Rouwenhorst (1998), Chui, Titman, and Wei (2003, 2011), and Griffin, Ji, and Martin (2003) examined non-US markets over 1975–97 and in 40 international markets over intervals ending in 2000, with effects that were more pronounced in developed than in emerging markets. There are also holdout-period tests that follow the original research period, such as Jegadeesh and Titman (2001).

Studies of momentum, including our own work (Dimson, Marsh and Staunton, 2008), use Jegadeesh and Titman's (1993) methodology. This involves ranking stocks based on their past returns over (say) the most recent three, six or 12 months. Top-performing stocks are assigned to a "winner" portfolio and the bottom performers to a "loser" portfolio. Researchers such as Jegadeesh and Titman (1993), Griffin, Ji, and Martin (2003) and Carhart (1997) use different definitions of winners and losers; typically, they are taken to be the top and bottom 10%, 20% or 30% of stocks.

The investing strategy is self-financing. It involves buying the winner portfolio and short-selling the loser portfolio. The position is retained for (say) 1, 3, 6, or 12 months. To allow time for implementation, and to avoid contamination from bid-ask bounce and any short-term reversal effects, there is usually a waiting period between the ranking and holding periods. In standard notation, R/W/H denotes a momentum strategy with a ranking period of R months, a wait period (if any) of W months and an H-month holding period.

Thus a 6/1/6 strategy involves ranking stocks by their returns over the past six months, waiting for one month and then buying the winners and short-selling the losers over the next six months. The strategy then repeats for a further six months and so on. The strategies most frequently used are 6/1/6 and 12/1/1, although many studies consider a range of alternatives.

To judge the performance of momentum strategies, researchers compute winner-minus-loser (WML) portfolio returns. Typically, the winner and loser portfolio returns are an equal-weighted average of the returns on portfolio constituents. As this can give excessive influence to micro-sized stocks, many studies screen these out, or else use capitalization weighting. Researchers calculate WML returns as either the arithmetic or the geometric difference between winner and loser returns. WML performance is therefore for a notional long-short portfolio.

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In the absence of a momentum effect, WML should generate a cumulative return of zero (before transaction costs). That is not what has happened, however, as can be seen in the left-hand chart in **Figure 56**. There is a very large difference in cumulative performance from winner stocks compared to loser stocks. Following a 6/1/6 momentum strategy, an investment in US loser stocks would have appreciated from one dollar in 1926 to USD 5,398 as at the start of 2022 – a nominal return of 9.4% per year.

In contrast, an equal initial investment over the same period, but allocated to winner stocks, would have grown to USD 4.9 million. This is an annualized return of 17.5%. The winner portfolio would have been worth 904 times as much as the loser portfolio, equivalent to 7.4% per year.

Profits like this are surprising because investors might be expected to compete to benefit from the WML premium. It would not be necessary for them to run long-short portfolios to profit from an apparent arbitrage opportunity. It would only be necessary for investors to recognize this pattern among stock prices. Then potential buyers would seek exposure to winners and they would be willing to pay a little more to acquire these stocks – and, in so doing, the winners' over-performance would be reduced. Similarly, potential sellers of a security ought to appreciate that they should hasten to sell stocks that are drifting down – which would depress the transaction price for these securities to the point at which the losers' underperformance would be curtailed.

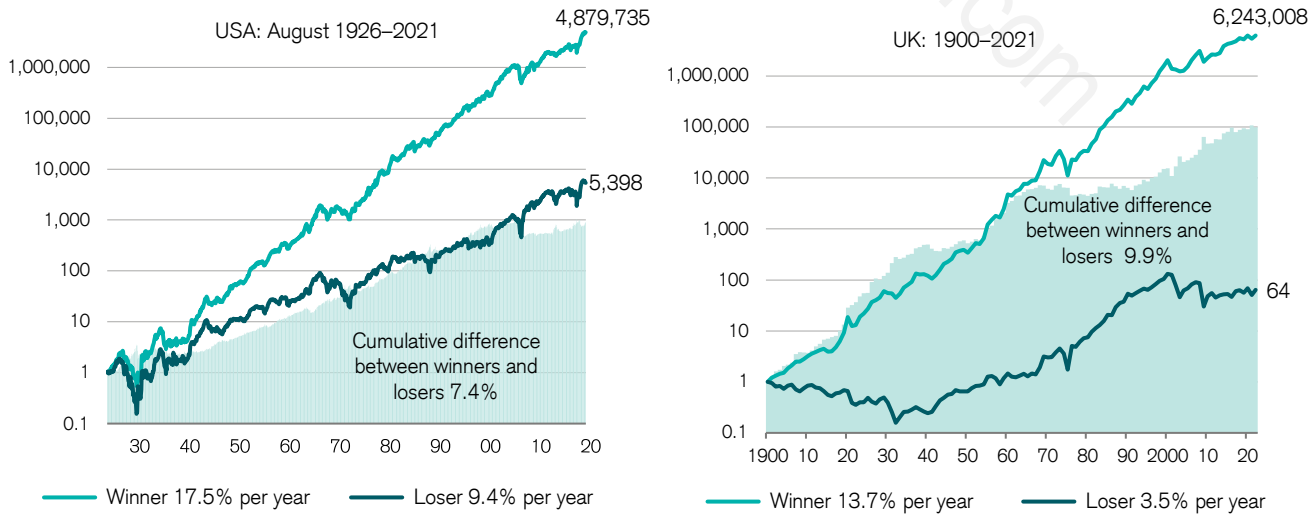
There are always buyers and sellers for every stock that is traded in the WML portfolio. The mystery is the price at which stocks change hands. Relative strength is not new; it was researched over half a century ago by Alexander (1961) and by Levy (1967a,b), who published in Journal of Finance and Financial Analysts Journal. It was not costly to exploit. It did not require creation of a market-neutral fund. For the momentum effect to be arbitraged away, all that is required is use by regular market participants, i.e. for buyers and sellers to pay cognizance to relative strength. Moreover, if the strategy was obvious only with hindsight, once it was endorsed by Jegadeesh and Titman, this regularity should have disappeared. Yet, as we will see, momentum has worked out of sample as well as in the earlier dataset.

Robustness

To investigate the robustness of the momentum effect, we can limit the strategy to relatively liquid stocks (the largest 100 companies) and can study a market (the UK) and sample period (122 years) that had not previously been investigated by other researchers. We do this in the right-hand chart of **Figure 56**, which shows that, for a universe of the Top 100 stocks as at the start of each year, from 1900 to 2021, winners outperformed losers by 9.9% per year.

The right-hand chart of **Figure 56** is based on a momentum strategy that replicates the most-cited US literature. For the period 1955–2021, we have a complete dataset and we find that the WML premium is even larger if (a) the strategy covers the full market and not just the Top 100, (b) portfolios are equally weighted (rather than value-weighted as in the chart), (c) the winner/loser break-points are the top and bottom 10% of stocks (rather than 20% as in the chart), and (d) the holding period is six months (rather than 12 months as in the chart).

Figure 56: Long-run cumulative returns from momentum strategies in the USA and UK



Sources: Elroy Dimson, Paul Marsh and Mike Staunton; US data is from Griffin, Ji and Martin (2003) to end-2000 updated to end-2021 by Elroy Dimson, Paul Marsh and Mike Staunton based on a 6/1/6 strategy; UK data is from Elroy Dimson, Paul Marsh, and Mike Staunton for a 12/1/1 strategy for the Top 100 UK stocks, using the London Share Price Database. Not to be reproduced without express written permission from the authors.

There are two significant caveats about momentum strategies. First, they are potentially costly to implement as turnover levels are high, especially for strategies that require frequent rebalancing. However, although transaction costs eat into the profits from momentum trading, they by no means eliminate them. The impact of costs on the Top 100, 12/1/1 strategy represented in the right-hand chart of **Figure 56** is discussed in Dimson, Marsh, and Staunton (2008).

The experience of 2009 underlines our second caveat. The returns from a WML strategy are volatile, with the occasional very bad year when markets sharply reverse direction, as in 2009. The dip in the WML series for 2009 shown in the right-hand chart of **Figure 56** represents an annual loss from the WML strategy of 25.4%.

Looking back in time, investors would have been similarly whiplashed at the turning points in 1975, 2000 and 2003, when annual losses of similar magnitude occurred. These were all strong years for long-only equity performance. The relative performance of a pure momentum manager would thus have looked extremely poor and severely tried the patience even of long-term investors.

Furthermore, although the losses during 2009 from the capitalization-weighted Top 100, 12/1/1 strategy were large at –25%, they were even larger for strategies that admitted more volatile stocks and/or used equal weighting. In the UK, the losses in 2009 from an equally weighted 6/1/6 strategy spanning the entire market were –46%, while, in the USA, the corresponding loss was –53% (see the left-hand chart of **Figure 56**).

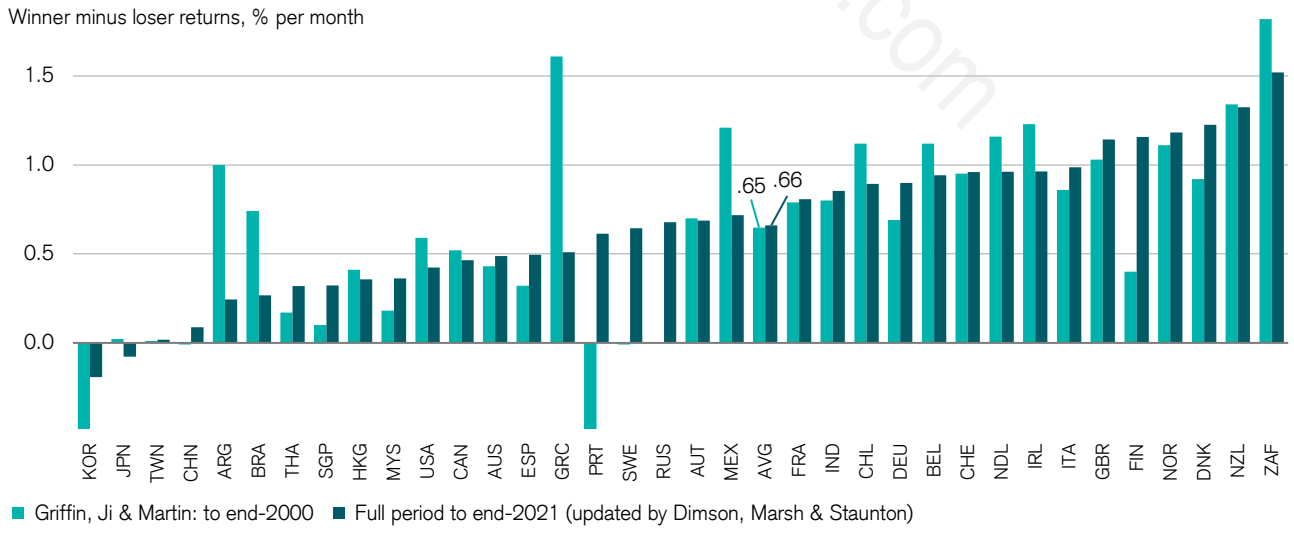
In **Figure 57**, we ask whether the momentum effect occurs in other markets around the world, drawing on an average of 38 years of evidence for the DMS 35 countries. We extend the study by Griffin, Ji, and Martin (2003), who examine momentum investing in many countries, and who generously provided us with their dataset. They study markets over intervals that start in 1926 (the USA), 1975 (ten larger developed markets), the mid-1980s (five additional markets), with all the other countries starting in the late 1980 or early 1990s.

For the DMS 35 countries, we update and extend Griffin, Ji, and Martin's research, and incorporate Russia, which was not covered in their study. We use their WML (winner minus loser) estimates up to end-2000. Thereafter, up to end-2021, we compute our own estimates using their methodology. This involves following a 6/1/6 strategy, with a monthly rolling window and equal weighting, using 20/80 breakpoints.

Figure 57 shows that, over the period to the end of 2000, Griffin, Ji, and Martin found that the monthly WML return was positive and quite large for all countries except China, Japan, Portugal, Sweden and South Korea, where, except for Portugal and South Korea, it was close to zero. The momentum premium was substantial over this period, averaging 0.65% per month for the 34 countries in the chart that were covered by their study (see bar labeled AVG).

After 2000, we find that momentum investing was profitable in 32 of the 35 markets, the important exceptions being Japan and the USA. Unusually for a "holdout" period, we find that, for the 34 markets shown in **Figure 57** that were covered in Griffin, Ji and Martin's original research, the average WML in the 21-year period

Figure 57: Returns from a 6/1/6 momentum strategy in 23 countries, 1975–2021, % per month



Sources: Elroy Dimson, Paul Marsh and Mike Staunton; Griffin, Ji and Martin (2003) WML returns to 2000; Dimson, Marsh, and Staunton (2008) WML returns after 2000. All WML returns are 6/1/6 with 20% and 80% breakpoints. Not to be reproduced without express written permission from the authors.

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following their study was in fact slightly larger than over their research period, namely 0.68% per month.

The darker bars in **Figure 57** show each country's WML returns over the entire period to date. The chart shows that the average WML return over this full period was 0.66% per month, whether each country is given equal weight or instead weighted by the number of observations for each country. This figure is just above the (weighted) average WML of 0.65% for the original research period. Notwithstanding the 2009 setback, and although it can be costly, momentum trading has generated a disturbingly large abnormal return.

Of the countries covered in **Figure 57,** 13 are emerging markets and 22 are developed markets. The momentum effect, while still present, is somewhat lower within emerging markets, which have an average WML of 0.48 compared with 0.77 in developed markets. Curiously, the four markets where momentum has failed to work – where the average WML has been negative and/or close to zero – are clustered in East Asia; namely, China, Japan, South Korea and Taiwan (Chinese Taipei).

Risk

From the earliest empirical studies of risk and return, it was apparent that the return from low-beta securities was higher than the classic Capital Asset Pricing Model (CAPM) implied and that the return from high-beta securities was not as high as the CAPM predicted. The observation made by Black, Jensen, and Scholes (BJS) (1972) was that the Security Market Line – the link between return and beta – was "too flat," which suggested potential for outperformance.

The BJS finding indicated that investors who could borrow at the risk-free rate would have a higher expected return if they bought a levered low-beta portfolio than if they purchased a higher-risk portfolio. Is that apparent expected return achievable? That is, can investors borrow at the risk-free rate? The answer is simple. All investors whose asset mix includes risk-free government bills or short-term bonds can "borrow" by reducing their holding of government securities. There are many such investors. Simply by amending their asset mix, they could in effect be borrowing at the same rate as the government. The BJS finding was one of the earliest reported stock market anomalies.

The beta anomaly has been persistent. Frazzini and Pedersen (2014) estimate a betting-against-beta (BAB) factor that involves taking a long position in a portfolio of low-beta assets leveraged to a beta of one, plus a short portfolio of high-beta assets unleveraged to a beta of one. They find empirical support for the profitability of a BAB strategy in the USA and other countries. Asness, Frazzini, and Pedersen (2014) dig further into this relationship.

Low volatility

Even more remarkable is the low-volatility anomaly. In old studies, Friend and Blume (1970) reported a significant inverse relation during the 1960s between volatility and return, and Haugen and Heins (1975) found that US returns starting in 1926 were higher for low-volatility stocks. Subsequent US studies such as Ang, Hodrick, Xing and Zhang (2006, 2009) revealed severe underperformance from stocks with high residual risk. The left-hand chart of **Figure 58** plots cumulative US returns provided by Ken French for portfolios ranked by the residual variance from the Fama-French three-factor model. The 20% of stocks with the highest residual risk underperformed dramatically.

The right-hand chart plots cumulative UK returns computed by us for portfolios ranked by the residual variance from the single-factor model. The sample comprises all companies listed on the London Stock Exchange. As in the US research, risk is estimated over the preceding three months of daily returns. UK stocks are assigned to the lowest 30%, middle 40%, and top 30% of residual risk. As in the French Data Library, portfolios are rebalanced monthly and returns are value-weighted. The chart starts in 1984 because that is the start-year for the daily version of the London Share Price Database (LSPD).

Both the US and UK studies broadly follow the methodology of Ang, Hodrick, Xing, and Zhang (2006, 2009) in that they are based on short-term estimates of residual risk. For the USA, French uses approximately three months (60 trading days) of data; for the UK, we use exactly three months of daily data. In both countries, the strategy reveals substantial underperformance by high-risk stocks. The gap compared to less risky stocks expands over most of the sample period, with one exception. High-risk stocks partially closed the gap toward the end of the 1990s. Then the tech-boom burst in 2000 and the value of high-risk portfolios collapsed. High-volatility stocks suffered again in the late 2000s in the face of the financial crisis.

The results reported here for the USA and UK are confirmed in other countries. The findings of Ang et al. (2006, 2009) have been subject to a comprehensive set of tests, many of them summarized and critiqued in a paper by Hou and Loh (2016). The Ang et al. results appear to hold up well in a range of markets, although there is little agreement on the causes of this anomaly.

However, volatile stocks tend to have a relatively low market capitalization. This presents a challenge in that a long-short strategy aiming to take advantage of the underperformance of risky stocks would be shorting the highest-risk companies. For the USA and UK, low risk companies represent an average 44% and 56% of the value of the equity market, respectively, whereas high-risk companies represent an average of just 7% and 8%, respectively. Bali and Cakici (2008) argue that the significant negative relation reported by Ang et al. (2006) is driven by small caps, which, if omitted, cause the results to become statistically insignificant. Fu (2009) draws similar conclusions.

Furthermore, short-term risk measures are estimated with considerable error and the true underlying risk of a stock is not only unobservable, but must also be time-varying. Consequently, portfolio turnover for these risk-based strategies can be high. Meanwhile, the cost of transacting small-cap securities is large. Just as for many momentum strategies, the Ang et al. strategy may be impractical for many long-term investors.

A practitioner perspective

For this reason, practitioner-researchers such as Blitz and van Vliet (2015) have investigated using longer-term risk measures and running lower-turnover portfolios. They report several studies, many by them and their colleagues, that demonstrate superiority from low-volatility investing compared with higher-risk strategies and they use risk measures estimated over periods of several years. Others have expressed notes of caution, however. For example, Li, Sullivan, and Garcia-Feijóo (2014) examined long-short strategies using 36-month and 60-month estimation windows, finding that excess returns accrued largely in the first month after portfolio formation. They also found that profits mostly disappeared when low-priced stocks (less than USD 5) were omitted from the investment universe.

For a longer-term perspective, we replicated the UK study reported above, replacing short-term risk measures with estimates based on 60 months as published since 1979 in the LBS Risk Measurement Service (Dimson and Marsh (2022)) and following the same estimation procedure for the prior period 1955–1978. We use the same 30:40:30 split of stocks, with percentiles based on the number of companies and weight portfolio returns by market capitalization.

We report in Dimson, Marsh, and Staunton (2017) that, until the tech bubble burst in 2000, all three risk-based portfolios performed similarly. The fallout after the end of the tech bubble is obvious, with high-risk stocks performing dismally. However, since the trough in 2003, high-risk stocks have outperformed. Thus, although low-risk stocks beat high-risk stocks over the full period, their outperformance was entirely attributable to the bursting of the tech bubble. This hardly forms the basis of a reliable long-run strategy based on residual risk estimated over longer 60-month rather than shorter 60-day periods.

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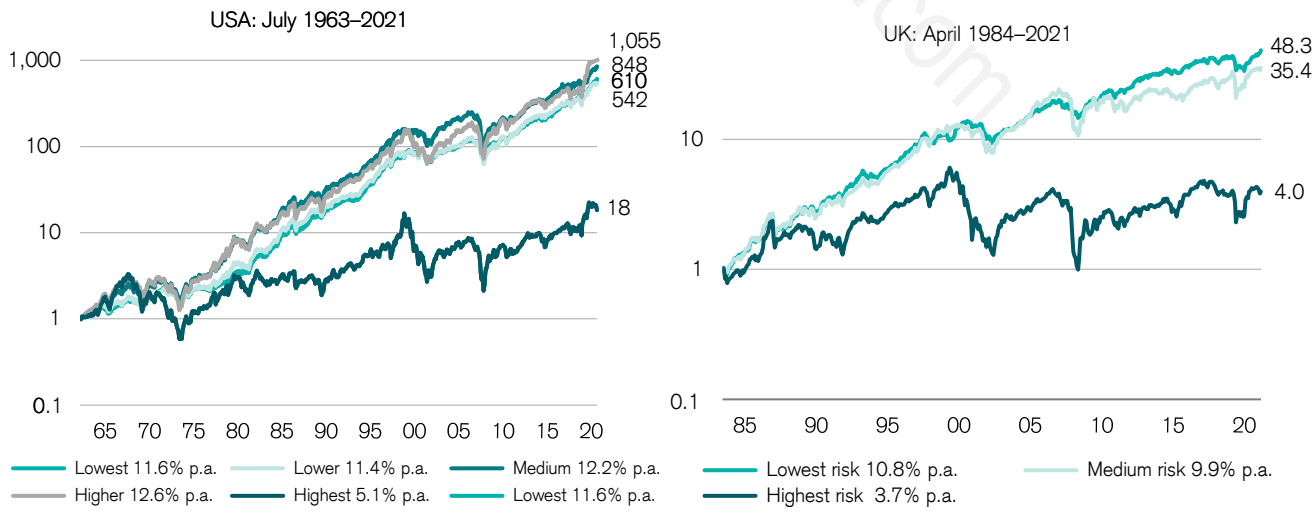
Figure 58: Long-run cumulative returns from stocks ranked by short-term residual risk in the USA and UK



Sources: Elroy Dimson, Paul Marsh and Mike Staunton; US data is from Professor Kenneth French, Tuck School of Business, Dartmouth (website); UK analysis is by Elroy Dimson, Paul Marsh, and Mike Staunton using the London Share Price Database. Not to be reproduced without express written permission from the authors.

Multi-factor models

The evidence we have shown so far has been on a univariate basis, looking at factors one by one. It is also important to look at the behavior of factors when they are combined in multi-factor models. It may be the case, for example, that variables that seem important when viewed alone diminish in importance in a multi-factor model. This may be because they are dominated or explained by other factors and interactions.

In this section, we look at the long-run evidence from the two best-known multi-factor models, the Fama-French 3-factor and 5-factor models. The latter involves looking at the quality factor, where Fama and French introduce two new factors: profitability and investment.

The Fama-French 3-factor model

The Fama-French 3-factor model (1993) expands the traditional Capital Asset Pricing Model with its single market factor by adding two additional variables for the size and value/growth effects. The size variable is based on market capitalization and is known as SMB (**S**mall **M**inus **B**ig). The value/growth variable is based on the book-to-market ratio and is referred to as HML (**H**igh book-to-market **M**inus **L**ow book-to-market).

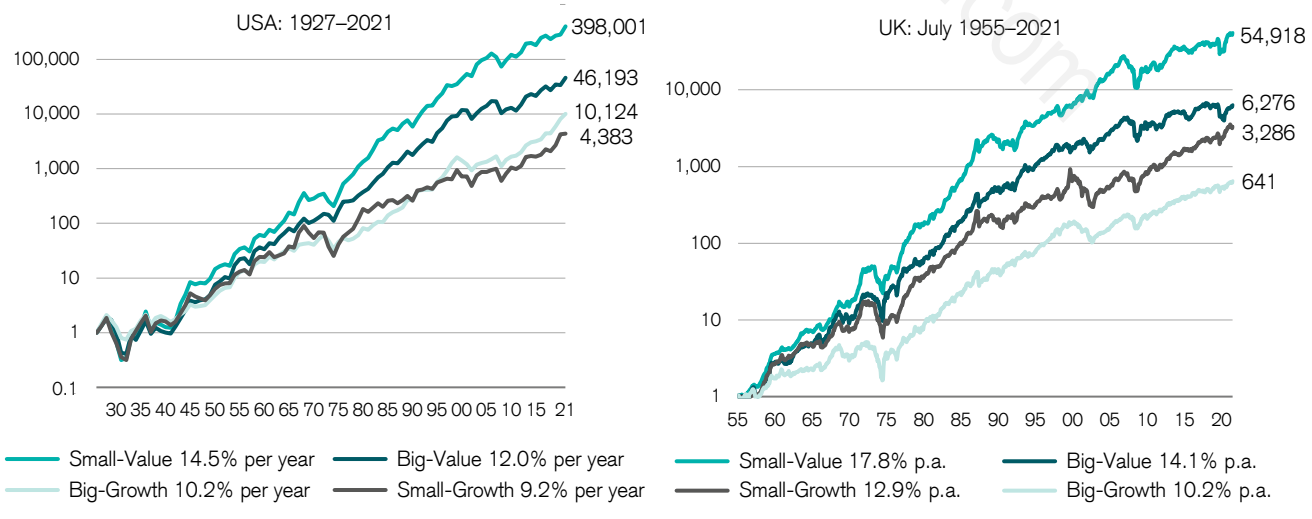
The Fama-French research procedure involves identifying value stocks as those that are among the top 30% of book-to-market ratios, and growth stocks as the 30% with the lowest book-to-market. The 40% "in-between" forms a third group. They also classify those stocks that are in the top 50% by market capitalization as big and the other 50% as small. Based on these two independent rankings, Fama-French intersect these groups to create six portfolios with a value, intermediate or growth orientation and with a large or small company size. Returns for these six portfolios are computed on a capitalization-weighted basis. SMB is the average of the small growth, intermediate and value portfolio returns minus the average of the large growth, intermediate and value portfolio returns. HML is the average of the large and small value portfolio returns minus the average of the large and small growth portfolio returns.

There is evidence in the USA and the UK that the value premium is more substantial among small than large companies. We show this by looking at the long-term performance in the USA of the four Fama-French portfolios that are of most interest: small value, large value, small growth and large growth. The left-hand chart of **Figure 59** shows that, in the USA small cap has been superior as has value, while big companies have disappointed as have growth stocks.

Figure 59 shows that, over the long-run, US growth stocks generated an annualized return of 9.2% and 10.2% per year for smaller and larger companies, respectively. These returns are fairly close: the size tilt of the indexes has only a slight impact. Compared to growth stocks, value stocks have done better, with big value companies having an annualized return of 12.0% and small value stocks having a return that is 2.5 percentage points higher still at 14.5% per year.

The right-hand chart of **Figure 59** reports the performance of four UK equity portfolios classified by whether they have a small or big market capitalization and whether they are classified as value or growth. The methodology is virtually identical to the Fama-French

Figure 59: Long-run cumulative performance from size and book-to-market portfolios in the USA and UK



Sources: Elroy Dimson, Paul Marsh and Mike Staunton; US data is from Professor Kenneth French, Tuck School of Business, Dartmouth (website); UK data is from Dimson, Nagel and Quigley, 2003, updated since then by Elroy Dimson, Paul Marsh, and Mike Staunton using the London Share Price Database. Not to be reproduced without express written permission from the authors.

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approach and is explained in Dimson, Nagel, and Quigley (2003). The main difference is that small stocks are defined as the smallest 70% of stocks, while big stocks are the 30% largest. Fama and French use a 50:50 split.

The top line in **Figure 59** confirms that, as in the USA, small-value stocks excelled over the long term. The chart shows that an end-June 1955 investment of one pound in small-value companies, with income reinvested, would have been worth GBP 54,918 by the end of 2021, equating to annualized performance of 17.8%.

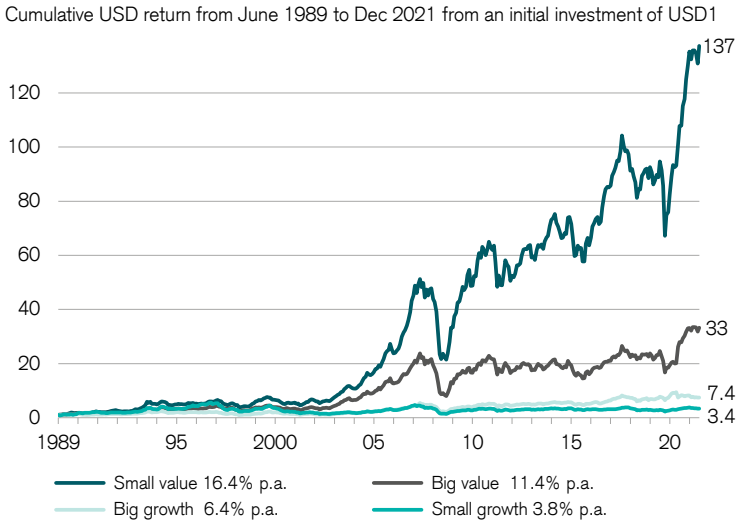
Over the long interval depicted in the chart, value stocks did better than growth stocks. Consequently, after small-value stocks, big-value stocks were the next best performers. However, after 66.5 years, an investment in these stocks had grown in value to less than one-eighth of the small-value portfolio.

While growth stocks have done well in recent years, from 2007 until the second half of 2020, they have been a long-term disappointment, whether the companies were small or big. An investment of one pound in small-growth companies was worth GBP 3,286 after 66.5 years – far beneath the GBP 54,918 of a similar investment in small-value companies. Yet, over the long run, big-growth companies were the most disappointing of all. With income reinvested, an investment in big-growth had appreciated to a final value of 1.2% of the final value of the small-value portfolio.

Figure 59 shows size-value portfolios for two large developed markets. Interestingly, precisely the same pattern of returns is found within emerging markets as **Figure 60** shows. This is plotted from data provided on Professor Ken French's data website. The chart shows the cumulative returns on the four portfolios from June 1989 to end-2021. Just as for the USA and UK, the chart shows that small-value stocks performed best, followed by large-value stocks. The two growth portfolios underperformed the two value portfolios. The annualized returns on the four portfolios are shown in the legend.

While the pattern of returns for EMs was the same as for the USA and UK, the magnitudes differed, with EMs giving more extreme returns over the same time period. In particular, the value effect within EMs over this period was stronger.

Figure 60: Performance of EM value and size portfolios



Source: Data from Professor Kenneth French, Tuck School of Business, Dartmouth (website).
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Quality: The Fama-French 5-factor model

Quality investing has a long history, but its popularity as an investment factor is due to the research of Novy-Marx (2013). This showed that quality, as measured by gross profitability, did as good a job at predicting future returns as conventional factors like value/book-to-market. Influenced by this, Fama and French (2015) developed a five-factor model for asset pricing. This added two quality factors, profitability and investment, to their original 3-factor model that was based on a market factor, SMB and HML.

Fama and French refer to their profitability variable as RMW, the difference between the returns on portfolios of **R**obust firms (i.e. the most profitable firms) **M**inus **W**eak firms (i.e. the least profitable firms). They refer to their investment factor as CMA, which is the difference between the returns from firms whose investment is most **C**onservative **M**inus those whose investment is most **A**ggressive. The sense in which these are quality variables is that investing in the RMW factor involves going long in profitable firms and shorting weak firms, while the CMA factor entails going long in firms that invest conservatively and shorting those that tend to over-invest.

Fama and French find that their 5-factor model performs better than their 3-factor model. Their average values for the five factors are plotted in **Figure 61** (overleaf). In this chart, the vertical axis measures the average difference in monthly percentage return between two groups of assets. One group is more exposed to a rewarded attribute, the other is less exposed. For example, the market factor is defined as the difference between the equity market return (Mkt) and the risk-free return (RF). The very first bar in the left-hand panel of **Figure 61** shows that the US equity market return exceeded the Treasury bill return by an average of almost 0.6% per month.

Figure 61 has four panels. The first shows 57 years of data for the USA (the longest period available). The Fama-French data for DMs starts in July 1990, while their EM data starts

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in July 1989. The remaining three panels therefore show average factor returns for the USA, DMs and EMs over a comparable period from the 1990s to the end of 2021.

Figure 61 shows that the market factor (Mkt–RF) is large across all four panels. In the USA over the last 57 years (first panel), the other four factors had similar magnitudes, with size (SMB) having the smallest impact. However, Fama and French (2015) point out that, over this period in the USA, value (HML) is a somewhat redundant factor as its high average return is fully captured by its exposures to the other four factors. Their tests suggest a four-factor model that dropped HML would perform as well as their 5-factor model. They argue, however, that to fully capture tilts to size, value, profitability and investment, their 5-factor model should be the first choice.

The second panel of the chart shows that, since the 1990s, the magnitude of the size (SMB) and value (HML) factors is much lower in the USA than over the longer period covered in the first panel. Both factors, especially value, are now small and dominated by the two quality variables. Within DMs (third panel), the size factor barely matters, but the value factor is larger than in the USA. Within EMs (fourth panel), the size factor is larger, but the most striking feature is the dominance of the value factor, which is much larger than in the USA or DMs. While EMs are often viewed as growth markets, EM value stocks have greatly outperformed EM growth stocks.

The two quality factors (the rightmost two bars in each of the three panels) show positive premiums across all markets. However, the profitability factor is much lower within EMs, averaging just 0.21% per month versus 0.37% for both DMs and the USA. In contrast, the investment factor is somewhat higher for EMs at 0.26% per month, versus 0.19% for DMs and 0.17% in the USA.

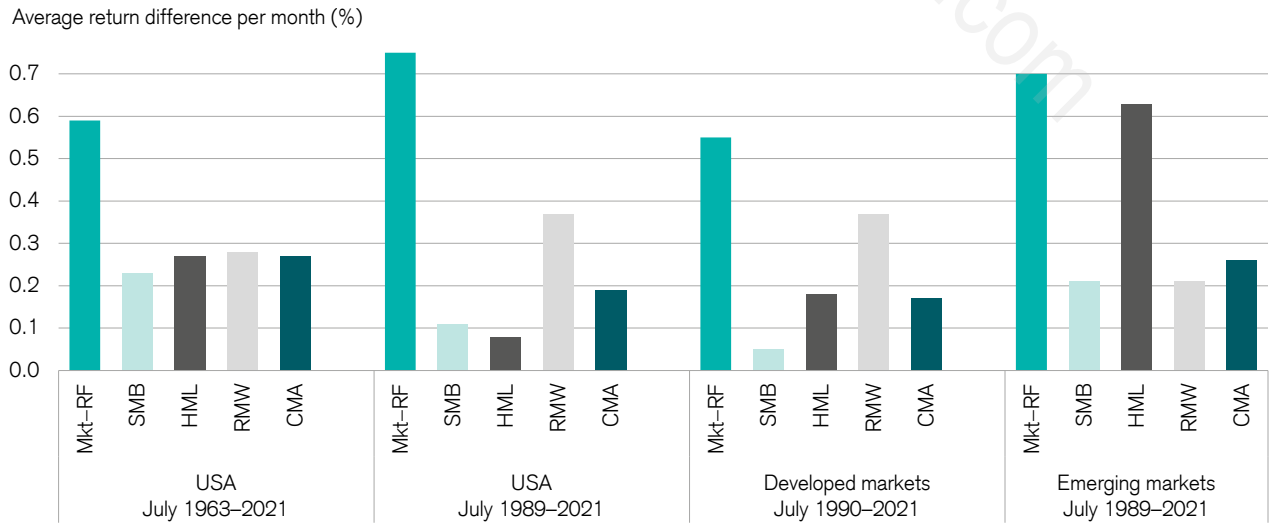
The value of looking at multi-factor models like the Fama-French 5-factor model is that they can reveal that factors which seemed important in a univariate setting can become less important or even redundant as their impact can be dominated by other variables and interactions.

Summary

We have traced the size effect since discovery and presented long-run evidence across multiple markets. We have seen that over the long-run, companies selling at a low stock price relative to fundamentals – value stocks – have beaten stocks selling at a low stock price relative to fundamentals – growth stocks. We documented the performance of high- and low-yielding stocks, and then reviewed momentum and low-risk strategies. Finally, we looked at the impact of combining variables in multi-factor models, examining the Fama-French 3- and 5-factor models.

While the long-term pattern of factor outperformance persisted for some strategies, others have experienced surprise reversals in recent years. The biggest surprise has been the long period of underperformance from value investing from 2007 until 2020. We turn in the next chapter to looking at out-of-sample evidence, and at whether we can expect factor premiums to prevail in the future.

Figure 61: Fama-French 5-factor model for the USA, developed markets and emerging markets



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Chapter 7: Factor premiums

In Aesop's fable "The Hen and the Golden Eggs," a farmer had a hen that laid a golden egg every day. Thinking the hen must contain a lump of gold, he killed it, only to find it was no different from the other hens. He deprived himself of the gain he could have had day after day. For a long time, factor premiums have been the "golden egg" of investing. Seeking to harvest extra rewards, investors have searched for ever more factors. However, most were just an artefact of data mining. We focus on the premiums that have been persistent over time and across markets. As "factor effects," they matter and will continue to exist. But will they generate premiums in the future?

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Photo: Toronto, Canada; Getty Images, Istvan Kadar Photography

The attraction of factor investing

A number of factor-investing strategies have a record of attractive returns over the long term, as illustrated in Chapter 6. Perhaps reflecting this, the rates of adoption of factor investing have been impressive. This trend has been especially visible through the lens of exchange-traded funds (ETFs) and exchange-traded products (ETPs).

ETFs and ETPs have provided extensive opportunities for investors to select their preferred factor exposures. The consulting company ETFGI reported that, at the end of November 2021, there were 1,360 factor-based equity ETFs and ETPs, with 2,771 listings and assets of USD1.32 trillion from 200 providers listed on 47 exchanges in 37 countries. Factor-based assets under management had increased at a rate of 22.8% per annum over the previous five years.

What is the allure of factor-based asset management, often known as "smart beta"? There are at least three attractions, each of which has contributed to the use of the adjective "smart." First, active management has lost credibility in the eyes of some (though certainly not all) investors. Smart beta offers a credible alternative to the underperformance of the average active manager. Factor investing is often regarded as a compromise between active investing and passive management.

Second, competition between asset managers is now fierce and they face profound cost pressures. Factor investing is attractive because it can be less costly than traditional active asset management. The lower-cost factor solution can be used to lower an asset manager's cost base or to reduce fees and charges that are passed on to clients.

Third, and in our view most important, real interest rates have declined precipitously since the Global Financial Crisis. The real yield on a representative 10-year inflation-linked government bond has fallen since the Global Financial Crisis from a worldwide average of approximately 3% to a worldwide average of less than –1% (see **Figure 48** in Chapter 5). Many investors have looked toward factor investing in the hope that it provides an innovative means of producing incremental returns with a greater degree of certainty than traditional active management.

Popular factors

Smart-beta investing seeks to harvest the long-run factor premiums highlighted by academic researchers and reviewed in the previous chapter. Factors are the security-related characteristics that give rise to common patterns of return among subsets of listed securities. While industry and sector membership have long been a part of how we categorize investments, our focus here is on attributes that go beyond industry membership.

To identify factors, researchers typically construct long-short portfolios. These portfolios are long the preferred exposure and short the unwanted exposure. In the equity market, for example, an income factor portfolio would contain high-dividend-yield stocks accompanied by a short position in lower-yielding stocks. It is far easier to buy stocks you do not own than to sell stocks you do not own. So the long side of a factor portfolio is usually easy to acquire, whereas the short side can be challenging. Long-short strategies are therefore relatively expensive – on occasion impossible – to construct; they can certainly be difficult to scale up.

What are the smart-beta strategies that researchers have highlighted? As we saw in Chapter 6, Fama and French (1993, 2012, 2015a) identify four factors in addition to the market: size, value, profitability and investment; Black (1972) and Frazzini and Pedersen (2014) identify low risk; and Jegadeesh and Titman (1993) and Carhart (1997) identify momentum. Asness, Ilmanen, Israel and Moskowitz (2015) argue that there are four classic style premiums, namely value, momentum, income (or "carry") and low-volatility (or "defensive") investing. Ang, Hogan, and Shores (2018) focus on size, value, momentum, volatility, and profitability.

In all, researchers have identified at least 316 factors, of which Harvey, Liu and Zhu (2016) point out that nearly all are unlikely to be robust in independent testing. Novy-Marx and Velikov (2015) and Green, Hand and Zhang (2017) express complementary doubts about the prospective profits from exploiting factors that appear promising on an in-sample basis. Researchers such as Harvey and Liu (2019) have identified over 400 factors and other studies have detected even more. Most of them are doomed to be unsuccessful in terms of investment returns.

The problem of apparently significant in-sample results being non-robust in out-of-sample tests is not new. It was discussed more than 30 years ago; see, for example, Dimson and Marsh (1990) and Markowitz and Xu (1994). There is no substitute for genuine out-of-sample testing. Yet, as Harvey (2017) observes, it is impractical to wait for additional data in order to test a model's out-of-sample reliability – not to mention the understandable impatience of practitioners.

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Fool's gold

Steve Johnson, writing in the Financial Times in 2020, observed: "The trials and tribulations of so-called 'smart beta' investing read almost like a biblical parable. Green-eyed stock market investors sit and watch as portfolios skewed towards certain factors — such as value, dividend generation, momentum, small size and low volatility — consistently outperform the market. These avaricious investors then pile into such smart beta products in the hope of grabbing their share of the outsize returns, only for the factors' magic to dissipate in front of their eyes, leaving them holding only a handful of fool's gold."

We believe that it is important to seek premiums supported by robust evidence, across countries and over time. Since any one factor may be relatively uncorrelated with another, unrelated factor, there is a clear solution: diversify, i.e. spread assets across a variety of factors. If one of the factor exposures performs dismally, not all of them (hopefully) will have moved in unison.

Multifactor funds were created to do just this – to provide broad exposure to a number of factors. They aimed to provide a smoother performance record, rather than heavily backing a particular strategy that, despite looking successful in one period, ran the risk of going into reverse after that. As long as factors tend to be rewarded, a multifactor investor should be able to reap a risk premium with greater reliability.

Yet, during 2020, more multifactor funds closed than opened – a first since this category was initiated in 2003. This followed several years of disappointing performance and an especially difficult year in 2020. Performance in 2021 was better, thanks in part to the revival in value stocks. However, this does reinforce the point that multifactor funds and ETFs are not a guaranteed route to outperformance and that factors do not always generate premiums.

Unless they are convinced that a particular multi-factor fund meets their needs, investors need to make judgements for themselves. Whereas passive long-only investors can purchase units in an index fund that provides exposure to the total market at minimal cost, there is no equivalent solution for factor investors.

Long-term evidence

Investors need access to reliable data for different assets and countries and, especially, for different sample periods. That is the objective of the Global Investment Returns Yearbook. We aim to answer the question, "Does this pattern persist?" by looking back in time and across countries as well as reporting very recent evidence.

We present summary evidence below on the five initial factors discussed in the previous chapter. The factors tabulated in **Table 14** – size, value, income, momentum and volatility – are far from new phenomena. In fact, all five were described and documented more than three decades ago in the book "Stock Market Anomalies" (Dimson, 1988). Our table presents estimates of the long-run annualized premium for these five factors, drawing on research by us and others which is cited in Chapter 6 and in the References section.

Since they are among the longest-established and best-documented regularities in the stock market, we can study these effects on an out-of-sample basis. We can do this in four ways. First, we can study countries that have not previously been considered. This we have done in Chapter 6 and there is extensive literature compiling regularities in other capital markets.

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Table 14: Long-run cumulative performance of factor strategies in the USA, UK and worldwide, 1900–2021

	Historical premium (%) (number of years)		
Factor	**United States**	**United Kingdom**	**All countries**
Size: Small-cap versus large-cap	1.8 (96)	3.2 (67)	2.8 (43)
Value: High book-to-market versus low book-to-market	2.5 (95)	4.3 (67)	1.4 (38)
Income: High yield versus low yield	1.3 (95)	2.4 (122)	2.7 (50)
Momentum: Winners minus losers	7.4 (95)	9.9 (122)	8.3 (38)
Low volatility: Low volatility versus high volatility	6.2 (59)	6.9 (38)	n/a

Note: For "All countries", the number of years is the average number of years. Sources: Elroy Dimson, Paul Marsh and Mike Staunton, premiums computed from multiple sources as documented in Chapter 6. Not to be reproduced without express written permission from the authors.

Second, we can evaluate truly long-term data – which we have shared to some extent in Chapter 6 and which we will also examine further in this chapter.

Third, we can revisit earlier periods using novel data to see if factor returns pre-existed prior to their initial discovery period. An example was our 2008 study which found a strong momentum effect from 1900 to 1955 in a hand-collected UK database. More recently, Baltussen, Van Vliet and Van Vliet (2021) constructed a novel "pre-CRSP" US database for 1866–1926. They found a flat relation between market beta and returns, an insignificant size premium, and significant momentum, value and low-risk premiums that are of similar size to those over the post-1926 period.

Finally, we can look at data that has amassed more recently after evidence on previously unidentified factors was published.

Factor premiums: short-term and long-run

We start by looking at annual premiums over the recent past. After that, we will turn to factor premiums estimated over a longer run of history.

Annual premiums

The size effect was discovered by Banz in 1981; value was identified by Basu in 1977 and previously by Graham in 1949; dividend yield was investigated by Miller and Scholes in 1978; momentum was identified by Jegadeesh and Titman in 1993 and previously by Levy in 1967; and low-volatility investing was proposed by Black, Jensen, and Scholes in 1972, and previously by Friend and Blume in 1970. For these factors, therefore, recent years are obviously out-of-sample.

We start by looking at factor premiums since the onset of the Global Financial Crisis. **Figure 62** reports premiums since the beginning of the crisis for both the USA (in the upper panel) and the UK (lower panel). For each year, we estimate factor performance by geometric subtraction. For example, the income premium is equal to 1 + return on higher-yielding stocks, divided by 1 + return on lower-yielding stocks, minus 1. The breakpoints are described in Chapter 6.

Within each country, the premiums for an individual year are ranked from high to low. Factors are color-coded. Several features stand out. First, although these are labeled premiums, the annual "premiums" are frequently negative. Indeed, fewer than half of the annual figures shown in **Figure 62** were positive. At best, factor investing is a long-term strategy.

Second, over time, the ranking of the factors varies a great deal. Third, and relatedly, although the rankings within a year for the two countries are often similar, that is not always the case. For example, in 2021, momentum performed well in the USA, but was the worst performer in the UK. In 2019, size was the best-performing factor in the UK, but provided a negative premium of 5% in the USA.

Fourth, it is not obvious which factors are destined to do well. There can be a successful run of years, but it is hard to know if it will persist. Fifth, over the 14 post-crisis years, a pattern has emerged in which value investing

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Figure 62: Post-crisis equity factor premiums (%) in the USA and UK, by year 2008–2021

USA	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2008–21
Highest	Low vol 91.8	Size 28.6	Size 13.5	Low vol 37.1	Value 10.7	Value 5.4	Low vol 11.2	Mom 42.4	Value 16.8	Mom 6.1	Mom 13.4	Mom 8.9	Mom 3.4	Low vol 44.8	Low vol 6.5
	Income 17.2	Value –8.1	Mom 8.6	Income 29.5	Size 7.7	Size 5.4	Income 1.7	Low vol 13.8	Income 13.8	Low vol 6.0	Low vol 13.3	Low vol 4.7	Size –0.3	Mom 13.3	Size 1.0
	Mom –2.5	Income –17.0	Income 6.7	Mom 1.3	Mom –0.9	Mom 4.5	Value –2.3	Income 0.1	Size 9.7	Size –3.0	Income 2.9	Size –4.8	Income –24.8	Value 10.5	Mom –1.0
	Size –4.0	Low vol –33.2	Value –4.9	Size –3.5	Low vol –1.9	Income –8.3	Mom –5.3	Size –9.4	Low vol –3.4	Value –9.2	Size –8.3	Value –5.9	Low vol –27.6	Income 0.1	Income –1.9
Lowest	Value –5.5	Mom –50.7	Low vol –15.7	Value –13.6	Income –7.4	Low vol –9.2	Size –6.9	Value –11.7	Mom –22.1	Income –13.8	Value –14.1	Income –10.0	Value –28.3	Size –5.9	Value –5.8
GBR															
Highest	Low vol 127.0	Size 26.9	Size 13.8	Low vol 35.0	Size 18.3	Mom 32.4	Mom 7.8	Low vol 23.7	Value 20.2	Mom 11.0	Low vol 18.2	Size 6.6	Mom 18.7	Low vol 14.3	Mom 7.5
	Mom 78.8	Income 1.1	Value 3.2	Income 28.3	Value 14.8	Size 17.2	Income –1.3	Mom 20.1	Income 15.3	Size 6.2	Mom 6.6	Low vol 6.3	Size 7.3	Value 10.5	Low vol 5.3
	Income 15.7	Value –6.9	Mom 0.7	Mom 20.6	Mom –1.7	Low vol 11.5	Size –2.6	Size 12.4	Size –5.4	Value 3.3	Income –2.4	Mom –3.6	Low vol –1.7	Size 3.8	Size 4.5
	Value –11.8	Low vol –20.1	Income –13.7	Size –5.6	Income –8.1	Income 0.0	Low vol –6.2	Income –11.2	Mom –18.3	Income –0.6	Value –7.0	Value –7.7	Income –16.9	Income 3.3	Income –0.6
Lowest	Size –18.9	Mom –25.4	Low vol –22.9	Value –10.7	Low vol –15.7	Value 0.0	Value –10.0	Value –20.9	Low vol –21.2	Low vol –9.6	Size –7.4	Income –7.9	Value –21.4	Mom –8.7	Value –3.9

Sources: Elroy Dimson, Paul Marsh and Mike Staunton; premiums computed from multiple sources as documented in Chapter 6. Not to be reproduced without express written permission from the authors.

has performed poorly. In ten out of 28 country-years, value was the worst-performing factor.

Finally, we report the cumulative annualized performance of each factor in the right-hand column of **Figure 62**. Note that the 2008–21 ranking is highly sensitive to the period over which that summary statistic is estimated. For example, we see in the right-most column that the highest factor performance in the USA comes from low-volatility investing, and that low volatility is ranked second for the UK.

Yet the striking performance of low-volatility investing in both countries over the course of 2008–21 owes a great deal to just one year (2008). An interval of 14 years is simply too brief to underpin judgements about the longer-term premiums from a particular factor. Looking ahead, the worry is that a factor that has ranked high in performance in a particular year may remain high, may slip down to low, or may end up in the middle in the following year.

We noted above that fewer than half the annual premiums were positive, but commented that factor investing should be viewed as a long-run strategy. However, even over the 14-year period since the Global Financial Crisis, half of the annualized premiums shown in the final column of the table were negative. In both the USA and UK, the income and value factors were negative, with value performing especially poorly. In the USA, momentum had a negative 14-year premium, but was the best-performing factor in the UK.

Figure 62 shows that, since the Global Financial Crisis, the ranking of investment performance has not been stable. Earlier years (not shown here) behave in a similar way. Because of the inherent unpredictability of factor premiums, perceptive investors choose to diversify across risk exposures.

A frustrating feature of factor premiums is that they may simply be transient anomalies rather than structural regularities. If so, no sooner have they been identified than they may cease to work.

Longer-term premiums

Having looked at a sequence of individual years, a natural follow-up question is what the record looks like over lengthier periods. To respond, we consider all the factor premiums in our dataset. That means some factors have a longer history, others a shorter one.

We now examine how factor strategies performed in recent decades (after publication of the original research) and long ago (before extensive research databases were available). This is in the spirit of recent research on factor risk premiums.

Figure 63 presents decade-by-decade annualized factor risk premiums. We draw on the research described in Chapter 6 and calculate risk premiums by geometric subtraction as described in relation to the previous exhibit.

Note that the first "decade" depicted for each strategy may start late. For example, in **Figure 63**, the low-volatility series for the USA commences in July 1963. For that factor in the USA, the period

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Figure 63: Long-term equity factor premiums (%) in the USA and UK, by decade 1900–2021

	1900s	1910s	1920s	1930s	1940s	1950s	1960s	1970s	1980s	1990s	2000s	2010–21	All years
USA													
Highest			Momentum 20.6	Size 3.9	Value 9.7	Momentum 8.6	Momentum 10.6	Value 9.6	Low vol 16.4	Momentum 10.2	Low vol 12.7	Momentum 5.2	Momentum 7.4
			Value −1.2	Momentum 1.0	Momentum 7.2	Value 3.7	Value 3.9	Momentum 8.0	Momentum 14.9	Low vol 0.7	Size 10.8	Low vol 4.3	Low vol 6.2
			Income −7.2	Income −2.1	Income 5.9	Income 0.3	Size 3.2	Low vol 5.3	Value 4.8	Value −2.6	Value 7.0	Size −0.7	Value 2.5
			Size −12.5	Value −4.8	Size 5.1	Size −0.1	Income 1.6	Size 5.2	Income 4.5	Size −3.5	Income 6.3	Income −1.7	Size 1.8
Lowest							Low vol −5.0	Income 4.8	Size 0.2	Income −4.0	Momentum −1.9	Value −4.7	Income 1.3
GBR													
Highest	Momentum 14.1	Momentum 22.5	Momentum 17.2	Momentum 13.5	Income 4.4	Momentum 19.9	Value 9.5	Value 10.5	Value 6.2	Momentum 9.4	Low vol 18.5	Momentum 6.2	Momentum 9.9
	Income 3.4	Income 2.2	Income 5.7	Income −0.6	Momentum 0.6	Value 9.9	Momentum 6.6	Size 8.1	Income 4.1	Low vol 3.3	Momentum 11.9	Size 5.0	Low vol 6.9
						Size 6.7	Size 3.2	Income 5.5	Low vol 3.7	Value −0.9	Income 6.1	Low vol 1.1	Value 4.3
						Income 1.7	Income 1.3	Momentum −3.2	Momentum 3.7	Income −1.8	Size 3.5	Income −2.0	Size 3.2
Lowest									Size 1.6	Size −3.7	Value 3.4	Value −2.9	Income 2.4

Note: The period labeled the 2010s runs for eleven years to end-2020. Sources: Elroy Dimson, Paul Marsh and Mike Staunton, premiums computed from multiple sources as documented in Chapter 6. Not to be reproduced without express written permission from the authors.

labeled 1960s actually refers to an interval of 6½ years. Note also that the final "decade" runs from start-2010 to end-2021, an interval of 12 years.

Analogously to the previous chart, the column on the far right labeled "All years" presents premiums computed over the longest possible period. The period covered varies from 122 years for some series, down to 38 years for the UK daily stock market data that underpins the low-volatility series (see Chapter 6). In contrast to the chart on the facing page, the "All years" column in **Figure 63** compares premiums estimated over intervals of varying duration. The premiums are not fully comparable as some of them have a head start over others.

Key takeaways from **Figure 63** include the following. First, even over entire decades, premiums can be negative. This applies to nearly one fifth of the entries in **Figure 63**. Second, there are 22 country-decades in the chart (12 for the UK and ten for the USA) and, in 12 of those intervals, the momentum premium ranked top. Relatedly, there are ten country-decades for which we report premiums for all five factors and, in five of those intervals, the momentum premium ranked top.

Third, the five factor approaches can be ranked by the simplicity and low cost of each strategy. In normal times (when corporate dividend payouts are stable), maximizing dividend income is easiest and is not costly; next-easiest is holding small-capitalization companies; value strategies are somewhat more complex; low-volatility investing requires careful and more pricey rebalancing; and momentum trading is the most complex and expensive strategy of the five.

In the right-hand column of **Figure 63**, the more profitable factor strategies are listed at the top. They involve higher portfolio turnover, larger costs and greater skill. As with all index calculations, our computations ignore costs. Nonetheless, it is vital to note that factor strategies that appear more profitable are also more difficult and costly to implement.

There are evidently periods when factors deliver superior performance and periods when they do not. Historically, we can examine the duration of the periods over which longer-term premia were negative.

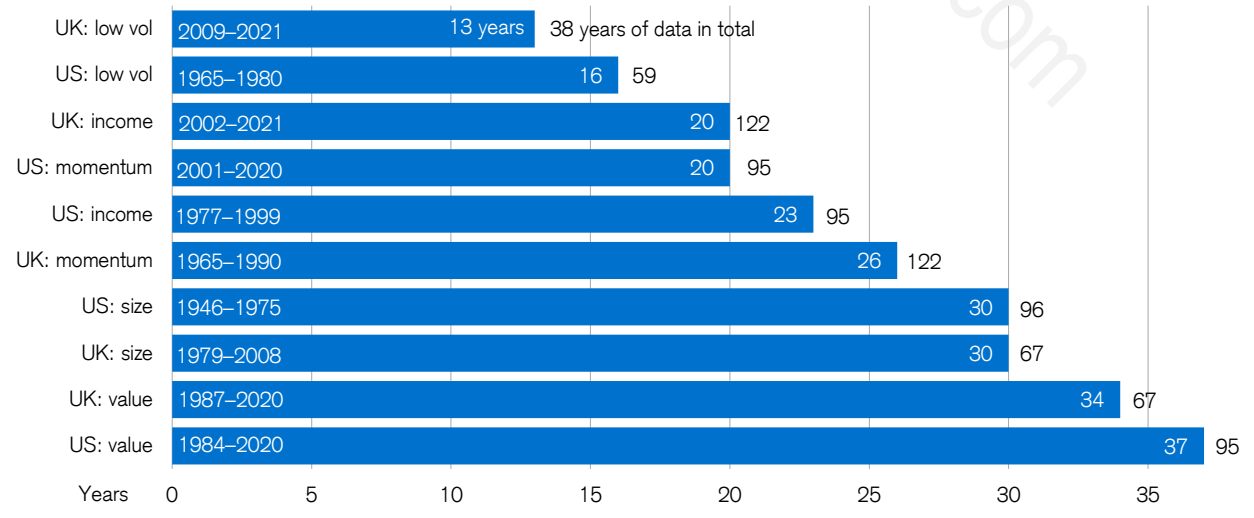
How long can premiums stay negative?

We have seen that factor premiums are not guaranteed. They may enhance returns, but they can also be a drag on performance. The tendency of securities with similar characteristics to generate similar investment outcomes is a factor effect. Factor effects can be lasting, but they are not always beneficial for the asset owner.

We distinguish between factor premiums and factor effects. The small-firm effect is likely to be durable because small companies will tend to remain small and are highly likely to perform differently from large stocks. Taken as a group, they may overperform or underperform. Similarly, value stocks, high-yielders and past winners will continue to show different performance characteristics from growth stocks, low-yielders and past losers, regardless of whether they generate a premium.

In **Figure 64**, we examine the maximum drawdown associated with the factors discussed above. We do not have daily data, so our periods

Figure 64: Duration of the longest period over which the factor premium remained negative, 1900–2021



Sources: Elroy Dimson, Paul Marsh and Mike Staunton, premiums computed from multiple sources as documented in Chapter 6. Not to be reproduced without express written permission from the authors.

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are annual, running from start-year to end-year. Our data is for the USA and UK, and it covers five factors, making ten country-factor combinations altogether. The bar chart is ranked by the maximum number of successive years during which each country-factor premium was negative.

Very importantly, the overall duration of our factor series varies from the UK low-volatility estimates, based on a daily dataset containing only 38 years, to our income estimates with a history that spans a full 122 years. At the top of the chart is the UK low-volatility factor; the longest period for which this factor generated a negative premium was 13 successive years. Since we have to calculate volatilities, we have only 38 complete years of volatility data and, within this period, there was a 13-year subperiod over which the cumulative low-volatility premium was negative. The longest period for which the US low-volatility factor premium was in negative territory was over a 16-year subperiod out of the 57 years for which we have data.

At the other end of the spectrum, value generated a negative cumulative premium over a period of 34 successive years in the UK and 37 successive years in the USA. Value in the USA was underwater for the 37-year period that ran until the end of 2020, and which began nine years before the publication of the influential Fama and French (1993) paper on value and size in the USA. The strong performance of US value stocks in 2021 narrowly saved this from extending to a 38-year drawdown. An investor who initiated a value strategy in the USA in 1993 on the strength of Fama and French's paper would still be underwater.

Looking at the two countries and five factors in **Figure 64**, the longest period of being underwater ran to end-2021 for two of the ten country-factor combinations and to the end of 2020 for three more. We have been through a period in which factor performance was disappointing.

Our chart would, of course, look different if it were ranked by the proportion of years in which the factor premium remained negative. The message would not change, however. We have looked in this chapter at the USA and UK, but we also have data for other countries, summarized in Chapter 6, though it generally spans a shorter interval. Nevertheless, the evidence presented here is replicated in other markets. Factor investing demands careful analysis and cautious asset allocation. This is true even when it is based on the longest-established factors with extensive back-histories and where there is supporting evidence from many countries.

The factor zoo

In his presidential address to the American Finance Association, Cochrane (2011) referred to a "zoo" of new factors that are related to investment returns. And as we noted earlier, the number of residents in Cochrane's zoo has increased since then. Which factors should be of interest to an investor who is visiting the zoo? As a guide to cutting-edge ideas, many people take the view that there is a market for research and that the best papers are more likely to appear in the most selective journals with the most demanding processes for refereeing and review.

The emergence of profitability, quality and investment as mainstream factors reflects the high standing of the journals in which the original research on profitability by Novy-Marx (2013) was published, as well as those in which the subsequent 5-factor model of Fama and French (2015–18) were published. Consequently, profitability and investment entered the language of academic finance as factors in the return generating process and the new 5-factor model became established.

Guidelines for practitioners

In a guide for investment practitioners, Berkin and Swedroe (2016) recount five criteria that a potential factor should meet if it is to be useful in practice. A factor must be persistent over time, pervasive across markets, robust to different definitions, intuitive to common sense and investable at reasonable cost.

They note that individual factors may underperform for long intervals, and stress that a long-term strategy is useless if the investor cannot stick to his/her plan. These aspirations for factor investing are reasonable, but they also present an implementation challenge. If one waits until compelling evidence has accumulated, the investor will be buying after the historical reward to a particular factor has accelerated.

This has two implications. First, smart-beta investors may pay a premium price for factor exposure, which suggests forward-looking returns that are lower than the historical record. Second, other smart-beta investors will have made similar portfolio allocations, acquiring factor exposure from asset owners who, on average, have no special factor preference.

Whenever investment strategies are popularized, there is a danger of hitting a reversal point. In the study of UK small-cap performance that we cited in Chapter 6, we compared the large and significant research-period premium with the post-publication premium (Dimson and Marsh, 1999). The latter was as large (in absolute terms) and as statistically significant as the former.

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However, the premium had become negative! On an out-of-sample basis, small caps performed far worse than large caps. Several studies subsequently observed similar patterns for other factors.

Replicability of academic studies

Linnainmaa and Roberts (2018) examine 36 anomalies in stock returns that have been reported in high-quality academic studies and (using new data) examine investment returns before and after the original researchers' sample periods. The average outperformance from these anomalies out-of-sample was 58% below the in-sample numbers. McLean and Pontiff (2016) examined 97 factors published in top scholarly journals, finding that post-publication returns were (coincidentally) also 58% lower than the published research reported, while correlations with other published return predictors rose, impairing the diversification benefits of multifactor investing.

After disappointing performance, amplified by the impact of transaction costs and management charges, investors seeking to exit from a smart-beta strategy run the danger of being involved in crowded trades, with price pressure imposed on exiting investors.

In their paper, "How can 'smart beta' go horribly wrong?", Arnott, Beck, Kalesnik and West (2016) highlight the danger of overcrowding, which varies with the factor. For example, some commentators have argued that the rapid growth in low-risk investing may have caused these assets to be bid up to an excessive price. Offsetting that is the argument that investors chase good stories and force up the prices of exciting, but volatile, stocks. The "crowd" is not unanimously clamoring for low-volatility investments.

Data-mined back-histories

In the Global Investment Returns Yearbook 2020, we reported on Schröder's (2007) study of ESG equity indexes from 11 suppliers. He found clear evidence of look-back bias. In every case where an index history underpinned an ESG product launch, the pre-launch index performance exceeded that over the post-launch period. Using a similar approach, we found a comparable pattern in a very small sample of recent ESG index launches.

Huang, Song and Xiang (2020) find that smart beta ETFs delivered above-average market returns of +2.77% per year prior to listing. However, after launching them, these smart beta strategies actually lost an average of –0.44% per year relative to the broader market. The authors carefully examine alternative rationales and are able to eliminate explanations such as fading factor premia or over-crowding in popular factors.

The authors blame extreme data-mining in the back-testing processes, designed to enhance reported performance over the pre-launch period. Smart beta ETFs are often multifactor and combining factors provides a significant opportunity to adjust the model to deliver historical outperformance. This may also help explain recent disillusionment with multifactor products.

Factor timing

The observation that individual factors can underperform for many years, combined with the concerns of Arnott et al. about overcrowding, raises an important question; namely, can factor premiums be "timed"? We explore this issue in the context of value. We have already noted that the value premium in both the USA and UK has been mostly negative since the Global Financial Crisis.

We illustrate this for the UK. In computing the value premium, value stocks are defined as the 40% of stocks in the UK market with the lowest price-to-book ratio, while growth stocks are the 40% with the highest ratios. Clearly, the price-to-book ratio of the growth stock portfolio will be appreciably higher than that of the value stock portfolio. The ratio of the difference is sometimes known as the "value stretch."

Value stretch indicates how much more investors are prepared to pay per unit of book value for growth stocks, rather than value stocks. When value stretch is high, this could be an indicator that the value factor is cheap, and this might help us to "time" our investments in value stocks.

Our findings are displayed in **Figure 65** (overleaf). On the left-hand side, the shaded area shows the rolling annualized value premium in the UK since 1960. It reveals that the recent run of underperformance from 2007 until the second half of 2020 is the deepest and longest over a period of 60 years. Did this indicate that value was due for a renaissance and that growth investing had become a crowded trade?

In the right-hand chart, we plot the value stretch ratio for the UK market since 1960. It is normalized as a zero-mean z-score (see the right-hand scale), so the values can be interpreted as the number of standard deviations from the mean.

Unsurprisingly, stretch was highest (i.e. growth was most highly valued relative to value) with a value of 5.1 in Q3 of 2020, while it was lowest in mid-1974 with a value of −1.9. With hindsight, moving into value at the peak of value stretch in Q3 2020 would have paid off handsomely. Value outperformed strongly over the following 6–8 months with a further resurgence in value, relative to growth, in the opening weeks of 2022.

However, a closer look at the right-hand chart shows that there were previous peaks in value stretch that would have provided false timing signals, leading investors into value at just the wrong time or at least too early. To test whether value stretch can be used to time investments, we regressed the future value premium on the prior level of stretch. We found no relationship. As with all mechanical timing signals, it provides too many premature buy and sell calls, which, in a real-life setting, would also generate high transaction costs.

Despite our own negative results, Arnott et al. maintain, very plausibly, that factors can become expensive and hence there is potential for their timing. This view is contested by Asness, Chandra, Ilmanen and Israel (2017), who argue that factor timing is deceptively difficult.

They conclude, "Our own slew of trading simulations…fails to produce economically meaningful improvement in either gross returns or gross Sharpe ratios, underscoring the difficulty of successfully implementing contrarian factor timing…Our research supports the approach of sticking to a diversified portfolio of uncorrelated factors that you believe in for the long term, instead of seeking to tactically time them." This debate has further to run.

Effects or premiums? Does theory help?

We have discussed five aspects of factor-based investing that are of great importance to investors. They are important because investment professionals cite strong evidence that they contribute to long-term returns. There is a size effect in that smaller companies behave differently from large ones. There is a value effect, whereby value stocks perform differently from growth stocks. There is an income effect with high-yielders performing differently from low- and zero-yielders, although this may also be regarded as a subset of the value effect. There is a momentum effect, whereby stocks with relative strength generate different returns from stocks with relative weakness. These effects are well substantiated. In addition, there is a low-volatility effect that is apparent in some markets.

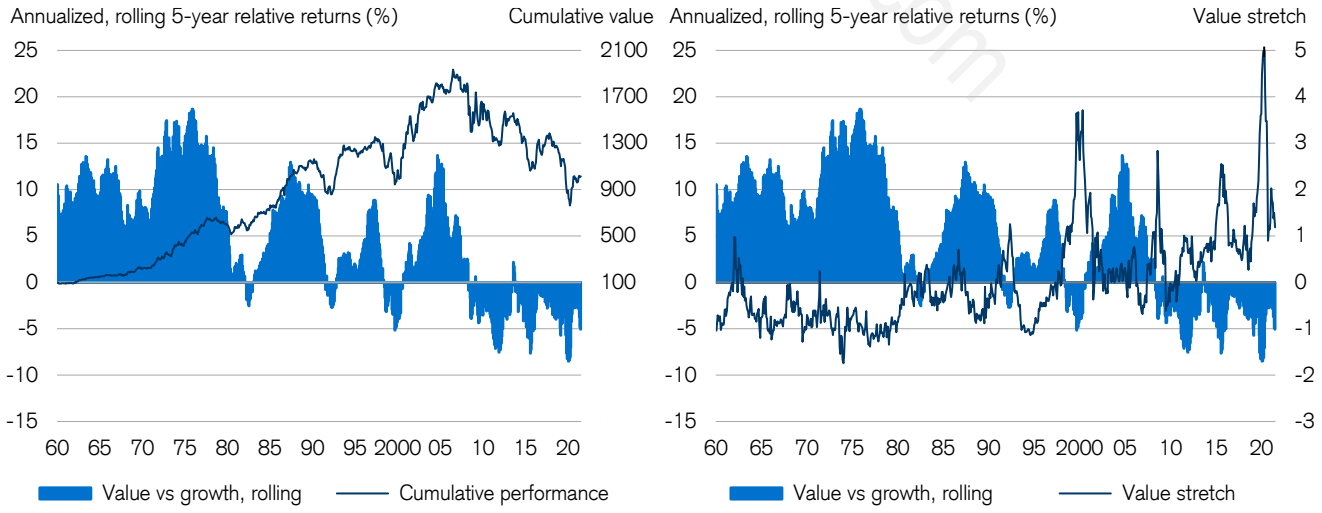
By an "effect," we mean a tendency for stocks with certain attributes to co-move. For example, value stocks move together and in a different direction to growth stocks. The reason these effects cannot be ignored is that they are likely to have an impact on portfolio returns. In addition to co-movement, there may also be a return premium for exposure to these factors.

However, the evidence on premiums is not conclusive. Of the factors we have examined, the theoretical case for a return premium is strongest for an expected size premium.

Size

Smaller companies are illiquid, their transaction costs are higher, and small-cap portfolios are costly to manage. For other asset classes, lack of marketability is rewarded: illiquid bonds sell at higher yields (i.e. a larger expected return) than comparable liquid instruments, and restricted

Figure 65: The rolling value premium and value stretch in the UK, 1960–2021



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(large-cap) stocks sell at lower prices than tradable stock in the same company. There is therefore good reason to expect illiquid, smaller companies to also generate larger returns over the long run. Yet, while the evidence is consistent with this, the magnitude of the small firm premium, measured over the longest possible intervals, now appears modest compared to the premiums reported in the original research studies.

Value and income

Value stocks are typically companies that are distressed, or which have impaired business prospects compared to growth stocks. High-yielding stocks frequently have the same attributes. They have often become high-yield because their price has fallen. Value stocks are said to be exposed to greater risks of financial distress, and this, according to Fama and French (1993, 1995) is the rationale for their higher expected return. However, empirical support for this higher risk argument is hard to pin down.

Other experts take the view that the gains from value investing reflect mispricing, whereby enthusiastic investors bid up the prices of growth stocks compared to value stocks. This behavioral argument, while theoretically less appealing, is widely cited as a foundation for a value premium.

In the past, the income premium and the value premium have been regarded as manifestations of the same underlying attribute: the ratio of security price to a measure of fundamental value. That changed in the years immediately following the Global Financial Crisis. The hunger for income in a low-return world pushed up the price of higher-yielding assets. This was not sustained, however, and as **Figure 62** attests, over the entire post-crisis period, the income premium has been negative, albeit not as large as the negative premium from value.

Momentum and volatility

Momentum investing is a stock-rotation trading strategy. Winners do not stay winners forever. The composition of a winner or loser portfolio changes rapidly. It is unlikely that we can advance a risk-based explanation for the momentum premium and the state of theory in this area is rudimentary and exploratory. Johnson (2002), for example, advances a coherent explanation of the momentum premium that is very stylized and Sagi and Seasholes (2007) also offer a rational model of momentum. But, while they explain why risk premiums can increase following positive stock returns, they require implausibly high levels of risk aversion to explain the magnitude of momentum profits.

While the search for a rational theory of momentum has proved unsuccessful, there has hitherto been little consensus on behavioral or inefficient market explanations. In a recent paper, Goyal, Jegadeesh and Subrahmanyam (2022) use international data to test various suggested momentum rationales based on overconfidence, slow diffusion of information, limited attention, anchoring bias and real options.

Their analysis strongly favors the Da, Gurun and Warachka (2014) "frog-in-the-pan" hypothesis. This posits that, due to limited attention, investors underreact to information that arrives gradually rather than in concentrated doses. They also find that momentum is stronger in less volatile markets and in up-markets. They argue that information flows more gradually during these market states, which they view as providing additional support for "frog-in-the-pan".

Whatever the explanation for the momentum premium, it has historically been large over a very long period. However, it is volatile, the strategy is costly to implement, and, as we saw in 2009, a pure winner-minus-loser strategy can lead to very large periodic losses when momentum traders are whiplashed by a sharp market reversal.

Finally, low-risk investing has attracted increased interest from investors. While it is less dynamic than momentum, it nevertheless involves a process of rebalancing and recalibration. A key aspect of low-volatility investing is that the strategy can achieve returns superior to a blend of the risk-free interest rate and the equity market index. If risk is measured by the CAPM beta, this is the anomaly reported, a half-century ago, by Black (1972). Why was low-risk investing ignored for so long, with few investment products offered until the onset of the financial crisis?

One explanation is that the low-risk factor does not offer a superior return, but instead a superior risk-adjusted return, and that this attracted attention only in the past decade. First, low-risk benchmarks were initiated. MSCI launched its minimum-volatility index in 2008, and S&P and Russell followed in 2011 with over a decade of back-data. Second, there was a bear market in 2008 and disappointing returns in 2011. In both years, low volatility outperformed (see **Figure 62**). Despite returns being relatively poor in the subsequent market recoveries, investors seem to have acquired a taste for downside protection.

In related work, we study asset returns in different monetary conditions since 1900 (see Dimson, Marsh and Staunton (2016), some of the results of which are updated and reported in Chapter 2). As well as looking at financial assets (stocks, bonds and bills) and real assets (such as precious metals and artworks), we also examine the factors proposed by Fama and

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French (see their series of papers between 2015 and 2020). All returns, including 5-factor risk premiums, are higher in periods of easing interest rates and lower when rates are tightening. This statistically significant difference in factor returns persists in the UK as well as the USA.

Of the various factors, the largest premium has been associated with momentum. This is the factor exposure that most challenges rational risk-based explanations. Low capitalization and illiquidity are associated with a smaller premium. This is the factor for which all investors might reasonably require some incremental reward.

While cogent rationales can be advanced for small-cap and value premiums, the fact is that both effects fluctuate and both have suffered protracted periods of negative returns. This should be a warning that, once a premium has been identified and the research disseminated, the rewards to factor exposure may change. Just like forecasts of the equity premium (see Chapter 5), it can be dangerous to extrapolate apparent anomalies into the future.

Nevertheless, these factors are associated with many styles of portfolio management. The size, value, income, momentum and low-risk effects remain major influences on performance. Portfolio managers may tilt their portfolios toward or away from large-cap stocks, or from growth stocks. Superior returns may therefore be attributable to one decision regarding size- or value-exposure and may not reflect the scores of individual transactions executed for the portfolio.

For example, a charity client in need of income can influence a manager to select high-yielding stocks, which are likely to do well in a period that favors income and value strategies. Similarly, a mutual fund facing volatile inflows and outflows needs liquid stocks, which are likely to do well in a period that favors large-cap strategies.

Almost all investors have investment styles that favor or conflict with momentum. Some believe they should let winners run and/or cut losses quickly. Institutional investors can be tempted to window-dress portfolios prior to reporting dates – clearing out losers, for example. Many investors are involuntary momentum traders because they are evaluated against a size-based benchmark, such as the S&P 500 or FTSE 100, and therefore buy stocks as they drift above the threshold for index membership. Growth investors buy into stocks that are selling at an increasing price relative to fundamentals.

All these investors are unwitting momentum traders and they transact with others, such as fundamental indexers, who may unconsciously be taking a position against momentum. Their performance will depend on whether their size and value positions, made in conjunction with their (perhaps unintended) exposure to momentum, are successful. Whatever an investor's approach, momentum can influence performance.

Conclusion

Size, value, income, momentum and volatility have an important impact on portfolio returns. As "factor effects," they will continue to exist and should be monitored by all investors. They are important in performance analysis and evaluation, and in distinguishing between style returns and stock selection or timing skill.

However, assessing whether they will generate premiums in the future is a harder call. On the one hand, we have seen that they have historically generated sizeable premiums, both over the long run and across many different countries.

Set against this, the theory for why such premiums should exist or what types of risk they are rewarding is admittedly weak. Furthermore, if they are generated by behavioral traits, behavior can change, especially as awareness of these factors – and their popularity – increases.

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Chapter 8: Diversification

Diversification across stocks, countries and assets reduces risk so investors can earn the same return with lower risk, or a higher return for the same risk. Globalization has lowered the potential risk reduction from international diversification; but although the benefits remain large, they are not guaranteed. Over the last 50 years, US investors would have been better off staying at home, rather than investing globally. Stock-bond diversification has been effective in recent years due to a negative stock-bond correlation, but we caution against relying on it continuing. Finally, we examine diversification during crises. Short-term correlations are higher at such times, but this should not be a major concern to long-run investors.



Photo: Santiago de Chile, Chile; Getty Images, Ruben Earth

The only free lunch in finance

Seventy years ago, Harry Markowitz (1952) published "Portfolio Selection," which laid the foundations of modern portfolio theory and won him a Nobel Prize. He showed that a portfolio's risk is not defined by the average riskiness of its individual assets, but by the extent to which the returns on those assets are correlated or move together.

Markowitz demonstrated that diversification allows investors to increase expected return while reducing risk. He argued that "diversification is the only free lunch in finance." Investors are urged to diversify across stocks, countries and asset classes. We examine each of these in turn.

Diversifying across stocks

Almost every textbook in investments or corporate finance includes a chart like the one on the left in **Figure 66**. It shows the average risk (standard deviation) of portfolios containing different numbers of stocks. The portfolios here were selected randomly from stocks traded on the New York Stock Exchange from 2011 to 2020. As more stocks are added to the portfolio, diversification reduces risk rapidly at first, then more slowly. The risk that it reduces is known as diversifiable risk, or sometimes as unique, specific, or residual risk. The horizontal line shows the risk of an equally weighted portfolio of all stocks. This irreducible risk is known as market or systematic risk.

Charts like this are invariably based on equally weighted portfolios. In aggregate, however, investors hold a value-weighted portfolio. Value-weighted "n-stock" portfolios show even larger levels of diversifiable risk than equally weighted portfolios.

Conventional wisdom is that a small number of stocks – say 10 to 20 – is sufficient to provide market-mimicking returns. That interpretation is misleading, as Bennett and Sias (2011) have pointed out. Many more stocks are needed to create a well-diversified portfolio. It would be more helpful if the standard diversification chart was presented as on the right-hand side of **Figure 66**, which shows the fall in unsystematic risk as the number of stocks is increased. It shows that even with 100 stocks, the tracking error is still 3.3% per annum.

The costs of underdiversification

Despite the longstanding and widespread advice to hold well-diversified portfolios, many studies find that most investors hold very concentrated portfolios. Goetzmann and Kumar (2008), for example, analyzed more than 60,000 investors at a large US discount brokerage house. Their average holding was four stocks (the median was three). Only 5% held fewer than ten stocks. The level of underdiversification was greater among younger, low-income, less educated and less sophisticated investors.

There are large costs to being underdiversified. Bessembinder (2018) shows that the majority of US stocks (57.4%) have had lifetime buy-and-hold returns below that on Treasury bills. Since 1926, the best-performing 4% of companies explain the net gain for the entire US stock market. This is caused by the strong positive skewness in individual stock returns. The positive premium over bills that we observe for overall stock markets is driven by very large returns for

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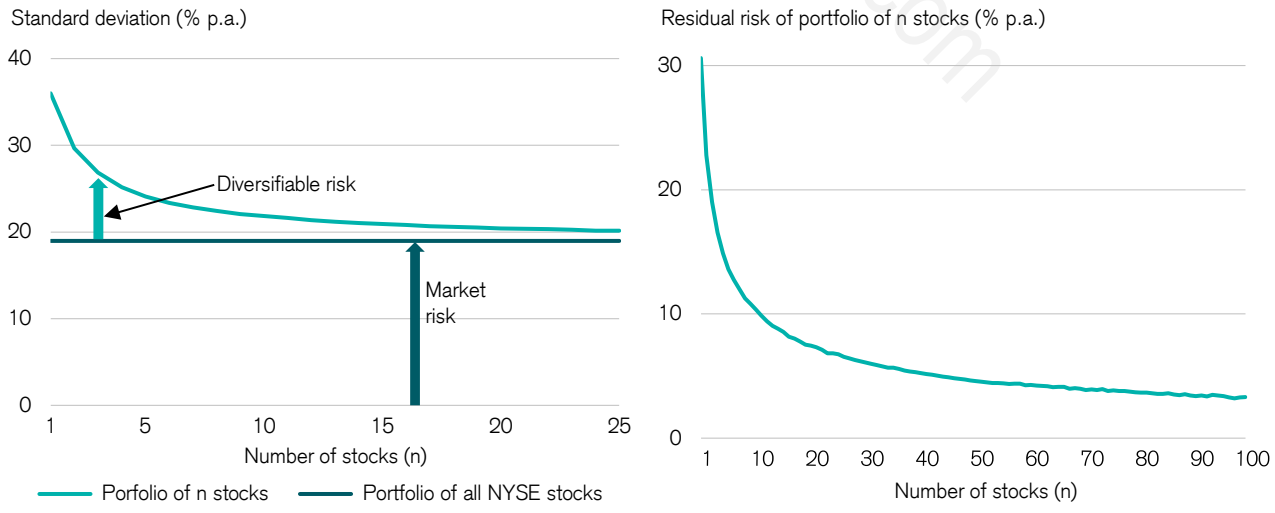
Figure 66: How overall portfolio risk (left) and residual portfolio risk (right) vary with the number of stocks



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relatively few stocks. Bessembinder et al. (2021) examined some 64,000 stocks from 42 countries and showed that the same pattern held for non-US stocks. The average individual with a concentrated portfolio is thus likely to receive less than the return on the overall market.

However, the costs of underdiversification are far greater than this. A Danish study by Florentsen, Nielsson, Raahauge and Rangvid (2019) analyzed a database for 4.4 million Danish investors. They showed that investors could increase their expected return by up to 3% a year by moving from the concentrated portfolio they typically held to an index fund with the same overall risk. Investors could have achieved this by decreasing cash or short-term bond holdings and increasing the index fund holding, or via leverage, thus gaining greater exposure to the equity premium. This reinforces a key point made by Markowitz. Diversification allows us to either reduce risk for the same level of expected return or increase expected returns for the same level of risk.

Overdiversification/diworsification

The term "diworsification" was devised by legendary investor Peter Lynch to describe companies that diversified into new businesses where they had little experience or expertise, rather than sticking to their core competencies. The usage of the term has subsequently been expanded to refer to the overdiversification of an investment portfolio in such a way that it reduces the overall risk-return characteristics.

Overdiversification occurs when an investor or fund manager has information or insights that are not being fully exploited because the portfolio is too diversified. You cannot beat the market by holding it. To beat the market, you need the skill to generate alpha – sometimes known as excess return or abnormal return, or return above the benchmark. Assuming you have such skill, you need to take large-enough positions to exploit it. This involves taking on additional unsystematic risk/tracking error and not being too diversified.

Individuals with no ability to predict alpha should hold an index fund. At the other extreme, highly skilled individuals or fund managers should run very concentrated portfolios. To judge whether a fund is overdiversified, we need to know how skilled the manager is. While this is difficult, there is nevertheless strong circumstantial evidence that many funds are overdiversified.

Alexeev and Tapon (2014) report that, according to Morningstar, the number of stocks held by the average domestic US equity fund in 2012 was 176, with an interquartile range of 128 to 583. These numbers seem remarkably high for actively managed funds. Closet index funds are those purporting to be actively managed, but which have portfolios that are sufficiently close to their benchmark to make superior performance unlikely – despite charging active management fees. Closet indexing is increasingly attracting the attention of regulators and even class actions from investors.

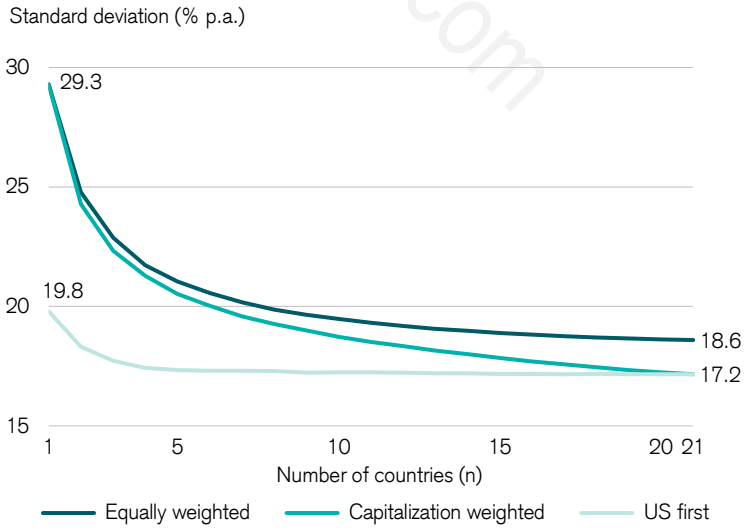
Diversifying across countries

Figure 66 shows how diversification across individual stocks rapidly reduces risk. But what about the question, "Why not diversify internationally rather than domestically?" That was the title of an influential article by Bruno Solnik (1974).

Solnik focused on the USA and seven European countries. For each one, he produced charts like **Figure 66**. He repeated the analysis with stocks selected from all eight countries and found that "In terms of variability of return, an internationally well-diversified portfolio would be … half as risky as a well-diversified portfolio of US stocks (with the same number of holdings)." He concluded that diversifying globally greatly reduces risk. Solnik's analysis was based on stocks, but a focus on diversification across countries supports his conclusion. **Figure 67** is based on the 21 DMS countries with continuous histories since 1900. It shows how risk for a dollar-based investor falls as the number of countries is increased.

The top, darker colored line shows the standard deviation (SD) for portfolios that give equal weight to each country, while the second line down shows the equivalent SDs when countries are weighted by their market capitalizations. For the one-country portfolio, these two lines show the average SD of the 21 countries. For the 21-

Figure 67: Diversifying across countries, 1900–2021



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country portfolio, they show the SD of the equally weighted and capitalization weighted 21-country "World". The 2- to 20-country portfolios were selected randomly from the 21 DMS countries, without repeating countries. For these portfolios, the SDs plotted in the chart are averaged across 10,000 random iterations.

Figure 67 shows that the SD of 29.3% for a typical single-country investment falls off to 18.6% for an equally weighted 21-country portfolio. For the capitalization-weighted 21-country world index, it falls to 17.2%. These 37% and 41% risk reductions are large.

These strategies are not very realistic. The assumption of equally weighted investments is pervasive in research on the gains from diversification. However, equally weighted results can be misleading, especially for an investor based in the USA, which today accounts for 60% of world capitalization. It is unrealistic to assume that investors will hold the same amount in small markets as in large ones. Assets must, in aggregate, be held in proportion to their market values.

However, even the capitalization-weighted results are unrealistic. They assume, as do the equally weighted results, that the one-country portfolio could, equally plausibly, be any one of the 21 countries, while the two-country portfolios span all possible two-country pairings and so on. More realistically, we would expect that, for a US investor, the one-country portfolio would be the USA, with other markets then being added to the US core.

The bottom line in **Figure 67** labeled "US first" shows the risk reduction achieved by a US investor who started with a single country holding in the USA and then diversified by selecting the largest foreign markets first, holding each in proportion to its size. Once this portfolio is invested in all 21 countries, it becomes the capitalization weighted 21-country "world" index. This strategy involves a reduction in risk from 19.8% (the SD of the US market over this period) to 17.3% (the SD of the 21-country world).

This 13% reduction in risk, while still worthwhile, is much lower than suggested by the upper two lines in **Figure 67**. This is because the one-country starting point is the USA, which was among the world's lowest risk countries. For most of the period covered, the US market dominated world equities and the size of the US market ensured that it was already very well diversified. The benefits of global diversification are much larger for smaller more-concentrated markets and for higher volatility markets.

Note also that the 13% risk reduction implied by the "US-first" strategy is a far cry from Solnik's claim that global diversification could reduce risk by half for a US-based investor.

A brief history of global investment

Figure 67 assumed that cross-border investment was possible and costless throughout the period from 1900 to date. In fact, full international diversification was not always possible during the 20th century. There was a U-shaped pattern of globalization, with international investment commonplace at both ends of the century. During the period in between, from the First World War through to the 1970s, many barriers and costs inhibited cross-border investment.

At the start of the 20th century, there was extensive cross-border investment. London was then the world's leading financial center and Conant (1908) estimates that, in 1900, at least 23% and perhaps as much as 51% of UK citizens' securities holdings were invested abroad. Paris ranked second after London and 32% of the value of French-owned securities was held in foreign stocks and bonds. For Germany, the figure was 46%.

World War I had a major dampening effect on international investment. Capital controls proliferated and then, in the 1920s, German hyperinflation and the Wall Street Crash crushed confidence. Foreign investment collapsed after 1929 and capital controls and protectionism characterized the period until World War II.

After the war, the tide turned again, but restrictions continued for many years. The United States imposed interest equalization tax from 1963–74; the Japanese financial markets were effectively closed to foreigners until the 1980s, and the United Kingdom, Germany and France all had periods of capital control, some continuing until the 1980s. In addition to restrictions on capital movements, there were constraints on cross-border holdings, complex tax barriers, poor information flows, few derivative instruments for hedging and very limited passive country index investment vehicles. As Cooper (2001) points out, the costs of achieving international diversification may well then have significantly offset the benefits.

Since the 1970s, these barriers and costs have been progressively swept aside. Following the 1971 breakdown of the Bretton Woods system of fixed exchange rates, most major currencies have floated freely, removing the risk of sudden large devaluations. While investors still face exchange-rate risk, currency, interest rate and equity market risk can now all be hedged cheaply. Barriers to international capital movement have mostly been dismantled. Low-fee passive vehicles including

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ETFs abound. Information is rapidly and widely available and in ever greater volume. Accounting, tax, governance, trading and issuance systems are being harmonized.

When Solnik began advocating international investment, he remarked that US equity investors "regarded participation in international markets as exotic at best and usually irrational." Yet, wittingly or unwittingly, Americans followed his advice. In 1974, according to Solnik, US pension funds had never invested outside the USA. By 2019, they held 38% of their equities abroad (FTSE Russell, 2019). Overall, US investors increased the percentage of equities held abroad from 1% in 1980 to 12% by end-2000 (Dimson, Marsh and Staunton (2002)) and 18% in 2019 (Wallmeier and Iseli (2021)). But did they benefit from this?

Should US investors have gone global?

To judge how Americans have fared from investing globally, we compare the real return from domestic US investment with the real return they would have achieved from investing in the world index. Initially, we examine an unhedged investment in the world index, where the latter is denominated in US dollars and converted to real terms using US inflation. We ignore all costs and taxes.

The world index is taken as the capitalization-weighted index of all DMS countries with a continuous history over each period examined. Note that the world index includes a holding in the investor's domestic market and, for US investors, this is substantial. At the start of 2022, the US market had a 60% weighting in the world index.

The risk reduction from diversification is a key motive for investing internationally. We thus make comparisons using a metric that captures both risk and return. We use the Sharpe ratio, which measures the reward per unit of risk. It is defined as the excess return – the return minus the US risk-free rate – divided by the standard deviation.

Figure 68 compares the Sharpe ratios for a US investor who diversified domestically and one who invested globally in the world index over five different periods. The first of these, 1974–2021, spans the period since the publication of Solnik's article to the present – reflecting the experience of a pioneer global investor. Disappointingly, over this period, a US investor would have fared better by investing at home with a Sharpe ratio of 0.40 compared with 0.33 from global investment.

The second set of bars in **Figure 68** relates to 1980–2021. Global investment for a US investor in 1980 would have been adventurous, rather than pioneering. Sadly, the outcome is again disappointing, with the Sharpe ratio (0.47) for domestic equities exceeding that for the world index (0.36). The third and fourth sets of bars are for later starters, who initiated global investment in 1990 and 2000. The story is the same: domestic investment outperformed global.

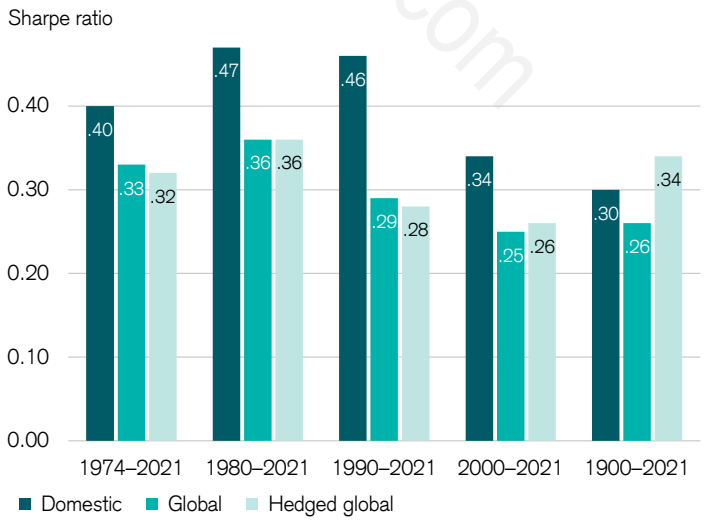
From 1980 onward, US investors made increasingly large investments in overseas equities. However, in risk-return terms, they would have been better off staying at home. With hindsight, following Solnik's advice proved a costly mistake. Moreover, this is before taking account of the higher costs of investing internationally in the earlier part of this period.

For a US investor, domestic investment beat global investment over these four (overlapping) periods for two reasons. First, US equities performed exceptionally well. Over the 48 years from 1974 to 2021, US stocks beat non-US stocks by 1.9% per year. Over the 32 years since 1990, the outperformance was even greater at 4.6% per annum. Dimson, Marsh and Staunton (2021) have documented this continuing outperformance of US equities and describe it as a case of "American exceptionalism."

Second, over this period, global diversification failed to lower volatility for US investors. The US equity market was among the world's least volatile as its size, scope and breadth ensured that it was highly diversified. Over the 1974–2021 period, the equally weighted average SD of non-US countries in the world index was almost double that of the US market. US investors had less to gain from risk reduction than their foreign counterparts.

Global diversification also involves exposure to currency risk. For each country in the world index, the global investor is taking a stake in two assets, the country's equity market and its currency. The net effect of the lower risk of the US market and

Figure 68: Global diversification for a US investor



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of currency risk in the world index was that, for a US investor, the SD of the world index was marginally higher than the SD of the US market over the first four periods shown in **Figure 68**.

Currency hedging

Currency risk can of course be hedged. Investors can hedge by selling futures/forward currency contracts or by borrowing foreign currency to fund the investment. We do not have access to long-run data on forward rates (if such data were even to exist), so we assume hedging is via back-to-back short-term loans, borrowing in foreign currency and lending in the domestic currency. This is anyway equivalent to a forward contract since arbitrage opportunities force the difference in interest rates to be equal to the difference between the forward and spot exchange rates.

Hedging can reduce, but cannot eliminate risk, as future returns are uncertain and we therefore do not know in advance how much to hedge. Most strategies involve hedging the initial capital over the period until the hedge is rebalanced. We use annual data and annual rebalancing.

The impact of currency hedging on returns (as opposed to risk) is a zero-sum game. The profit a German investor makes on Swiss assets if the franc appreciates against the euro is offset by the loss the Swiss investor incurs on German assets. Jensen's inequality states that the profit from an appreciating currency always exceeds the loss in a depreciating currency, but, in practical terms, this effect is insignificant. Averaged over all reference currencies and countries, the mean return advantage to hedging is zero. For specific currencies and time periods, however, the impact can be appreciable.

Returning to **Figure 68**, the third lighter-shaded bar for each period shows the Sharpe ratio for currency-hedged global investment. For the four post-Solnik periods that we have already examined, hedging has only a minimal impact. The Sharpe ratio for global investment either remains unchanged or else is marginally lower.

This seems surprising, as hedging reduced risk, lowering the SD of the world index by an average of 6.7% over these four periods. However, this risk reduction was counterbalanced by an average fall in return of 36 basis points per annum. Why was hedging costly for the US investor in terms of lowered returns? Hedging causes the reallocation of exposure from a basket of currencies back to the dollar. Over these four periods, US dollar exposure reduced real returns, compared with accepting exposure to the other currencies in the basket. The US dollar was weak against the currencies that mattered most in the world index weightings, most notably the Japanese yen.

Over the last half century, US investors would have been better off investing in their home market than globally, whether or not they hedged foreign currency exposure. These are ex-post results with outcomes observed with hindsight. Markets are uncertain and good decisions made before the event can easily result in disappointing outcomes. The fact that, over this period, US investors did better by staying domestic does not mean that past decisions to go global were misjudged or that domestic investment is the correct decision for the future.

The final set of bars in the chart shows the domestic versus global comparison for the full historical period from 1900 to 2021. Domestic investment once again beat unhedged global investment, but hedged global investment performed best of all. Over the full period, currency hedging reduced the SD of the global portfolio by 11%, while it increased the annualized return by 76 basis points per year. Over the very long run, returns were enhanced by being in the US dollar, rather than a basket of other currencies.

Global diversification gains across countries

Since the 1970s, there has been a gradual, but very substantial increase in international portfolio investment. While Americans would have been better off staying at home, did investors elsewhere gain from investing abroad?

To investigate this, we focus again on the period since Solnik wrote his influential article advocating cross-border investment, namely 1974–2021. In 1974, the DMS world equity index contained 32 countries, including the USA (the DMS 35 countries except for China, Russia and Thailand). We look at each of these to see whether investors were better off staying in their home market or investing globally.

For each of the 32 countries, we compare local real equity returns with the real returns on a holding in the world equity index from the perspective of that country. In all cases, investing in the world equity index involves an investment in the same underlying equities with the same weightings. However, the real returns on the world index differ for each reference country. This is because they are converted into the currency of the country in question and deflated to real terms using that country's inflation rate.

We compare domestic with global investment by computing the difference between the Sharpe ratio for global investment and the equivalent ratio for domestic investment. A positive value indicates gains from global diversification, while a negative value indicates that the investors of that country would have been better off investing domestically.

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We examine both unhedged and currency-hedged global diversification.

Figure 69 presents the results. The darker bars show the gain from unhedged global diversification. Countries are ranked from left to right in ascending order of these gains. The lighter bars show the gains from currency-hedged global diversification. Bars below the zero line indicate that investors would have been better off – in terms of reward for risk – investing domestically.

Looking first at the USA, the chart repeats what we reported in **Figure 68**. Unhedged global diversification had a Sharpe ratio that was 0.07 lower than domestic diversification, i.e., 0.33 – 0.40 = –0.07; for currency hedged global diversification, the figure was 0.32 – 0.40 = –0.08. **Figure 69** plots these two differences.

There were eight countries, including the USA, where, with hindsight, investors would have been better off staying local. As with the USA, the explanations lie in high (ex post) local real returns, and/or below average riskiness (SD) of local real returns, plus factors linked to currency risk and return.

All eight countries enjoyed exceptionally high local real returns, except Switzerland, where returns were average. However, unhedged global diversification for a Swiss investor involved moving out of the very strong Swiss franc, thereby lowering returns. When currency risk was hedged, **Figure 69** shows that Swiss investors were better off investing globally.

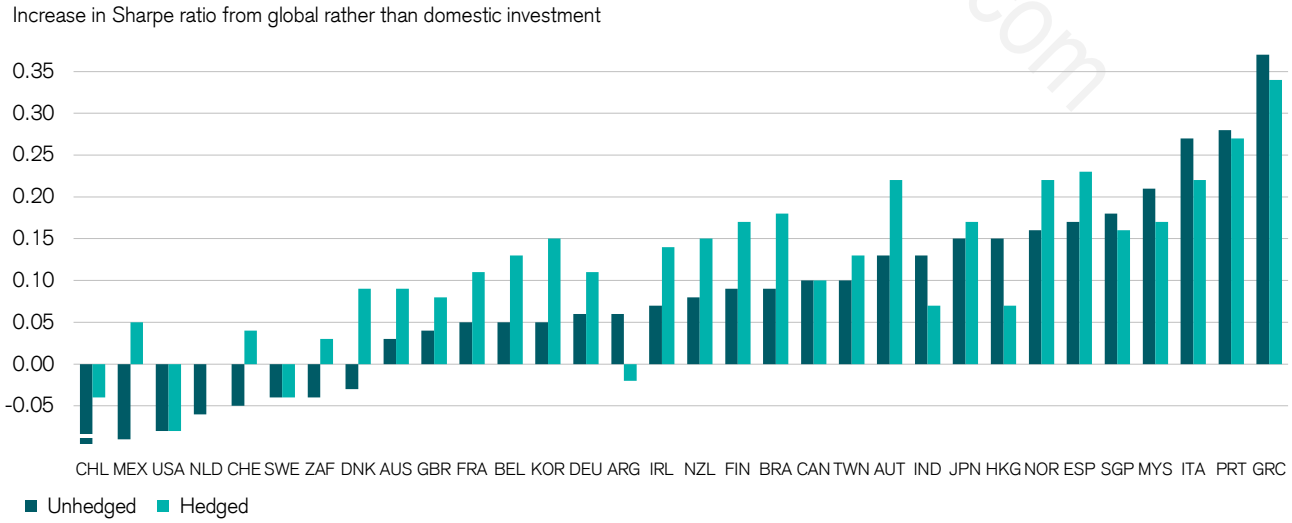
Similarly, except for Chile and Mexico, the equity markets for these eight countries had below average risk. Four had especially low SDs, thereby restricting the potential risk reduction from global diversification. Mexican real returns had a high SD, but the volatility of the Mexican peso meant that the SD of the world portfolio for a Mexican investor was marginally higher than that of local returns.

This was unusual. Across all 32 countries, the SD of the unhedged world portfolio was, on average, 26% below that of domestic investment (37% on a hedged basis). However, for four countries, unhedged global diversification proved riskier than domestic investment. For Mexico, the USA and Switzerland, the difference was small, but, for South Africa, unhedged global investment was much riskier (SD of 27%) than domestic investment (SD of 21%) due to the volatility of the South African rand.

Figure 69 shows that, when currency risk was hedged, investors in only the USA, Sweden, Chile and Argentina were better off staying domestic rather than investing globally. Although Swedish and Chilean investors could both have reduced risk by 36% by investing globally, this was not enough to compensate for these two countries' world-beating domestic returns over this period. For Argentina, although hedging modestly reduced the risk of global investment, it led to lower returns. For The Netherlands, domestic and global were level-pegging, while, for the remaining 27 countries, hedged global beat domestic investment.

The USA was thus an outlier, albeit a very important one. However, we are observing these results with hindsight. Ex ante, it is hard to predict which countries will perform best or where domestic investment might beat global. There is no obvious reason to expect continued American

Figure 69: Domestic versus global investment for the 32 countries in the world index, 1974–2021



Source: Elroy Dimson, Paul Marsh, and Mike Staunton, DMS database 2022, Morningstar. Not to be reproduced without express written permission of the authors.

exceptionalism. Surely, US corporate superiority should by now be priced in?

Prospectively, therefore, the advice to investors from all countries, including the USA – despite its historical record – is that they should invest globally. This is very likely to reduce risk and increase the Sharpe ratio, although this is not guaranteed. However, the benefits will not be uniform. Many smaller countries have highly concentrated stock markets. Even some larger markets, such as Japan, the UK, Germany and France have limited domestic exposure to key sectors such as technology. These countries have potentially more to gain from international diversification than US investors as the US market is already very large, broad and highly diversified.

Have correlations changed over time?
The scope for risk reduction from global diversification depends on the magnitude of the correlations between the returns from different countries. Low correlations imply greater scope for risk reduction. Have correlations changed over time?

Goetzmann, Li, and Rouwenhorst (2005) show how correlations between equity markets changed between 1872 and 2000 over seven successive subperiods representing distinct economic and political conditions. Their estimates for four core countries – the United States, the United Kingdom, France and Germany – are shown in **Figure 70**. We have updated their analysis by adding correlations for an eighth period, 2001–2021.

Correlations have clearly changed over time. For example, the US:UK correlation has varied from near zero (–0.01) to 0.81, while the US:Germany correlation has ranged from –0.28 to +0.88. During the two world wars, several correlations were negative as one might expect between opposing sides. While low correlations imply higher diversification benefits, wars are precisely the times when international investment is hardest and ownership claims most likely to be rescinded.

The final (blue) bar for each sub-period in **Figure 70** shows that the average correlation level also varied over time. Goetzmann, Li, and Rouwenhorst show that these differences in both the level and structure of correlations were statistically significant. The two "early integration" periods before World War I were statistically indistinguishable. The war periods were quite different, with low average correlations of –0.07 in World War I and 0.05 in World War II.

Equity returns in all other periods showed appreciable inter-linkages. Returns were modestly correlated before World War I, between the wars, and in the 1946–71 Bretton Woods period, and strongly correlated in the post-Bretton Woods period of growing international investment and highly correlated in what we might label the globalization period from 2001.

But, while there were some similarities between the "early integration" and Bretton Woods periods, the correlation structures otherwise differed considerably. The inter-war period, with its post-war boom, hyperinflation in Germany, the Wall Street Crash, and the Great Depression, was unique. Correlations were quite high due to common factors such as the crash and Depression, but the correlation structure differed from all other periods.

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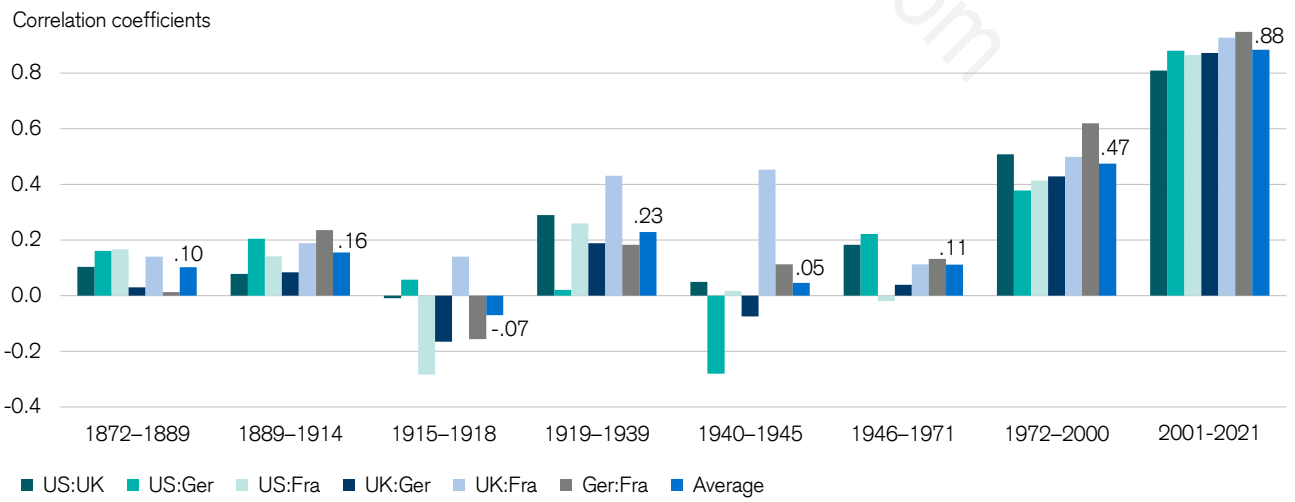
Figure 70: Correlations coefficients between four countries over eight successive subperiods, 1872–2021



Source: Goetzmann, Li and Rouwenhorst (2005), first seven periods; Dimson, Marsh and Staunton using MSCI data for the eighth period (2001–21). Not to be reproduced without express written permission of the authors.

Broadly, we can view the two early periods from 1872 to 1914, plus the two later periods from 1972 to 2021 as the era of integrated global markets. In the in-between years from 1915 to 1971, markets were more segmented. **Figure 70** strongly suggests that, post Bretton Woods, correlations have been much higher and have been increasing. We now examine this and its implications more closely.

Falling benefits from global diversification?
Figure 71 provides a more comprehensive look at how correlations have changed over time since the 1970s. In **Figure 70**, this period was divided into two and just four countries were considered. In contrast, **Figure 71** examines ten subperiods and is based on data for up to 52 countries.

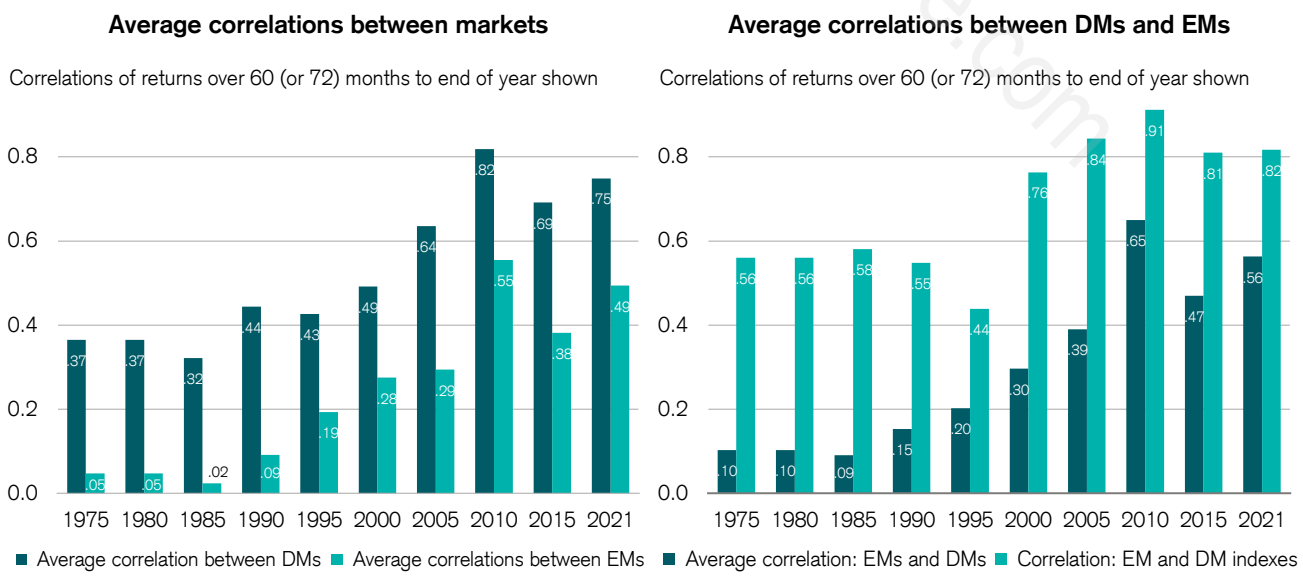
Figure 71 uses monthly returns data from MSCI over the 52 years from 1970 to 2021. The ten consecutive subperiods shown in **Figure 71** each span 60 months (five years), except for the first and last, which cover 72 months (six years). Our analysis covers 21 developed markets (DMs) and 31 emerging markets (EMs) (which, in terms of MSCI classifications, are a mixture of EMs and frontier markets, but which we refer to generically as EMs). By no means all countries start at end-1969, so the sample expands as data accumulates for more countries. By end-1987, we have returns for 21 DMs and 18 EMs and, by mid-2002, the coverage expands to 21 DMs and 29 EMs.

The darker bars in the left-hand panel show how the average correlation between DMs has changed over time. In each period, we compute the average correlation between USD-denominated equity returns for every pairing of DMs for which data is available. Correlations have risen, but not monotonically. They are higher than would be expected from the general upward trend in the periods 1986–90 and 2006–10. The first of these saw the October 1987 Crash, while the second included the Global Financial Crisis. It is well known that correlations tend to be elevated during crises, a topic we will examine in greater detail below.

The lighter bars in the left-hand panel show the same pattern for the average correlation between all pairs of EMs. While these were well below the averages for DMs, they increase markedly over time. Again, the average correlation is higher than would be expected from the overall upward trend during the period including the Global Financial Crisis.

The average correlation between DMs more than doubled from 0.37 in the early 1970s to 0.75 in the most recent period. The corresponding increase for EMs was from a very low base of 0.05 to 0.49. These increases have coincided with and been driven by the removal of barriers, and by the increased globalization of economies and markets. Ironically, with correlations now at a level unmatched in the past, this has reduced the potential gains from diversification. Despite this, some textbooks still cite quite high potential gains, based perhaps on old data or unrealistic assumptions. Our estimates suggest that global investors in most DMs can now expect a more modest, but still useful level of risk reduction from global diversification.

Figure 71: Correlations between developed and emerging market returns over ten subperiods, 1970–2021



Source: Data from MSCI and DMS Database 2022, Morningstar; analysis by Dimson, Marsh and Staunton; periods are of 60 months (5 years), except for the first and last, which are for 72 months (6 years). Not to be reproduced without express written permission of the authors.

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Diversification into emerging markets
Goetzmann, Li and Rouwenhorst (2005) argue that globalization has had drawbacks and benefits. The higher correlations have attenuated the risk reduction benefits, but the opportunity set has expanded dramatically with many new emerging, re-emerging and frontier markets now open to the investor. For those willing to invest in EMs, the risk reduction benefits may be greater.

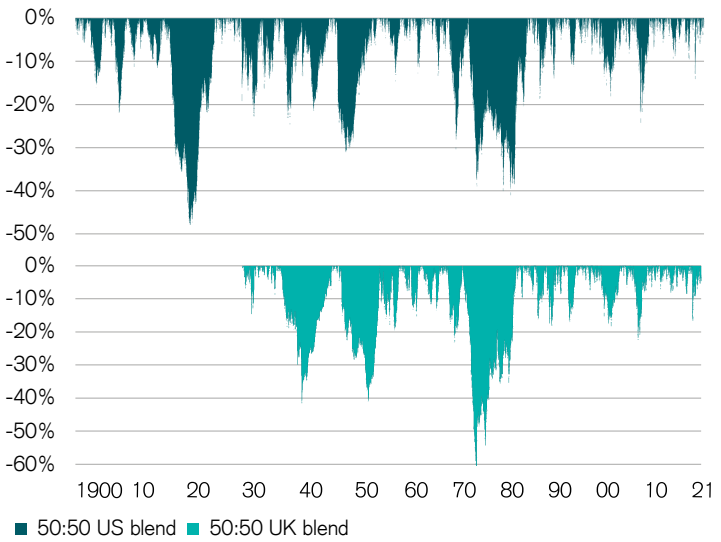
We have already noted that the average correlation between pairs of EMs is much lower than that between DMs, suggesting greater scope for diversification within EMs. The right-hand panel of **Figure 71** focuses on the scope for diversification between DMs and EMs. It uses the same data, countries and time periods as the left-hand panel. We compute the average correlation between USD equity returns for every pairing of each EM with each DM. We also estimate the correlation between the EM and DM indexes.

The darker colored bars display the average correlations between all pairs of EMs and DMs. As we saw in the left-hand panel, correlations have risen over time, indicating that the scope for diversification has declined. However, for each period, the average EM:DM correlation is lower than the corresponding DM:DM average in the left-hand panel of **Figure 71**. A DM investor will thus typically find more scope for diversification by investing in an EM than another DM.

However, investors do not generally invest in single pairs of developed and emerging markets, but instead view markets as broad asset classes. The lighter-colored bars show the correlation between the EM and DM indexes. These are the correlations that would apply to a US investor who already held a portfolio like the MSCI World Index (which is DM-only) and was considering diversifying into EMs.

These bars tell the same story of rising correlations and declining diversification benefits. Even for the most recent period, the average correlation between the EM and DM index remains well below one: there is still an appreciable benefit from risk reduction. For a DM investor, EMs continue to offer superior diversification.

Figure 72: Real drawdown: stock-bond blend, 1900–2021



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Diversifying across asset classes

Investors also reduce risk by diversifying their portfolios across asset classes. Two assets dominate – stocks and bonds. At the end of 2021, the total (full float) value of listed equities was around USD 105 trillion, compared with around USD 150 trillion for bonds. Some two-thirds of bonds were issued by governments (central and local, as well as international bodies), while the rest were corporate bonds. While the value of world real estate is estimated to be even larger than the combined value of equity and bonds (see Dimson, Marsh and Staunton, 2018), the bulk of this relates to residential housing stock.

Many investors hold both stocks and bonds, as well as cash and other assets. Our focus here is on diversification between stocks and bonds and the risk reduction benefits investors enjoy from holding both asset classes.

In Chapter 4 we presented charts for the USA and UK showing historical drawdowns from stocks and bonds from 1900 to 2021 (**see Figures 30 and 32**). These showed that, for equities, there had been periods of deep and protracted losses. However, they also showed that bond market drawdowns have been larger and/or longer. At first sight, this seems odd as equities are riskier than bonds. However, the long-run returns from government bonds were substantially lower than for equities. This increased the likelihood of lengthy periods of negative real bond returns.

Figure 72 presents the drawdown on an illustrative balanced portfolio of 50% equities and 50% bonds. The drawdown is plotted for both the USA (in darker shading, upper panel) and the UK (in lighter shading, lower panel). Individually, the charts displayed earlier in Chapter 4 show that equities and bonds have on several occasions lost more than 70% in real terms. But, since 1900, this 50:50 blend has never (USA) or virtually never (UK) suffered a decline of over 50%. Furthermore, the duration of drawdowns is briefer

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for the blend portfolio than for the supposedly low-risk fixed income asset.

Measured in local currency adjusted for inflation, the long-term annualized real return on US equities was 6.6% (6.1% in the UK, from 1930). Meanwhile, US government bonds had a real return of 2.0% (2.6% in the UK from 1930 onward). The 50:50 blend portfolio returned an annualized 4.9% in the USA (4.0% in the UK).

While the 50:50 equity/bond blend experienced a lower return than the all-equity portfolio, it also had a lower volatility. Since 1900, the standard deviation of real equity returns has been 19.8% in the USA and 20.7% in the UK (since 1930), compared with bonds, which have a standard deviation of 10.4% in the USA and 12.8% in the UK. For the blend portfolio, the standard deviation has been attractively low: 11.9% in the USA and 14.3% in the UK.

There is nothing special about a 50:50 asset mix and investors should and do diversify across more assets than just local stocks and bonds. However, this example serves to highlight the risk-reducing potential of a balanced portfolio of bonds and stocks.

Bonds as a diversifier

Why is the downside risk of the blended stock/bond portfolio lower? There are two reasons. First, bonds are less volatile than equities. A comparison of **Tables 1 and 2** in Chapter 2 shows that, in 34 of the DMS 35 countries, bonds had a lower standard deviation than equities. The exception was Austria, where bond returns were exceptionally volatile due to the hyperinflation in 1921–22 and the turmoil of the two world wars. Across the 21 countries with continuous returns histories since 1900, but excluding Austria, the average standard deviation of real bond returns was 13.0% compared with 23.2% for real equity returns.

Second, bonds are imperfectly correlated with stocks. **Figure 73** plots the long-run pattern of correlations between real stock and bond returns for the USA and UK over a rolling window of 60 months. The stock-bond correlations as at end-2021 are negative: for the USA, a correlation of –0.27 and for the UK –0.09.

In contrast to recent experience, **Figure 73** shows that the stock-bond correlation in the USA and UK has been positive over much of the long term. In the USA, it averaged +0.15 over the period 1900–2021 with a range of –0.63 (in March 2014) to +0.67 (in October 1924). In the UK, it averaged +0.27 over the period 1930–2021 with a range of –0.34 (in August 2014) to +0.74 (in December 1939). These positive, but low correlations, provide good scope for diversification between stocks and bonds.

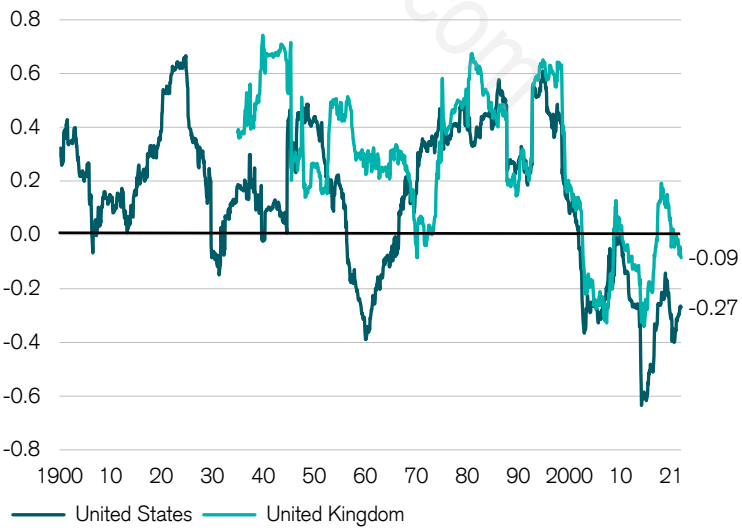
Negative correlations are even better, as stocks and bonds then act as a hedge for each other.

Negative correlations were unusual in the 20th century. In the USA, the stock-bond correlation was mildly negative for three months in 1906, briefly negative around the 1929 Crash and then more sharply negative for a decade in the late 1950s and early 1960s. In the UK, the correlation was always positive except for a few months in the early 1970s.

During the 2000s, however, the correlation became negative in both countries and strongly negative in the USA. Much of the research and commentary on the stock-bond correlation focuses on the USA. In **Figure 74**, we compare the USA with other countries. The chart shows rolling 60-month stock-bond correlations over the period from end-1992 to end-2021. For monthly bond returns, we employ the bond index series used in the DMS database (see Chapter 9), while, for monthly equity returns, we use the DMS series for the USA and UK, and MSCI indices for all other countries. These local currency indices are converted to real terms using the local CPI indices.

In **Figure 74**, the lightest of the three lines shows the correlations for the USA already reported in **Figure 73**. The second line shows the average correlation across the DMS 35 countries (but excluding the three newest additions to the DMS Database – Argentina, Chile and Greece), while the darkest line focuses on the average for the G7 countries plus China.

Figure 73: Rolling 60-month stock-bond correlations, 1900–2021



Source: Elroy Dimson, Paul Marsh, and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission of the authors.

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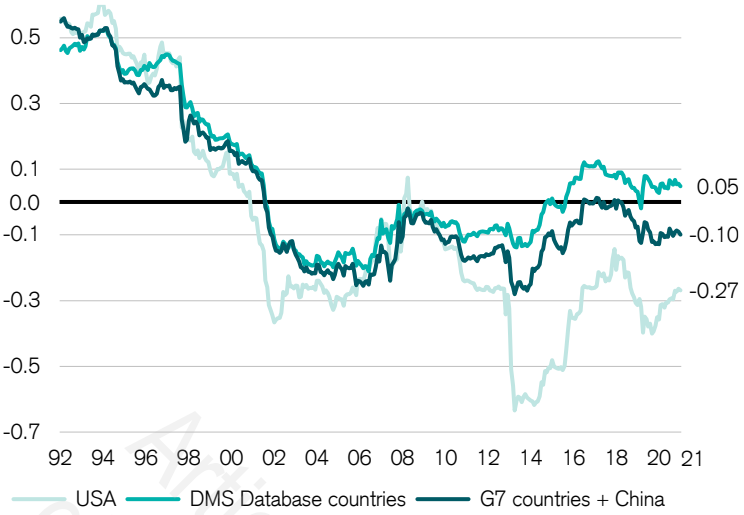
Figure 74: Global average of rolling 60-month stock-bond correlations



Source: Elroy Dimson, Paul Marsh, and Mike Staunton; MSCI, FTSE Russell and DMS Database 2022, Morningstar. Not to be reproduced without express written permission of the authors.

Figure 75: Stock-bond correlations – subperiods, 1900–2021

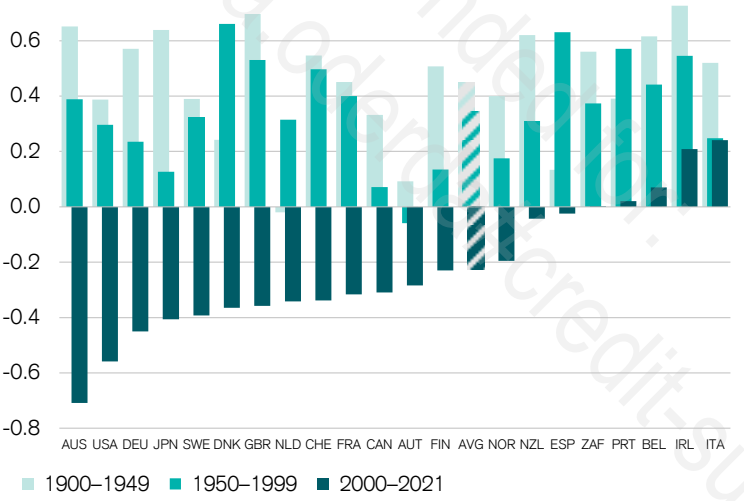


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Figure 74 confirms that the broad pattern of stock-bond correlations we saw in **Figure 73** for the USA and UK was prevalent worldwide. Correlations everywhere were lower after 2000. However, the pattern for the USA was more extreme. The US 60-month correlation turned negative in late 2001, ahead of the global average. Higher frequency data shows that the turning point came earlier at the start of 1998. From 1998, the US stock-bond correlation was almost always lower than the world average, and in some periods markedly so. The global average stock-bond correlation turned positive from the summer of 2016, but remained low, with a value of +0.05 at the end of 2021. This contrasted with a value of –0.27 for the USA.

The 32-country average gives equal weight to all countries and is thus impacted by many smaller markets punching above their weight. The darker line in **Figure 74** focuses just on major world markets. These account for 80% of the capitalization of world equities and over 90% of world government bonds. The average stock-bond correlation for these larger countries has mostly been negative for almost 20 years now, with an end-2021 value of –0.10.

Note that, during the Global Financial Crisis, the US stock-bond correlation briefly turned positive, while the global and the G7+China averages approached zero. Over this period, the stock-bond correlation was impacted by the introduction of unconventional monetary policies, particularly in the USA, the Eurozone and UK. These asset purchase programs helped to boost bond prices, and this was matched by a stock market recovery.

Finally, we examine how stock-bond correlations behaved over the very long term in all 21 Yearbook countries with a continuous history since 1900. Our aim is to see whether the broad pattern of correlations over time that we have found for the USA and UK – and for other countries more recently – has been repeated elsewhere and to see which countries have proved exceptions.

We therefore compute stock-bond correlations for all 21 countries, based on annual real returns for three periods: 1900–49, 1950–99 and 2000–21. These correlations are shown in **Figure 75**, with the averages for the three periods shown in striped shading. The correlations are generally positive over the first and second halves of the 20th century, with averages of +0.42 (first half) and +0.30 (second half) and mostly negative since 2000 with an average of –0.23.

However, four countries had positive stock-bond correlations over 2000–21. These countries – Portugal, Italy, Ireland and Belgium – were among the countries most impacted by the Eurozone crisis in the early 2010s. During the crisis, concerns about bank solvency and even potential sovereign defaults negatively affected both bond and equity markets. During the subsequent recovery, stocks and bonds rose in tandem.

For every country featured in **Figure 75**, the stock-bond correlation estimated over 2000–21 is lower than the average of the correlations estimated over the longer intervals of 1900–49 and 1950–99. On average, the post-2000 stock-bond correlations are 0.66 lower. With a low correlation to equities, bonds offer significant diversification opportunities.

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Bonds as a hedge

The stock-bond correlation plays an important role in institutional portfolio construction. It is central to forming optimal portfolios, designing hedging strategies and assessing risk. Stock-bond correlations have now been mostly negative in major world markets for some 20 years. This negative correlation means that stocks and bonds have served as a hedge for each other, enabling investors to increase stock allocations while still satisfying a portfolio risk budget.

To illustrate the value of this hedge, we analyze the impact of different levels of stock-bond correlations on portfolio risk and Sharpe ratios. We assume an expected annualized real return of 0.5% on bonds and 4.0% on stocks – broadly in line with our estimates in Chapter 5. Similarly, we assume an annual standard deviation of 10% on bonds and 20% on equities.

Figure 76 shows the impact of varying the stock-bond correlation on both portfolio standard deviation (left-hand panel) and Sharpe ratio (right-hand panel). We examine regimes in which correlations are –0.3, broadly consistent with the period since 2000, zero and +0.3, which is broadly in line with the period from 1950 to 1999. The horizontal axis runs from a zero allocation to equities through to 100% in stocks.

Figure 76 shows that the different correlation regimes significantly impact volatility and the Sharpe ratio. Consider the case of an investment institution with a (lowish) risk budget of 10%. When the stock-bond correlation is –0.3, a 10% standard deviation could be achieved with 52% in equities and 48% in bonds. This would provide an expected return of 2.31% per annum and a Sharpe ration of 0.23.

If the correlation were to rise to zero, the stock allocation would need to fall to 40% to come within the risk budget. This would reduce the expected return to 1.90% p.a., a reduction of 41 basis points. However, if the correlation rose to its approximate 1950–99 average of +0.3, the equity allocation would need to be reduced to 21%. The expected return would decline to 1.24% p.a., a reduction of a further 66 basis points, while the Sharpe ratio would fall to 0.12.

Drivers of stock-bond correlations

The stock-bond correlation is clearly important, and the future of the stock-bond correlation therefore matters. While we cannot predict the future, we can seek to illuminate it by understanding what drives the correlation. To do this, we look at the theory and the results of empirical research. The aim is to understand what factors determine the stock-bond correlation.

The value of bonds depends on interest rates and the bond risk premium (the maturity premium plus any premium for credit risk). The value of stocks depends on expected cash flows and their likely growth, as well as interest rates and the equity risk premium. Stock and bond returns – and hence also the stock-bond correlation – arise from (unexpected) changes in these variables.

The interest rate is a common variable for both stocks and bonds as it impacts the discount rate. Other things equal, a rise in interest rates should lead to a fall in stock and bond prices and vice

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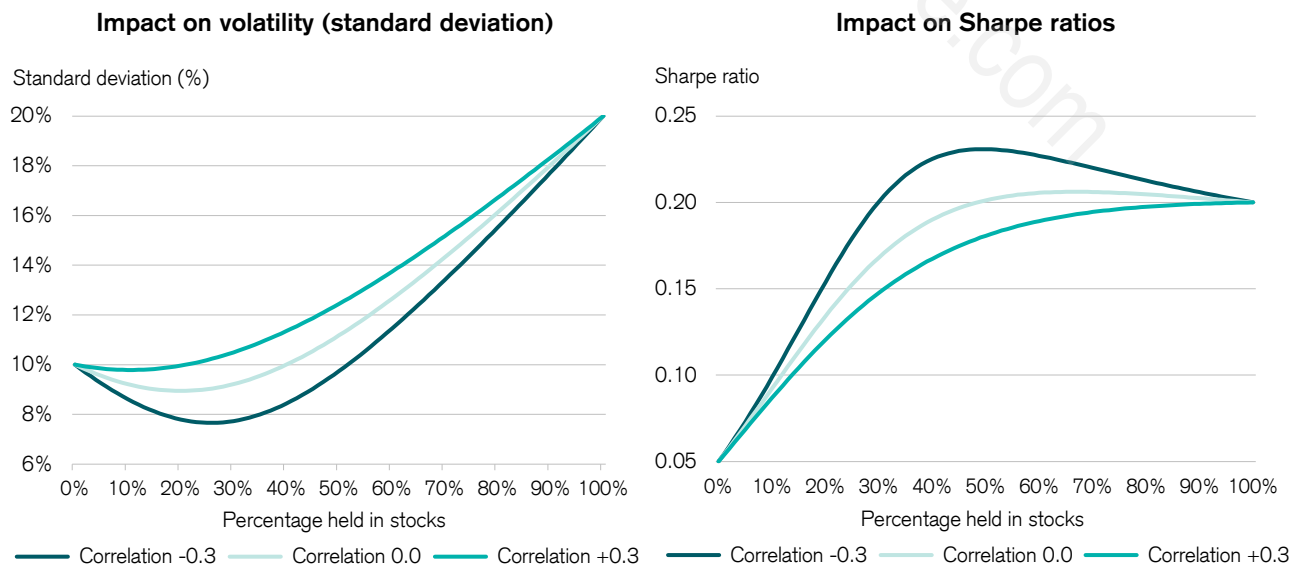
Figure 76: Stock-bond portfolio performance assuming different stock-bond correlations



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versa. This should lead to a positive correlation between stocks and bonds. The interest rate can be further decomposed into the real rate of interest and the inflation rate. Both stocks and bonds are sensitive to changes in real interest rates, but (nominal) bonds are far more sensitive to inflation as their payoffs are fixed in nominal terms (see Chapter 2). Companies have far more scope to adjust cash flows for the impact of inflation.

The common dependence of both stocks and bonds on interest rates helps explain why the stock-bond correlation was consistently positive between 1965 and 1997 during a period of large gyrations in real interest rates and expected inflation. Over this period, changes in real rates and expected inflation drove stock and bond returns in tandem (see Ilmanen, 2011). However, this does not explain the much lower/ negative correlations since the end of the 1990s.

However, other factors also matter. First, there is the interplay (covariance) between expected equity cash flows and interest rates. If these rise together, the stock-bond correlation will tend to be negative as stock prices alone benefit from the higher cash flows, but both stocks and bonds suffer from the higher interest rates. However, if they move in opposite directions, the stock-bond correlation will tend to be positive. Second, there is the interaction of the equity and bond risk premiums. If these move together, stock-bond correlations will tend to be positive, but, if they move in opposite directions, they will tend to be negative.

The main problem in seeking to understand the drivers of the stock-bond correlation is that there are many relationships in play, and hence a lot of "moving parts." Over any given period, some relationships may indicate lower correlations, while others will favor higher correlations. Furthermore, key variables, such as the expected future corporate cash flows and the equity and bond risk premiums, are not observable and have to be inferred. This is challenging for researchers, especially if the period in question in relatively brief.

What explains recent low correlations?

In recent years, much research has focused on why the sign of the stock-bond correlation flipped in the late 1990s. What was different about the period before and afterwards? From the late 1990s on, there were more frequent crises, including three major bear markets, much lower/falling real and nominal interest rates, far lower and more stable inflation, somewhat slower economic growth, a more accommodative monetary policy (especially from 2008), somewhat more volatile and lower real equity returns, and less volatile and higher real bond returns.

The period since the late 1990s is relatively short, making it hard to establish statistically significant results. Furthermore, when researchers are seeking to explain a change that dates from a specific point in time, there is a danger that data mining will find explanations that fit "in sample," but have no predictive ability.

Ilmanen (2003) argues that the stock-bond correlation is likely to be negative in a world of low and stable inflation as well as during financial crises. The latter is borne out by Connolly, Stivers and Sun (2005) and Baur and Lucey (2009) who show that flight-to-safety (FTS) episodes occur during market stress and are characterized by high stock market volatility, large negative equity returns, large positive bond returns and hence negative stock-bond correlations.

FTS episodes are driven by a rise in the equity risk premium and a fall in the bond risk premium. Baele, Bekaert, Ingelbrecht and Wei (2020) examine the years 1980–2015 and find that FTS episodes were less common before 1997, and highly prevalent thereafter. However, 94% of FTS episodes lasted less than three days, so this cannot be a full explanation for the longer period of negative stock-bond correlations.

Other researchers have focused on macroeconomic models and variables. Campbell, Pflueger and Viceira (2020) estimate that the correlation between the US output gap and inflation switched from negative to positive at the end of 2000. Higher inflation lowers real bond returns, while higher economic output raises stock returns, so this would explain the move to negative stock-bond correlations. The argument is that inflation has become procyclical, tending to increase in expansions, whereas, before 2001, it tended to increase in periods of lower output.

While plausible, macro models of this kind inevitably suffer from measurement issues. For example, the output gap is not measurable, so is proxied by detrended consumption, which in turn is proxying for expected corporate cash flow changes. Moreover, the results from macro models are typically only borderline significant.

Baele and Van Holle (2017) conclude that pure macro regimes explain relatively little of the variation in stock-bond correlations. Their research examines the impact of monetary policy. They conclude that stock-bond correlations tend to be strongly negative when monetary policy is accommodating, but only in times of low inflation. Irrespective of the inflation or output regime, stock-bond correlations turn positive as soon as monetary policy turns restrictive.

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Will stock-bond correlations stay negative?
The hedging properties of bonds have proved valuable to investors and the future of the stock-bond correlation clearly matters. The stock-bond correlation is manifestly not immutable. A key question therefore is whether negative correlations will persist. To answer this, we have looked at the evidence to try to understand what has caused the negative correlations.

Despite the volume of research, neither theory nor empirical studies point to a single or clear explanation for the negative stock-bond correlation. Those who claim to have found explanations largely replace one puzzle with another. For example, why have crises been more frequent or why has the correlation between the output gap and inflation changed signs?

Anticipating changes in the stock-bond correlation requires not only a clear understanding of the past (which we do not have), but also good forecasts of how the economy will move, how policymakers will react and how economic data will evolve in response to policy moves.

During 2021, there have been several occasions where stock and bond returns have moved in tandem, causing investor unease. Based on daily data, the US stock-bond correlation from the end of 2020 until early 2022 has been closer to zero at –0.09. The rapid resurgence of inflation in North America and Europe, greater inflation uncertainty and the prospect of less accommodative monetary policies add to a sense of impending regime change. This seems likely to impact the stock-bond correlation.

Historically, the long-run stock-bond correlation across countries from 1900 to 2021 has been +0.32. Based on a reading of the empirical evidence and the tea leaves of history, we would not recommend placing reliance on a continuation of negative stock-bond correlations.

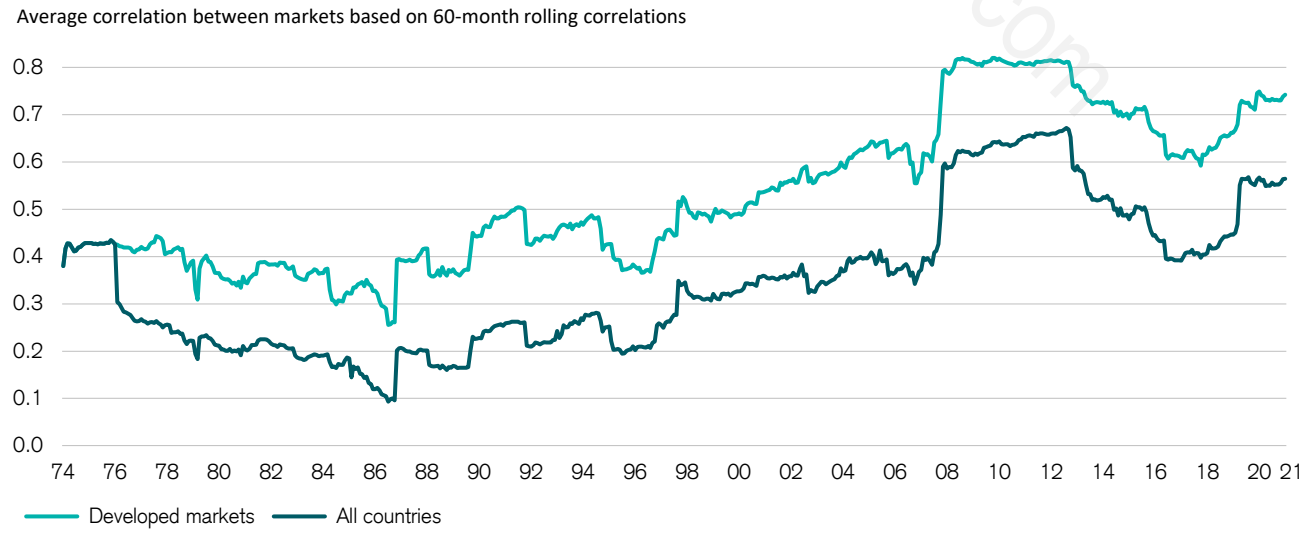
A return to positively correlated stock and bond returns and the loss of hedging benefits would require investors to rethink their asset allocation, portfolio risk and long-term capital market assumptions. Such a regime shift could also impact valuations, particularly of bonds, if investors prove less willing to pay for correlated portfolio assets and seek higher expected returns to compensate for greater cross-asset risk.

Diversification during crises

There is a concern that diversification across stocks and countries proves disappointing to investors just when they need it most – in times of crisis. Early evidence that this is the case is provided by Longin and Solnik (1995). They found that markets became more closely correlated during turmoil, thereby making diversification less effective. The episodes they highlighted were the 1974 oil shock, the October 1987 crash, the 1990 invasion of Kuwait and the ensuing Gulf War in 1991.

Figure 77 helps illustrate this. It shows the monthly average correlation between all possible pairs of countries' equity markets. The computations are based on returns for MSCI indices using the same set of 52 countries employed in **Figure 71** above. The initial estimate (on the left) is for December 1974,

Figure 77: Average correlations between equity markets over time, 1974–2021



Source: Dimson, Marsh and Staunton analysis using MSCI data. Not to be reproduced without express written permission of the authors.

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based on data for 1970–74, while the final estimate (on the right) is for December 2021. The darker of the two lines shows the average correlation between all pairs of markets, while the lighter line shows the average for developed markets only. Both lines in **Figure 77** show the secular upward trend in average correlations that we discussed earlier.

Both lines also show upward jumps that take place when a crisis hits. In addition to the episodes noted by Longin and Solnik, jumps can be seen at the time of the 1997 Asian financial crisis, the 1998 Russian debt default and LTCM, the Global Financial Crisis and the COVID-19 crisis. The largest jump was during the Global Financial Crisis when the average correlation across all countries rose from 0.38 to 0.59. The jumps tend to reverse themselves five years later, as the crisis months drop out of the computations. However, in some cases, new crises have arisen during the five years, which obfuscate the reversion.

In a subsequent paper, Longin and Solnik (2001) explore the relationship between correlation and volatility. Their results contradicted the then-established wisdom that international correlations are much higher in periods of market volatility. They show that correlation is not related to volatility per se, but to the market trend. They find that correlation increases in bear markets, but not in bull markets. While noteworthy, this is of little consolation to investors since it is bear markets that they are concerned with.

Do higher crisis correlations matter?
Das and Uppal (2004) confirm that systemic risk arises in crisis periods from the jumps that occur at the same time across countries. Furthermore, they verify that this does indeed reduce the gains from international diversification. However, their analysis leads them to conclude that the loss from reduced diversification is not substantial.

The cost of elevated correlations depends on their duration. Charts like **Figure 77** can give a misleading impression of lengthy periods of higher correlations. This is because they show rolling 60-month correlations, where the extreme returns from the crisis do not drop out of the estimation until 60 months later. The duration of higher correlations is clearly far shorter than this. Yet we cannot demonstrate this by estimating correlations between international stock markets using rolling 60-day estimates. This is because markets around the world are open at different times of the day and trading hours often do not even overlap.

There is evidence that the higher correlations arising from crises are quite short-lived. This comes from the research on FTS episodes (see Baele, Bekaert, Ingelbrecht and Wei (2020) and the discussion above). This is supported by the rapidity with which spikes in the VIX revert to the mean (see **Figure 45** and the associated discussion in Chapter 5). The extent to which international diversification can fail investors in a crisis is thus limited to quite short intervals, and then only if these coincide with the timing of realizations where the investor is effectively a forced seller. For long-term investors, the enhanced correlations are of less consequence.

Finally, we note that, while stock and country diversification may be less effective during immediate crisis periods, cross-asset correlation can be more effective. We have seen that the stock-bond correlation tends to be negative during crisis periods. This makes government bonds extremely valuable diversifiers that raise the power of portfolio diversification when most needed.

Concluding remarks

Diversification reduces risk. It allows investors either to earn the same expected return, with lower risk, or a higher expected return for the same level of risk. It is often described as a free lunch – or even the only free lunch in finance. However, diversification should be the default, so perhaps we should instead think of a failure to diversify as a self-imposed tax.

At the start of 2022, the winds of change are blowing, indeed gusting. It is therefore more important than ever to review portfolio diversification. Investors can easily be misled by claims that only 10 to 20 stocks are needed for a diversified portfolio. We have seen that far more are required for effective diversification, especially for a global portfolio.

The start of 2022 has brought an uptick in volatility, continued rises in inflation, the prospect of a decisive hiking cycle to cure this, and hence rising real and nominal interest rates, all accompanied by sector and factor rotation. The environment is therefore potentially more promising for active managers. We have seen that to exploit this would require more concentrated portfolios. Crucially, it also requires genuine stock selection and timing skills. Caution is required, as these skills are widely claimed, but rare in practice.

There is a compelling case for global diversification, especially at the current time. While we have seen that globalization has increased the extent to which markets move together, the potential risk reduction benefits from international diversification remain

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large. Global diversification can be oversold, however, if it is presented as a surefire route to a superior return-risk tradeoff. It should certainly lead to a higher *expected* level of return for risk, but this is not assured.

We have seen that over the last 50 years, global investment led to higher Sharpe ratios than domestic investment in the vast majority of countries. While there were few exceptions, one of these was the world's most important market, the USA, where investors would have been better off remaining in US stocks. This is a cautionary tale. It is a reminder that investment is subject to considerable uncertainty. Good investment decisions, based on sensible criteria, can sometimes have disappointing outcomes.

Prospectively, our advice to investors from all countries, including the USA, is that they should invest globally. This is very likely to reduce risk and increase the Sharpe ratio, but it is important to recognize that this is not guaranteed.

The benefits of global diversification are not uniform, however. Smaller countries often have concentrated stock markets that are dependent on a small number of business activities. Their stock markets are concentrated not only by company but also by sector. As we showed in the 2015 Yearbook, many countries have the majority of the value of their stock market invested in only three industrial sectors. As countries increasingly focus on specific sectors, globalization can leave them more – not less – exposed to success or disappointment.

When a large proportion of a nation's corporate earnings come from a particular natural resource, a specific manufacturing capability or a distinct technology, global diversification can ensure that investors are not solely reliant on its success. Investors in such countries have potentially much more to gain from international diversification than US investors, with their large, highly diversified domestic market.

The reduction in risk from international diversification is of particular value to investors whose portfolios have a pronounced home bias. Investors from emerging markets also have more to gain from international diversification than those from developed markets. For developed market investors, emerging markets continue to offer better diversification prospects than other developed markets.

Diversification across asset classes is also a powerful way of reducing portfolio risk. Our focus has been on diversification between the two most important asset classes, stocks, and bonds. Over the very long run the stock-bond correlation has averaged 0.32 across countries. This low correlation has provided good scope for risk reduction by diversifying across stocks and bonds.

Negative correlations are even better. Since the late 1990s, the predominantly negative stock-bond correlation has made stocks and bonds a hedge for each other. This has been of great value to investors. However, as we have seen, change is in the air. This negative correlation has been associated with a period of falling real interest rates, mostly accommodative monetary policy and generally low inflation.

We are now entering a different environment. The long-run behavior of the stock-bond correlation reveals that the mostly negative correlation over the last two decades has been the exception, not the rule. We therefore do not recommend placing reliance on a continuation of negative stock-bond correlations.

Finally, we have seen that correlations within and between equity markets tend to increase in bear markets and times of crisis. An oft-expressed worry is that diversification lets you down when you need it most. We have examined this concern, and concluded that for long-term investors, these short-term enhanced correlations should not be a major concern.

Furthermore, cross-asset correlations can offer compensation by being more effective during periods of turmoil. We have seen that the stock-bond correlation tends to be negative during crises. This makes government bonds valuable diversifiers that raise the power of portfolio diversification when it is needed most.

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Chapter 9: Individual markets

The Credit Suisse Global Investment Returns Yearbook covers 35 markets and five composite indexes, i.e. the world, the world ex-USA, Europe, developed markets and emerging markets. Twenty-three of the countries and all five composite indexes start in 1900. The other 12 markets, which have been added to the Yearbook over the last two years, start later than 1900, but have long histories ranging from 46 to 71 years. This chapter describes each of the markets and composite indexes, providing charts and tables summarizing the historical performance of stocks, bonds, bills, inflation and currencies.

Article intended for: Stanford Oderda#cre



Photo: Athens, Greece; Getty Images, George Pachantouris

The 35 markets and five composite indexes

The list of markets included in the Dimson-Marsh-Staunton (DMS) database – used in the Yearbook – has expanded over time, but was stable from 2015 until 2020, comprising 23 countries, all with a start date of 1900. These 23 countries represented 98% of world equity market capitalization at the start of 1900.

From the start of 2021, we have included a further 12 markets. Their investment returns start later than 1900, but all have long histories, ranging from 46 through to 71 years. The new markets are Argentina, Brazil, Chile, Greece, Hong Kong SAR, India, Malaysia, Mexico, Singapore, South Korea, Taiwan (Chinese Taipei) and Thailand.

Our 35 markets now represent 98.7% of the investable equity universe in 2022. They comprise two North American countries, four from Latin America, 17 European countries, one African country and 11 markets from Asia-Pacific. More details on their global coverage and the sizes of each market are provided in **Figure 1** and the accompanying discussion on page 7.

We also present five transnational markets or composite indexes. These are a world market index, a world index that excludes the USA, a Europe-only index, a developed markets index and an emerging markets index. These indexes are all expressed in US dollars. They have some special attributes that are described in the text on the first page of each of these composite indexes, and also in the data sources section (see below).

In addition to the 35 markets, and five composite indexes, we maintain annual data on equity returns, inflation and currencies for a further 55 markets. These countries have returns histories ranging from 12 years (ten is the minimum for inclusion) to 46 years. These countries are not described separately in this chapter, but all 90 markets are included in the five composite equity indexes.

The underlying annual returns for the DMS database are distributed as the DMS data module by Morningstar Inc.

Data sources

At the end of this chapter, we list our data sources for each market, covering equities, bonds, bills, currencies and inflation. The primary data sources are cited in the Reference list at the end of this book. Additional bibliographic references may be found in Triumph of the Optimists and in our chapter in The Handbook of the Equity Risk Premium, which is listed in the references as Dimson, Marsh, and Staunton (2007).

Our data series are comprehensive. We cover five assets in each of 35 markets and five composite indexes. Where possible, we use high-quality contemporary return indexes with a broad coverage. We link these to data from peer-reviewed academic research or, alternatively, highly rated professional studies. Often, we link together a sequence of indexes.

We choose the best available indexes for each period, switching when feasible to superior alternatives as these become available. The criteria for judging superiority are, first, index methodology (such as weighting scheme and free-float adjustment) and, second, the breadth of coverage of the index. All indexes incorporate reinvested income. Exchange rates are not described separately; where there is a choice of exchange rates, we use market rather than official rates.

Guide to markets and composite indexes

Markets are listed alphabetically, followed by the five composite indexes. There are three pages per market (only two for China and Russia, which have a break in their history). Each market section opens with a short historical overview and economic snapshot. We summarize the evolution of securities exchanges in each individual country/region and spotlight a few financial descriptors of the economy in more recent times. We compare the local stock market with other markets around the world, highlight industry sectors that are dominant, and identify prominent listed companies.

The first page for each market also includes an overview of long-term investment performance, encapsulated in two charts. The left-hand chart reports the annualized real returns on equities, bonds and bills. It covers three periods. The first period, shown in the left-hand set of bars, is the most recent 20 years. The second period, shown in the middle set of bars, is for the last 50 years (46 years for Thailand as that is the total history, and a shorter timespan for China and Russia, covering the period since their markets re-opened in the early 1990s). The third period depicted in the right-hand set of bars is for the longest period available. For 23 countries and the five composite indexes, this is the 122-year period since 1900.

The right-hand chart reports the annualized premiums achieved by equities relative to bonds and bills, by bonds relative to bills, and by the real exchange rate relative to the US dollar. It covers the second two periods described above, i.e. the last 50 years, and the longest period available.

The second page for each market shows a graph of the real (inflation-adjusted) returns achieved on equities, bonds, and bills, together with the real exchange rate against the US dollar, all based to a value of one at the start date of each series. The real exchange rate is defined as the nominal exchange rate against the dollar, adjusted by the inflation rate of the country relative to that of the USA.

The start date for 23 of the markets and all five composite indexes is 1900. The 12 new countries which have been added all have start dates later than this. For some of these markets, the bond series starts later than the equity series. When this occurs, the bond series is plotted from the point at which bond data becomes available, starting at a base value of one. The vertical axis for the chart varies from market to market and is shown on the left-hand side of the graph; the scale is logarithmic.

A summary table follows the chart. This provides an overview of the asset returns and risk premiums for that market. For both nominal and real (inflation-adjusted) asset returns and for three risk-premium series, we show the geometric and arithmetic mean return, the standard error of the arithmetic mean, the standard deviation and serial correlation of annual returns, and the lowest and highest annual return, together with the dates in which these extremes occurred.

We also show the lowest and highest 10-year returns, together with the end-year for those returns, as well as the rank of the most recent year's returns (where the highest return has rank 1, and the lowest, for a country with a complete history since 1900, has rank 122). These statistics are based on the entire period spanned by the market in question.

The third page for each market provides "return triangles" of the annualized real returns on each of the principal asset categories, the three premiums relating to equities, bonds, and bills, real and nominal exchange rates against the dollar, plus the annualized inflation rate.

For countries and composite indexes with a start date of 1900, these return triangles span all multiples of a decade from one to 12 decades, where the final "decade" is the 12-year period from 2010 to 2021. The "triangles" table presents returns over individual decades and returns to the end of 2021 from an initial investment made at the start of 1900, 1910, and so on to 2010.

The triangles are divided into two groups of five. The five lower triangular tables on the left (the unshaded triangles) are read from top to bottom; for instance, the annualized real return for Australian equities from the start of 1910 to the start of 1930 was 8.6%. The five (shaded) upper triangular tables on the right are read from left to right; for instance, the annualized equity premium versus bonds for Australia during 1910–70 was 6.9%.

The twelve new markets that we have introduced in 2021 and 2022 all have start dates later than 1900 and their start dates mostly do not fall on a decade boundary. For these markets, the first "decade" is therefore the period from their start date until the end of that decade. For example, Brazil has a start date of 1951, so that the first "decade" is the 9-year period from the start of 1951 until the end of 1959. For eight of the 12 new countries, the bond series starts later than the equity series. In these cases, the triangles for the bond series and for series derived from bonds all begin at the bond series start date.

Note that there is no triangles page for China or Russia since both have material breaks in their returns series. These countries occupy just two pages. All other countries follow the three-page format described above.

Data enhancements

We follow a policy of continuous improvement with our data sources, introducing new countries where this becomes feasible, and switching to superior index series as they become available or when we become aware of them. As noted above, in the 2021 and 2022 Yearbooks, we have added 12 new markets, all with start dates later than 1900, but all with substantial returns histories. We have also added two new composite indexes, one for developed markets and one for emerging markets. These are all described fully in the relevant sections below.

In addition, we have made minor revisions to our US equity data to include the latest updates to the Center for Research in Security Prices (CRSP) data.

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Argentina



Argentina ranks 49th (between Oman and Russia) in the latest UN Human development Index. It is the largest Spanish-speaking nation in the world by area and is South America's second-largest economy after Brazil. The country has a diverse industrial base and abundant natural resources. Before the Great Depression of the 1930s, it was among the ten richest economies in the world. Subsequently, the country descended into political instability, social disruption, debt and economic decline.

Argentina has suffered decades of stagnant productivity and poor economic growth, accompanied by high inflation and frequent sovereign debt defaults. In 2001, it suffered the largest government bankruptcy in history.

The Buenos Aires Stock Exchange was founded in 1854 as the successor of the Banco Mercantil, which was founded in 1822. There are over 100 companies listed on the exchange, denominated in Argentine pesos.

In 2020, FTSE Russell announced that Argentina would no longer be classified as a frontier market after failing to remove capital controls on international institutional investors introduced in 2019. In 2021, only three years after MSCI raised the country's shares from frontier to emerging-market status, it downgraded Argentina to "standalone" status, making it now an unclassified market.

Our data for Argentina starts in 1960, except for bonds, which begin in 1992.

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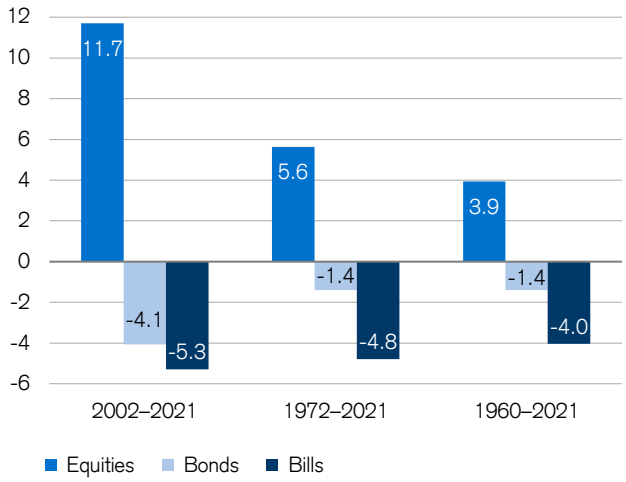
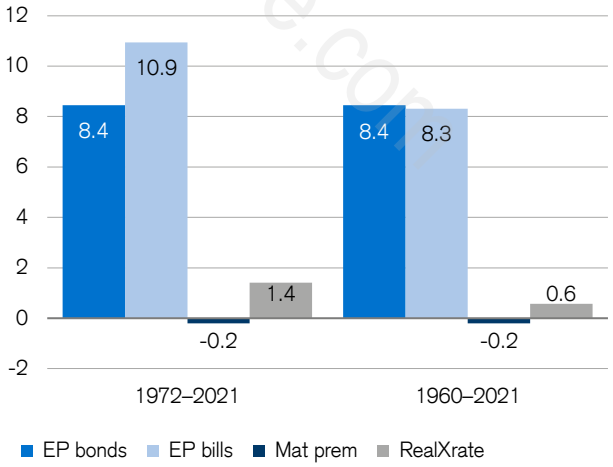
Figure 1: Annualized real returns and risk premiums (%) for Argentina, 1960–2021 (bonds from 1992)



Note: The three asset classes are equities, long-term government bonds, and Treasury bills. All returns include reinvested income, are adjusted for inflation, and are expressed as geometric mean returns.



Note: EP bonds and EP bills denote the equity premium relative to bonds and to bills; Mat prem denotes the maturity premium for bonds relative to bills; RealXRate denotes the inflation-adjusted change in the exchange rate against the US dollar.

Source: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

Figure 2: Real returns on Argentine asset classes, 1960–2021 (bonds from 1992)

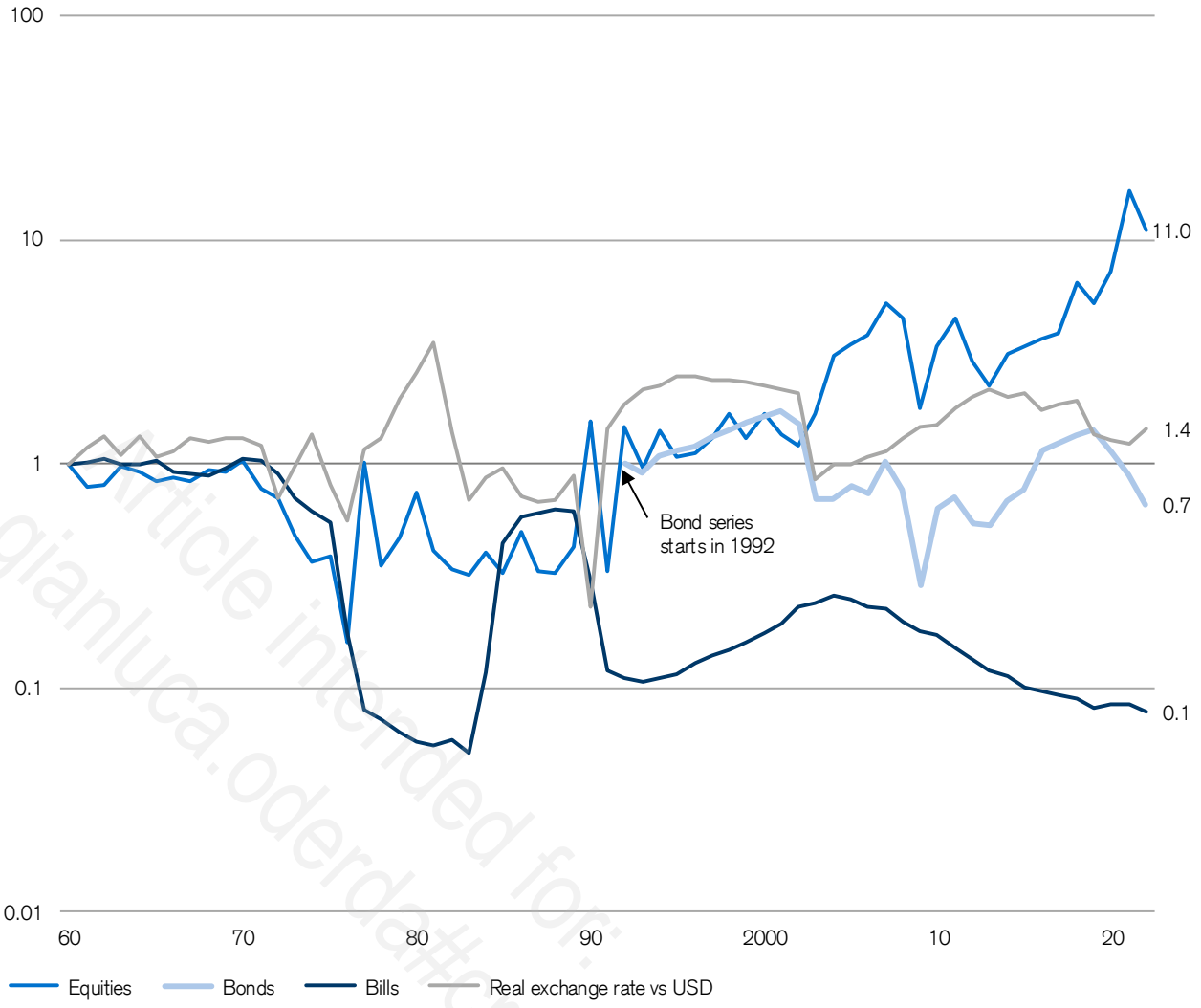


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Table 1: Returns on Argentine asset classes, 1960–2021 (bonds from 1992)

		Mean returns % p.a.					Annual returns %				10-year returns % p.a.				Current
Return	Asset	GM	AM	SE	SD	SC	Lowest		Highest		Lowest		Highest		year rank
Nominal	Equities	76.3	428.0	292.8	2305	0.01	–50.9	2008	18046	1989	0.5	2001	523.9	1991	52
	Bonds	16.4	21.8	7.1	38.7	0.08	–53.9	2008	156.2	2009	–6.3	2008	50.8	2018	15
	Bills	62.7	159.2	61.5	484.2	0.40	2.8	2004	2871	1984	9.1	2012	495.1	1990	20
	Inflation	69.6	178.8	82.1	646.3	0.30	–1.8	1999	4924	1989	2.6	2001	451.1	1990	21
Real	Equities	3.9	22.2	11.9	93.5	–0.30	–78.5	1990	538.1	1976	–15.6	1975	17.9	1997	56
	Bonds	–1.4	3.4	5.9	32.3	–0.12	–62.6	2008	119.8	2009	–15.4	2008	17.4	2018	30
	Bills	–4.0	1.4	5.5	42.9	0.48	–68.3	1975	277.1	1984	–25.5	1980	25.7	1988	44
	Exchange rate	0.6	10.5	9.1	71.9	–0.10	–73.7	1989	524.8	1990	–21.3	1989	25.4	1999	17
Premiums	Equities vs bills	8.3	42.5	24.2	190.3	–0.09	–78.8	1984	1297	1976	–27.1	1986	36.1	1997	55
	Equities vs bonds	8.4	17.1	10.3	56.4	0.15	–28.6	2015	202.4	2002	–5.9	2001	23.0	2010	23
	Bonds vs bills	–0.2	4.9	6.2	34.1	0.03	–58.5	2008	126.7	2009	–16.3	2008	26.8	2018	27

GM=geometric mean; AM=arithmetic mean, SE=standard error of mean; SD=standard deviation; SC=serial correlation; 10-year returns to end of given year.
Source: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

Table 2: Argentine real returns, inflation and premiums, 1960–2021 (bonds from 1992)

	1 Jan	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000	2010	2022	
Real equity total returns	**1900**														**Equity premium vs bonds**
	1910														
	1920														
	1930														
	1940														
	1950														
	1960														
	1970							0.4							
	1980							−1.5	−3.3						
	1990							1.5	2.0	7.6		−4.3	7.4	8.4	
	2000							1.3	1.6	4.2	0.8		17.8	13.5	
	2010							2.5	3.0	5.2	4.0	7.2		10.0	
	2022							3.9	4.6	6.6	6.3	8.9	10.3		
Real equity capital gains	**1900**														**Equity premium vs bills**
	1910														
	1920														
	1930														
	1940														
	1950														
	1960								−0.1	13.7	5.6	5.8	6.1	8.3	
	1970							−3.5		29.4	8.6	7.9	7.7	10.0	
	1980							−5.4	−7.1		−8.9	−1.5	1.4	5.9	
	1990							−1.9	−1.1	5.4		6.4	6.9	10.9	
	2000							−1.8	−1.3	1.8	−1.7		7.4	13.0	
	2010							−0.5	0.2	2.8	1.5	4.8		18.0	
	2022							1.2	2.1	4.5	4.2	7.0	8.8		
Real bonds	**1900**														**Bond maturity premium**
	1910														
	1920														
	1930														
	1940														
	1950														
	1960														
	1970														
	1980														
	1990											0.4	−4.9	−0.2	
	2000										6.3		−8.9	−0.4	
	2010										−2.5	−9.0		7.2	
	2022										−1.4	−4.1	0.3		
Real bills	**1900**														**Inflation**
	1910														
	1920														
	1930														
	1940														
	1950														
	1960								21.6	60.5	126.3	101.6	79.5	69.6	
	1970							0.5		112.0	208.7	138.7	97.8	80.8	
	1980							−13.3	−25.2		349.4	153.3	93.3	74.1	
	1990							−3.9	−6.1	18.0		42.7	26.8	29.4	
	2000							−4.3	−5.8	5.7	−5.3		12.6	23.8	
	2010							−3.5	−4.4	3.7	−2.7	−0.1		33.9	
	2022							−4.0	−4.9	0.7	−4.2	−3.6	−6.5		
Real exchange rate vs USD	**1900**														**Exchange rate vs USD**
	1910														
	1920														
	1930														
	1940														
	1950														
	1960								−13.4	−31.5	−55.8	−47.2	−41.5	−38.5	
	1970							2.6		−45.8	−68.4	−55.2	−47.0	−42.4	
	1980							4.8	7.0		−81.6	−59.2	−47.4	−41.6	
	1990							−4.8	−8.3	−21.3		−9.6	−11.1	−16.2	
	2000							2.0	1.8	−0.7	25.4		−12.5	−19.0	
	2010							0.8	0.3	−1.8	9.8	−3.9		−24.0	
	2022							0.6	0.2	−1.4	5.8	−2.0	−0.4		

Source: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

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Australia



Australia is often described as "The Lucky Country" with reference to its natural resources, weather and distance from problems elsewhere in the world. But maybe Australians make their own luck.

Services make up a large part of the Australian economy, representing three-quarters of GDP. With a strong banking system, the country was relatively untouched by the Global Financial Crisis and was supported by strong demand for resources from China and other Asian nations. Australia is the world's largest exporter of coal, iron ore, lead, rutile and zinc; the second largest of gold and uranium and the third largest of aluminum.

Whether it is down to economic management, a resource advantage or a generous spirit, Australia has in real local currency terms been the world's best-performing equity market over the past 122 years, while in common-currency (USD) terms, it is second-ranked, after the USA. Since 1900, the Australian stock market has achieved an annualized real local-currency return of 6.8% per year and a real USD return of 6.6% per year.

Australia is the world's ninth-largest equity market. Some 41% of the FTSE World Australia index is represented by banks (24%) and basic materials (17%, predominantly mining). The largest stocks at the start of 2022 were Commonwealth Bank of Australia (9% of the index), CSL (8%) and BHP (7%), followed by National Australia Bank, Westpac Banking Corporation, and Australia & New Zealand Banking Group.

Australia also has a significant government and corporate bond market and is home to the largest financial futures and options exchange in the Asia-Pacific region.

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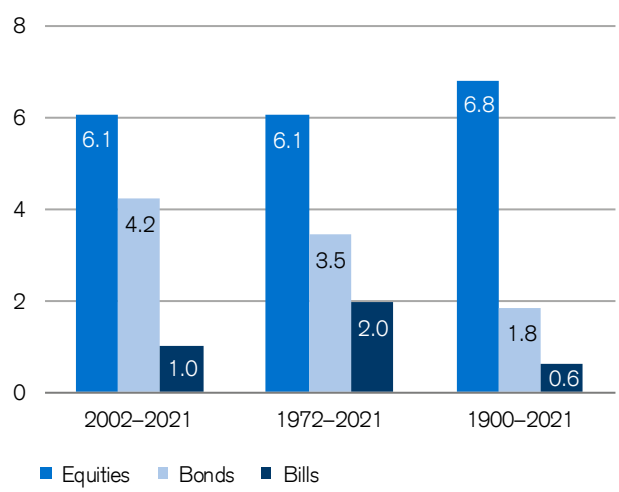
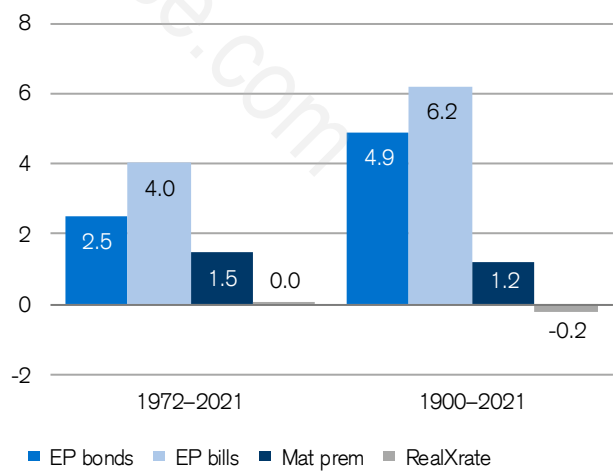
Figure 69: Annualized real returns and risk premiums (%) for Australia, 1900–2021



Note: The three asset classes are equities, long-term government bonds, and Treasury bills. All returns include reinvested income, are adjusted for inflation, and are expressed as geometric mean returns.



Note: EP bonds and EP bills denote the equity premium relative to bonds and to bills; Mat prem denotes the maturity premium for bonds relative to bills; RealXRate denotes the inflation-adjusted change in the exchange rate against the US dollar.

Source: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

Figure 70: Real returns on Australian asset classes, 1900–2021

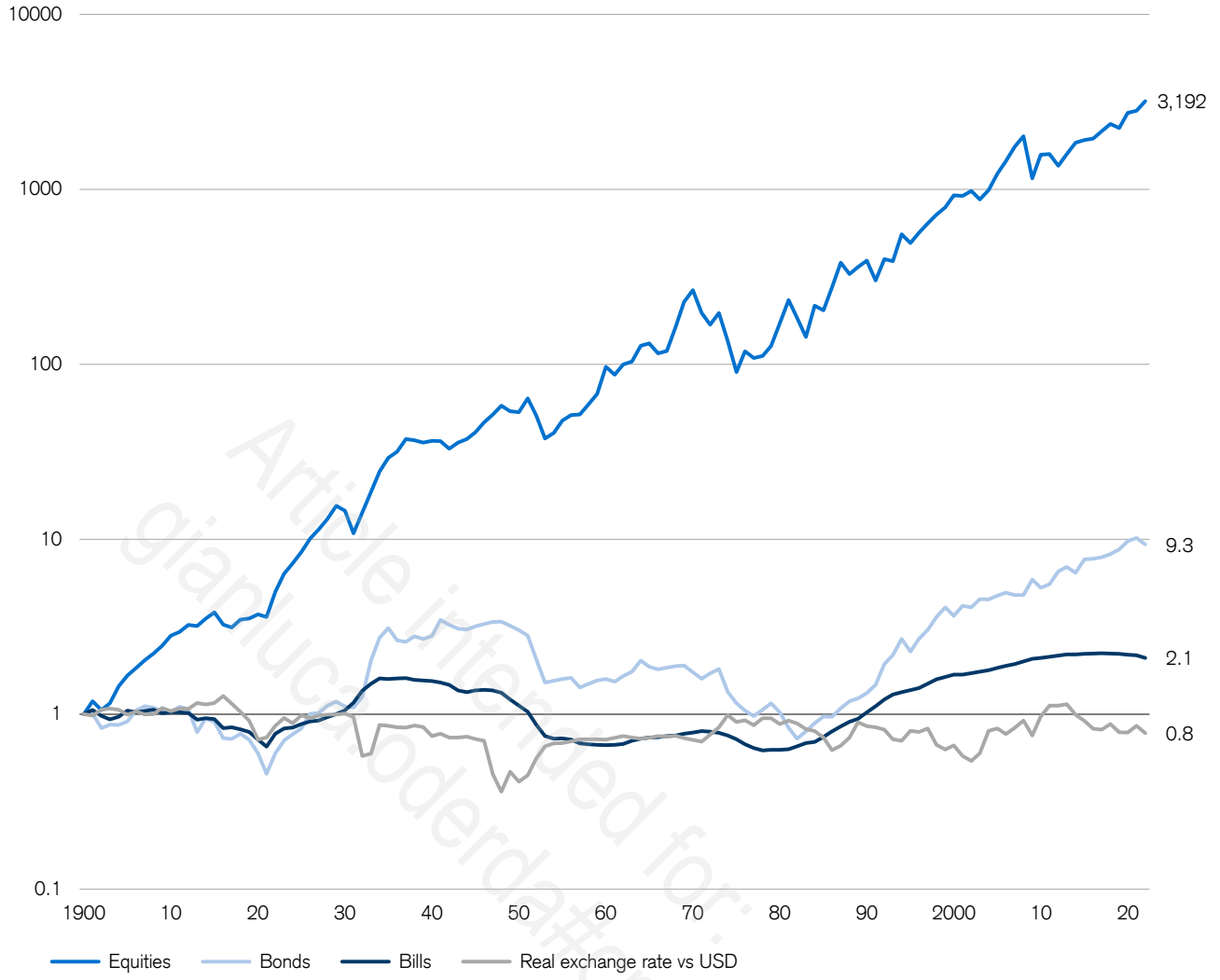


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Table 14: Returns on Australian asset classes, 1900–2021

		Mean returns % p.a.					Annual returns %				10-year returns % p.a.				Current
Return	**Asset**	**GM**	**AM**	**SE**	**SD**	**SC**	**Lowest**		**Highest**		**Lowest**		**Highest**		**year rank**
Nominal	Equities	10.8	12.1	1.6	17.2	–0.12	–40.4	2008	66.8	1983	1.7	1974	23.7	1986	41
	Bonds	5.6	6.2	1.0	11.5	0.12	–19.1	1973	53.8	1932	–1.9	1920	18.3	1991	106
	Bills	4.3	4.4	0.3	3.9	0.94	0.0	2021	17.3	1989	0.9	1957	14.3	1990	122
	Inflation	3.7	3.8	0.5	5.0	0.54	–12.6	1921	19.3	1951	–2.2	1933	11.4	1983	50
Real	Equities	6.8	8.3	1.6	17.4	–0.05	–42.5	2008	51.5	1983	–5.6	1978	16.0	1928	48
	Bonds	1.8	2.7	1.2	13.1	0.26	–26.6	1951	62.2	1932	–8.4	1920	14.1	1934	103
	Bills	0.6	0.7	0.5	5.2	0.59	–15.5	1951	18.5	1921	–6.7	1956	6.8	1993	102
	Exchange rate	–0.2	0.5	1.0	11.5	0.08	–40.1	1931	46.0	1933	–8.3	1947	7.6	2011	105
Premiums	Equities vs bills	6.2	7.5	1.5	16.2	–0.12	–44.4	2008	49.2	1983	–3.6	1978	13.3	1928	24
	Equities vs bonds	4.9	6.4	1.6	17.9	–0.08	–53.3	2008	66.3	1980	–5.0	1996	13.2	1959	20
	Bonds vs bills	1.2	1.8	0.9	10.5	0.06	–23.3	1973	48.2	1932	–6.6	1982	9.3	1940	97

GM=geometric mean; AM=arithmetic mean, SE=standard error of mean; SD=standard deviation; SC=serial correlation; 10-year returns to end of given year.
Source: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

Table 15: Australian real returns, inflation and premiums, 1900–2021

	1 Jan	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000	2010	2022	
Real equity total returns	**1900**		10.5	9.6	9.0	6.6	5.9	7.1	7.4	6.6	6.5	5.7	5.3	4.9	**Equity premium vs bonds**
	1910	10.9		8.6	8.2	5.4	4.8	6.4	6.9	6.1	6.0	5.2	4.8	4.4	
	1920	6.8	2.9		7.7	3.8	3.5	5.9	6.6	5.6	5.7	4.7	4.4	4.0	
	1930	9.3	8.6	14.6		0.0	1.5	5.3	6.3	5.2	5.3	4.3	4.0	3.6	
	1940	9.4	8.9	12.1	9.7		3.0	8.0	8.5	6.6	6.4	5.1	4.6	4.1	
	1950	8.3	7.6	9.3	6.7	3.8		13.2	11.4	7.8	7.3	5.5	4.8	4.2	
	1960	7.9	7.3	8.5	6.5	5.0	6.2		9.6	5.2	5.4	3.6	3.2	2.8	
	1970	8.3	7.9	8.9	7.5	6.8	8.4	10.6		1.0	3.4	1.7	1.7	1.6	
	1980	6.6	6.1	6.6	5.1	3.9	4.0	2.9	−4.2		5.8	2.1	1.9	1.7	
	1990	6.9	6.4	6.9	5.6	4.9	5.1	4.8	2.0	8.6		−1.5	0.1	0.5	
	2000	7.1	6.6	7.1	6.1	5.5	5.9	5.8	4.2	8.8	9.0		1.7	1.4	
	2010	6.9	6.5	7.0	6.0	5.5	5.8	5.7	4.6	7.7	7.2	5.5		1.2	
	2022	6.8	6.5	6.8	6.0	5.6	5.9	5.8	4.9	7.2	6.8	5.8	6.0		
Real equity capital gains	**1900**		10.6	8.6	9.1	8.2	8.0	8.6	8.7	7.3	6.8	6.5	6.2	6.2	**Equity premium vs bills**
	1910	5.3		6.6	8.4	7.4	7.4	8.3	8.4	6.8	6.4	6.1	5.8	5.8	
	1920	1.1	−3.1		10.3	7.9	7.7	8.7	8.7	6.8	6.3	6.0	5.7	5.7	
	1930	3.1	2.0	7.3		5.5	6.4	8.2	8.3	6.2	5.7	5.4	5.1	5.2	
	1940	3.5	3.0	6.1	4.9		7.2	9.5	9.3	6.3	5.7	5.4	5.1	5.2	
	1950	2.7	2.1	3.9	2.2	−0.5		11.8	10.3	6.0	5.3	5.0	4.7	4.9	
	1960	2.5	1.9	3.2	1.9	0.4	1.2		8.8	3.2	3.3	3.4	3.3	3.9	
	1970	2.8	2.3	3.5	2.5	1.7	2.9	4.6		−2.0	0.6	1.6	2.0	2.9	
	1980	1.0	0.4	1.0	−0.2	−1.5	−1.8	−3.3	−10.6		3.3	3.5	3.4	4.2	
	1990	1.3	0.8	1.4	0.4	−0.4	−0.4	−1.0	−3.6	4.0		3.7	3.5	4.4	
	2000	1.6	1.2	1.8	1.0	0.4	0.6	0.4	−0.9	4.3	4.6		3.2	4.7	
	2010	1.6	1.3	1.7	1.1	0.5	0.7	0.6	−0.4	3.3	3.0	1.4		6.0	
	2022	1.6	1.3	1.8	1.2	0.7	0.9	0.8	0.1	2.9	2.6	1.6	1.8		
Real bonds	**1900**		0.0	−0.9	0.2	1.5	2.0	1.5	1.1	0.6	0.3	0.8	0.8	1.2	**Bond maturity premium**
	1910	0.3		−1.8	0.2	2.0	2.5	1.7	1.3	0.7	0.3	0.9	0.9	1.3	
	1920	−2.5	−5.3		2.4	3.9	4.0	2.7	2.0	1.1	0.6	1.2	1.2	1.7	
	1930	0.3	0.4	6.4		5.5	4.8	2.8	1.9	0.9	0.3	1.0	1.1	1.6	
	1940	2.6	3.4	8.0	9.7		4.1	1.4	0.7	−0.2	−0.7	0.3	0.5	1.1	
	1950	2.2	2.7	5.6	5.2	0.8		−1.3	−1.0	−1.7	−1.8	−0.4	−0.1	0.7	
	1960	0.8	0.9	2.5	1.2	−2.8	−6.3		−0.7	−1.8	−2.0	−0.2	0.1	1.0	
	1970	0.8	0.9	2.2	1.1	−1.6	−2.7	0.9		−3.0	−2.7	−0.1	0.3	1.3	
	1980	0.0	0.0	0.9	−0.2	−2.5	−3.5	−2.2	−5.1		−2.4	1.4	1.4	2.4	
	1990	0.3	0.3	1.1	0.3	−1.5	−2.0	−0.6	−1.4	2.6		5.3	3.4	3.9	
	2000	1.3	1.4	2.3	1.7	0.4	0.4	2.1	2.5	6.6	10.7		1.5	3.3	
	2010	1.5	1.6	2.5	2.0	0.9	0.9	2.4	2.8	5.6	7.2	3.8		4.8	
	2022	1.8	2.0	2.7	2.3	1.5	1.6	2.9	3.3	5.4	6.3	4.4	4.8		
Real bills	**1900**		1.3	3.6	2.4	1.5	2.1	2.8	2.8	3.6	4.1	3.9	3.9	3.7	**Inflation**
	1910	0.3		6.0	2.9	1.6	2.3	3.1	3.0	3.9	4.5	4.2	4.1	3.9	
	1920	−1.6	−3.5		0.0	−0.5	1.1	2.4	2.4	3.6	4.3	4.0	3.9	3.7	
	1930	0.2	0.1	3.9		−1.0	1.7	3.2	3.0	4.4	5.0	4.6	4.4	4.1	
	1940	1.1	1.4	3.9	3.9		4.6	5.5	4.4	5.7	6.3	5.6	5.2	4.8	
	1950	0.2	0.2	1.5	0.3	−3.2		6.4	4.4	6.1	6.7	5.8	5.4	4.8	
	1960	−0.7	−0.9	−0.2	−1.5	−4.1	−5.1		2.5	6.0	6.8	5.7	5.2	4.6	
	1970	−0.3	−0.4	0.2	−0.7	−2.2	−1.8	1.7		9.8	9.1	6.8	5.8	5.0	
	1980	−0.6	−0.7	−0.2	−1.0	−2.2	−1.9	−0.3	−2.2		8.4	5.3	4.6	3.9	
	1990	0.0	0.0	0.5	0.0	−0.8	−0.2	1.4	1.3	5.1		2.3	2.7	2.5	
	2000	0.5	0.6	1.1	0.7	0.1	0.8	2.3	2.6	5.1	5.1		3.2	2.6	
	2010	0.7	0.7	1.2	0.9	0.4	1.0	2.3	2.5	4.1	3.6	2.2		2.1	
	2022	0.6	0.6	1.1	0.8	0.4	0.9	1.9	1.9	2.9	2.3	1.0	0.0		
Real exchange rate vs USD	**1900**		0.1	−1.2	0.0	−1.0	−1.8	−1.3	−1.1	−1.0	−1.2	−1.3	−0.9	−1.0	**Exchange rate vs USD**
	1910	0.4		−2.5	−0.1	−1.3	−2.3	−1.5	−1.3	−1.1	−1.4	−1.4	−1.0	−1.1	
	1920	−1.6	−3.7		2.5	−0.7	−2.2	−1.3	−1.0	−0.9	−1.2	−1.3	−0.8	−0.9	
	1930	0.0	−0.2	3.5		−3.9	−4.5	−2.5	−1.9	−1.5	−1.8	−1.8	−1.2	−1.3	
	1940	−0.7	−1.1	0.2	−2.9		−5.1	−1.8	−1.2	−0.9	−1.4	−1.5	−0.8	−1.0	
	1950	−1.8	−2.3	−1.8	−4.4	−5.9		1.6	0.8	0.5	−0.5	−0.7	−0.1	−0.4	
	1960	−0.6	−0.7	0.0	−1.1	−0.2	5.7		0.0	−0.1	−1.2	−1.3	−0.4	−0.7	
	1970	−0.5	−0.6	0.0	−0.9	−0.2	2.8	−0.1		−0.1	−1.7	−1.8	−0.5	−0.8	
	1980	−0.2	−0.2	0.3	−0.3	0.4	2.6	1.0	2.1		−3.3	−2.6	−0.7	−1.0	
	1990	−0.2	−0.2	0.3	−0.3	0.3	1.8	0.6	0.9	−0.3		−1.9	0.7	−0.3	
	2000	−0.4	−0.5	−0.1	−0.6	−0.2	1.0	−0.2	−0.2	−1.4	−2.5		3.2	0.5	
	2010	0.0	−0.1	0.3	0.0	0.4	1.4	0.6	0.8	0.3	0.6	3.9		−1.8	
	2022	−0.2	−0.3	0.1	−0.3	0.0	0.9	0.1	0.2	−0.3	−0.3	0.7	−1.8		

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Austria



The Austrian Empire was re-formed in the 19th century into Austria-Hungary, which, by 1900, was the second-largest country in Europe, after Russia. It comprised modern-day Austria, Bosnia-Herzegovina, Croatia, The Czech Republic, Hungary, Slovakia, Slovenia, large parts of Romania and Serbia, and small parts of Italy, Montenegro, Poland, and Ukraine. At the end of World War I and the break-up of the Habsburg Empire, the First Austrian Republic was established. Although Austria did not pay reparations after World War I, the country suffered hyperinflation during 1921–22.

In 1938, Austria was annexed by Germany and ceased to exist as an independent country until after World War II. In 1955, Austria became a self-governing sovereign state again, and was admitted as a member of the European Union in 1995 and of the Eurozone in 1999. Today, Austria is prosperous, enjoying a high per capita GDP.

Bonds were traded on the Wiener Börse from 1771 and shares from 1818 onward. Trading was interrupted by the world wars and, after the stock exchange reopened in 1948, share trading was sluggish and there was not a single IPO in the 1960s or 1970s. The Exchange's activity expanded from the mid-1980s onward, building on Austria's gateway to Eastern Europe. Still, over the last 122 years, real stock-market returns (1.1% per year) have been lower for Austria than for any other country with a continuous record from 1900 to date.

Financials represent almost half (43%) of the FTSE World Austria index. At the start of 2022, the largest Austrian company was Erste Group Bank (34% of the index), followed by OMV, Verbund and Voestalpine.

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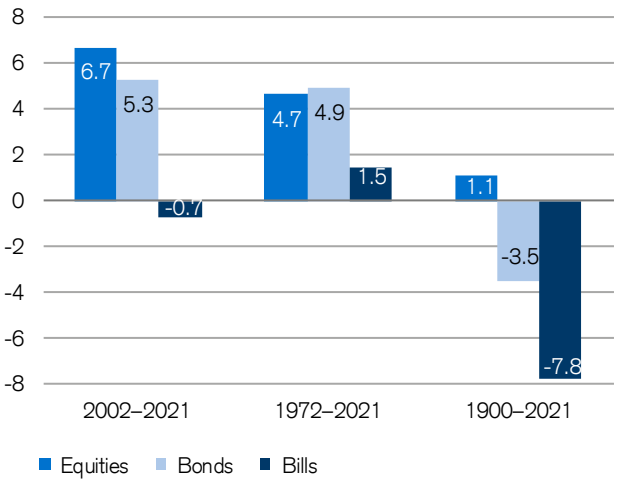
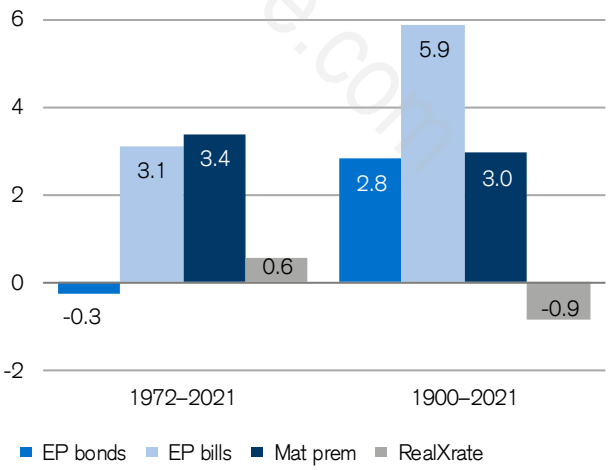
Figure 71: Annualized real returns and risk premiums (%) for Austria, 1900–2021



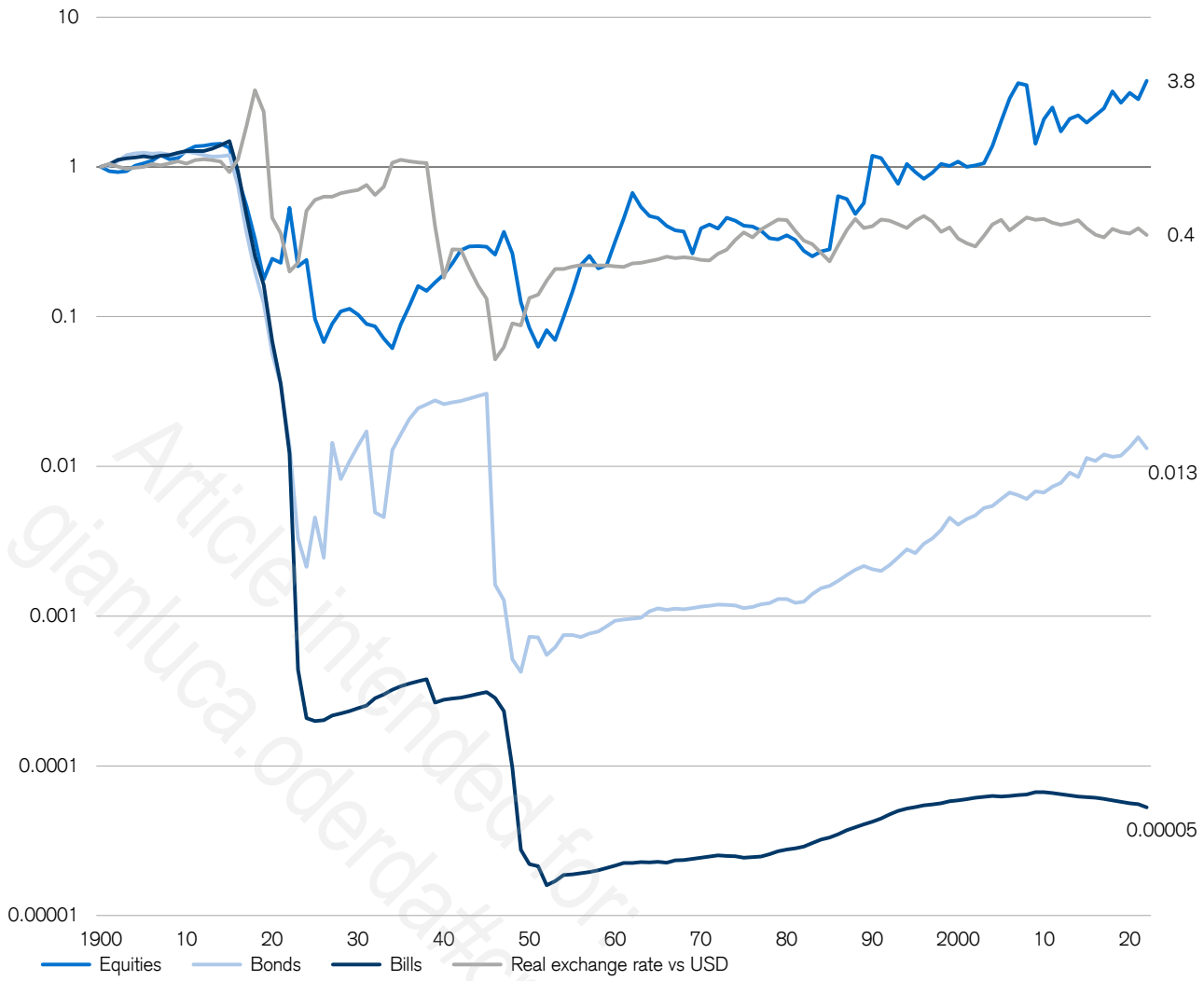
Note: The three asset classes are equities, long-term government bonds, and Treasury bills. All returns include reinvested income, are adjusted for inflation, and are expressed as geometric mean returns.



Note: EP bonds and EP bills denote the equity premium relative to bonds and to bills; Mat prem denotes the maturity premium for bonds relative to bills; RealXRate denotes the inflation-adjusted change in the exchange rate against the US dollar.

The three premiums exclude the years 1921–22. Source: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

Figure 72: Real returns on Austrian asset classes, 1900–2021



Sources: Elroy Dimson, Paul Marsh, and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

Table 16: Returns on Austrian asset classes, 1900–2021 (premiums exclude the years 1921 and 1922)

		Mean returns % p.a.					Annual returns %				10-year returns % p.a.				Current
Return	Asset	GM	AM	SE	SD	SC	Lowest		Highest		Lowest		Highest		year rank
Nominal	Equities	13.4	28.2	10.7	118.6	0.49	–58.8	2008	1109	1922	–10.3	1933	113.2	1923	22
	Bonds	8.3	18.1	6.7	74.5	–0.04	–94.0	1945	616.1	1922	–23.4	1948	67.0	1926	118
	Bills	3.5	4.0	0.7	7.6	0.13	–65.5	1948	12.5	1924	–7.2	1949	8.7	1985	119
	Inflation	12.2	35.6	23.7	261.4	0.11	–4.7	1953	2877	1922	–0.8	1939	159.4	1924	36
Real	Equities	1.1	5.2	2.8	30.4	0.03	–59.6	1924	132.7	1921	–23.1	1924	23.5	1961	20
	Bonds	–3.5	4.7	4.8	52.9	–0.08	–94.7	1945	484.8	1926	–46.8	1923	23.8	1935	105
	Bills	–7.8	–4.0	1.6	18.1	0.78	–96.4	1922	12.2	1931	–59.0	1924	5.8	1935	106
	Exchange rate	–0.9	2.1	2.1	23.3	0.25	–80.4	1919	122.7	1923	–26.3	1945	15.6	1955	101
Premiums	Equities vs bills	5.9	10.5	3.4	36.7	0.08	–60.8	2008	223.9	1919	–16.4	1933	39.9	1923	18
	Equities vs bonds	2.8	21.0	13.7	150.3	0.02	–81.1	1924	1572	1945	–27.0	1933	56.8	1947	11
	Bonds vs bills	3.0	10.0	4.7	51.0	–0.10	–94.2	1945	442.3	1926	–22.5	1947	35.5	1926	114

GM=geometric mean; AM=arithmetic mean, SE=standard error of mean; SD=standard deviation; SC=serial correlation; 10-year returns to end of given year.
Source: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

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Table 17: Austrian real returns, inflation and premiums, 1900–2021

	1 Jan	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000	2010	2022	
Real equity total returns	**1900**		0.2	7.6	–1.0	–0.8	5.2	6.3	5.3	4.3	4.7	3.4	3.2	2.8	**Equity premium vs bonds**
	1910	2.6		15.5	–1.7	–1.2	6.6	7.6	6.2	4.9	5.3	3.8	3.5	3.1	
	1920	–6.8	–15.4		–19.6	–9.4	3.6	5.6	4.4	3.2	3.9	2.4	2.3	1.9	
	1930	–7.3	–11.9	–8.2		–0.2	14.6	13.6	10.0	7.4	7.5	5.2	4.8	4.0	
	1940	–4.1	–6.2	–1.2	6.4		31.7	21.2	13.6	9.4	9.1	6.2	5.5	4.6	
	1950	–4.8	–6.6	–3.5	–1.0	–7.9		11.4	5.5	2.8	4.1	1.7	1.7	1.3	
	1960	–1.9	–2.8	0.7	3.8	2.6	14.2		–0.1	–1.2	1.8	–0.6	–0.2	–0.3	
	1970	–1.3	–2.0	0.9	3.4	2.4	7.9	2.0		–2.2	2.7	–0.8	–0.2	–0.3	
	1980	–1.3	–1.8	0.6	2.5	1.5	4.9	0.5	–1.1		8.0	0.0	0.5	0.1	
	1990	0.2	–0.1	2.3	4.2	3.7	6.8	4.5	5.8	13.0		–7.5	–3.0	–2.2	
	2000	0.1	–0.2	1.9	3.4	2.9	5.2	3.1	3.5	5.8	–0.9		1.6	0.3	
	2010	0.7	0.5	2.4	3.8	3.5	5.5	3.8	4.3	6.1	2.9	6.8		–0.8	
	2022	1.1	1.0	2.7	4.0	3.7	5.4	4.1	4.5	5.8	3.7	5.8	5.0		
Real equity capital gains	**1900**		0.1	6.5	6.3	6.0	8.5	9.5	8.2	6.8	6.9	5.8	5.7	5.9	**Equity premium vs bills**
	1910	–1.6		13.4	9.9	8.1	10.8	11.6	9.6	7.8	7.9	6.4	6.3	6.4	
	1920	–10.2	–18.1		5.8	5.3	9.9	11.1	8.9	6.8	7.1	5.6	5.5	5.7	
	1930	–10.5	–14.6	–11.0		5.0	11.6	12.5	9.5	7.0	7.2	5.5	5.5	5.7	
	1940	–7.5	–9.3	–4.6	2.2		18.7	16.5	11.0	7.5	7.7	5.6	5.6	5.8	
	1950	–7.5	–9.0	–5.7	–3.0	–7.9		14.4	7.4	4.1	5.1	3.2	3.6	4.1	
	1960	–4.4	–5.0	–1.4	2.0	2.0	12.9		0.8	–0.8	2.2	0.6	1.5	2.6	
	1970	–3.8	–4.1	–1.1	1.5	1.3	6.3	0.1		–2.3	2.9	0.5	1.7	2.9	
	1980	–3.8	–4.1	–1.5	0.5	0.0	2.8	–1.9	–3.8		8.3	1.9	3.1	4.2	
	1990	–2.3	–2.4	0.1	2.1	2.1	4.7	2.1	3.1	10.6		–4.1	0.5	2.9	
	2000	–2.3	–2.4	–0.3	1.4	1.2	3.2	0.9	1.1	3.7	–2.7		5.4	6.3	
	2010	–1.7	–1.7	0.3	1.8	1.7	3.4	1.6	2.0	4.0	0.8	4.5		7.1	
	2022	–1.4	–1.3	0.5	1.8	1.8	3.2	1.7	2.0	3.4	1.3	3.2	2.1		
Real bonds	**1900**		–0.1	–1.0	7.4	6.8	3.1	3.0	2.7	2.4	2.1	2.3	2.4	3.0	**Bond maturity premium**
	1910	2.4		–1.8	11.9	9.4	4.0	3.7	3.2	2.7	2.4	2.6	2.7	3.2	
	1920	–13.4	–26.7		31.7	16.2	6.1	5.2	4.3	3.5	3.1	3.1	3.2	3.8	
	1930	–13.3	–20.2	–13.2		5.2	–2.7	–0.9	–0.4	–0.4	–0.3	0.3	0.7	1.6	
	1940	–8.7	–12.1	–3.8	6.6		–9.9	–3.8	–2.3	–1.7	–1.3	–0.5	0.1	1.2	
	1950	–13.5	–17.0	–13.5	–13.7	–30.1		2.7	1.8	1.2	1.0	1.5	1.9	2.8	
	1960	–11.0	–13.4	–9.8	–8.6	–15.3	2.5		0.9	0.4	0.4	1.2	1.7	2.9	
	1970	–9.2	–11.0	–7.5	–6.0	–9.9	2.3	2.2		–0.1	0.1	1.3	1.9	3.2	
	1980	–8.0	–9.4	–6.1	–4.6	–7.2	2.0	1.7	1.2		0.3	2.0	2.5	4.1	
	1990	–6.6	–7.7	–4.6	–3.1	–4.9	2.6	2.7	2.9	4.7		3.6	3.7	5.2	
	2000	–5.4	–6.2	–3.2	–1.7	–3.0	3.5	3.8	4.3	5.9	7.1		3.7	6.0	
	2010	–4.5	–5.1	–2.3	–0.9	–1.9	3.8	4.0	4.5	5.6	6.1	5.1		7.9	
	2022	–3.5	–4.0	–1.4	0.0	–0.8	4.1	4.4	4.8	5.7	6.0	5.5	5.8		
Real bills	**1900**		1.4	19.4	39.1	27.9	26.1	22.3	19.4	17.7	16.0	14.6	13.4	12.2	**Inflation**
	1910	2.5		40.7	63.0	38.1	33.2	27.0	22.7	20.2	18.0	16.2	14.6	13.2	
	1920	–12.5	–25.3		88.8	36.9	30.8	23.8	19.4	17.1	15.1	13.4	12.1	10.8	
	1930	–24.2	–34.8	–43.1		–0.8	8.9	7.5	6.5	6.4	5.9	5.4	5.0	4.6	
	1940	–18.5	–24.5	–24.1	1.3		19.5	11.9	9.0	8.3	7.3	6.5	5.8	5.3	
	1950	–19.3	–24.0	–23.5	–11.3	–22.4		4.8	4.1	4.8	4.5	4.1	3.7	3.4	
	1960	–16.4	–19.7	–18.3	–7.7	–12.0	–0.2		3.4	4.8	4.4	3.9	3.5	3.2	
	1970	–14.1	–16.6	–14.7	–5.6	–7.8	0.5	1.2		6.1	4.9	4.1	3.5	3.2	
	1980	–12.3	–14.2	–12.2	–4.2	–5.6	0.8	1.2	1.3		3.7	3.1	2.7	2.5	
	1990	–10.6	–12.1	–10.0	–2.9	–3.7	1.6	2.3	2.8	4.3		2.4	2.2	2.1	
	2000	–9.3	–10.5	–8.4	–2.0	–2.5	2.0	2.5	3.0	3.9	3.4		1.9	2.0	
	2010	–8.4	–9.4	–7.4	–1.6	–2.0	1.9	2.3	2.6	3.0	2.3	1.3		2.1	
	2022	–7.8	–8.6	–6.8	–1.6	–2.0	1.2	1.5	1.5	1.6	0.7	–0.5	–1.9		
Real exchange rate vs USD	**1900**		0.1	–16.2	–27.3	–24.1	–22.3	–18.6	–16.2	–13.5	–12.1	–11.1	–9.8	–9.1	**Exchange rate vs USD**
	1910	0.5		–29.9	–38.0	–30.8	–27.1	–21.9	–18.6	–15.3	–13.5	–12.2	–10.8	–9.9	
	1920	–3.8	–8.0		–45.2	–31.3	–26.1	–19.8	–16.2	–12.6	–10.9	–9.7	–8.3	–7.6	
	1930	–1.2	–2.0	4.4		–13.8	–14.1	–8.9	–6.8	–4.1	–3.3	–3.1	–2.2	–2.2	
	1940	–4.2	–5.7	–4.5	–12.6		–14.5	–6.4	–4.3	–1.5	–1.1	–1.1	–0.5	–0.7	
	1950	–4.0	–5.0	–4.0	–8.0	–3.1		2.4	1.2	3.3	2.6	1.8	2.1	1.4	
	1960	–2.5	–3.1	–1.8	–3.8	0.9	5.0		0.1	3.7	2.6	1.6	2.0	1.2	
	1970	–2.0	–2.4	–1.3	–2.7	0.9	3.0	1.0		7.6	3.9	2.1	2.5	1.5	
	1980	–1.0	–1.2	–0.1	–0.9	2.2	4.1	3.6	6.3		0.5	–0.5	0.9	0.1	
	1990	–1.0	–1.2	–0.2	–0.9	1.6	2.8	2.1	2.6	–0.9		–1.4	1.1	–0.1	
	2000	–1.1	–1.3	–0.4	–1.1	1.0	1.8	1.1	1.1	–1.4	–1.9		3.7	0.6	
	2010	–0.7	–0.8	0.0	–0.6	1.3	2.1	1.5	1.6	0.1	0.6	3.1		–2.0	
	2022	–0.9	–1.0	–0.3	–0.8	0.8	1.4	0.8	0.7	–0.5	–0.4	0.2	–2.1		

The three premiums exclude the years 1921–22. Source: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

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Belgium



Belgium is at the heart of Europe. Brussels is considered to be the de facto capital of the European Union, having a long history of hosting the institutions of the European Union within its European Quarter. Belgium is home to the diamond capital of the world and is the producer of more beer per capita than any other country.

Belgium's strategic location has been a mixed blessing, making it a major battleground in international wars, including the Battle of Waterloo, 200 years ago, and the two world wars of the 20th century. The ravages of war and attendant high inflation rates are an important contributory factor to its poor long-run investment returns – Belgium has been one of the three worst-performing equity markets and the eighth worst-performing bond market out of all those with a complete history. Its equity risk premium over 122 years was the lowest of the Yearbook countries when measured relative to bills and second-lowest measured relative to bonds.

The Brussels Stock Exchange was established in 1801 under French Napoleonic rule. Brussels rapidly grew into a major financial center, specializing in the early 20th century in tramways and urban transport.

Its importance has gradually declined, and what became Euronext Brussels suffered badly during the banking crisis. Three large banks made up a majority of its market capitalization at the start of 2008, but the banking sector now represents just 13% of the FTSE World Belgium index. By the start of 2022, a high proportion of the index (29%) was invested in just one company, Anheuser-Busch InBev, the leading global brewer and one of the world's largest consumer products companies.

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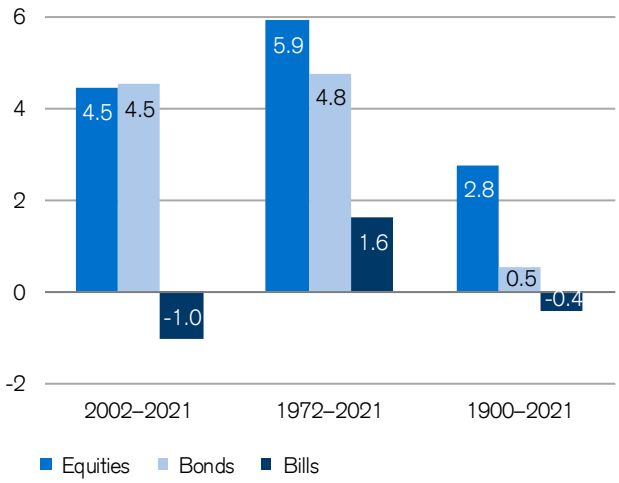
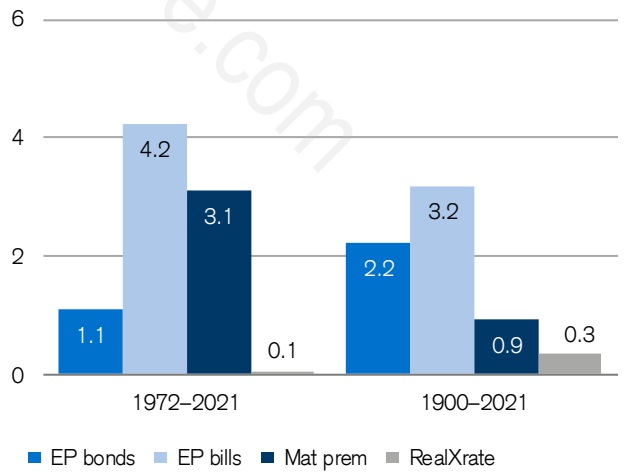
Figure 73: Annualized real returns and risk premiums (%) for Belgium, 1900–2021





Note: The three asset classes are equities, long-term government bonds, and Treasury bills. All returns include reinvested income, are adjusted for inflation, and are expressed as geometric mean returns.

Note: EP bonds and EP bills denote the equity premium relative to bonds and to bills; Mat prem denotes the maturity premium for bonds relative to bills; RealXRate denotes the inflation-adjusted change in the exchange rate against the US dollar.

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Figure 74: Real returns on Belgian asset classes, 1900–2021

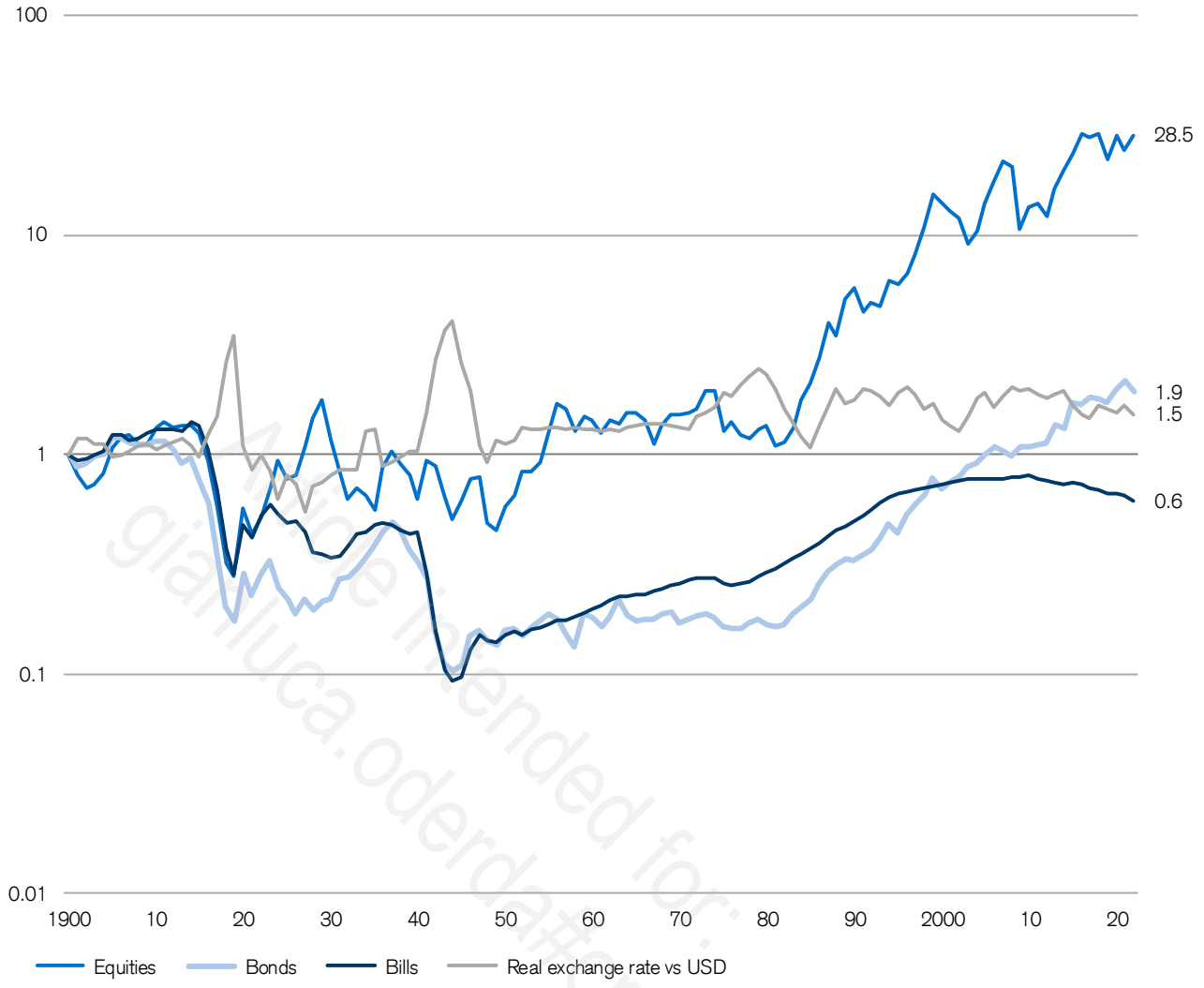

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Table 18: Returns on Belgian asset classes, 1900–2021

		Mean returns % p.a.					Annual returns %				10-year returns % p.a.				Current
Return	Asset	GM	AM	SE	SD	SC	Lowest		Highest		Lowest		Highest		year rank
Nominal	Equities	7.8	10.3	2.2	24.3	0.21	–47.6	2008	127.8	1940	–8.3	1938	23.4	1928	33
	Bonds	5.4	5.9	0.9	10.1	–0.01	–15.5	1914	40.8	1958	–1.4	1914	12.4	1990	108
	Bills	4.5	4.5	0.3	3.2	0.95	–0.7	2017	14.1	1981	–0.2	2020	11.1	1985	121
	Inflation	4.9	5.9	1.5	16.1	0.56	–37.9	1919	96.3	1917	–1.9	1953	21.2	1918	34
Real	Equities	2.8	5.4	2.1	23.5	0.09	–48.9	2008	105.1	1919	–13.0	1918	20.4	1928	40
	Bonds	0.5	1.7	1.4	14.9	0.18	–45.6	1917	62.3	1919	–16.7	1918	9.2	1993	104
	Bills	–0.4	0.4	1.1	12.4	0.34	–46.6	1941	69.0	1919	–14.6	1944	6.2	1993	108
	Exchange rate	0.3	2.1	1.7	18.8	0.28	–68.5	1919	78.4	1917	–14.2	1928	15.7	1942	98
Premiums	Equities vs bills	3.2	5.6	2.1	23.7	0.21	–49.7	2008	125.0	1940	–9.6	1938	18.3	1944	23
	Equities vs bonds	2.2	4.3	1.9	20.9	0.10	–53.9	2008	80.1	1940	–12.6	1938	18.0	1928	10
	Bonds vs bills	0.9	1.4	0.9	9.8	0.03	–19.6	1914	34.0	1958	–5.8	1916	9.2	1935	100

GM=geometric mean; AM=arithmetic mean, SE=standard error of mean; SD=standard deviation; SC=serial correlation; 10-year returns to end of given year.
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Table 19: Belgian real returns, inflation and premiums, 1900–2021

	1 Jan	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000	2010	2022	
Real	**1900**		1.5	3.5	5.7	1.7	2.6	3.5	3.2	2.6	3.2	3.0	2.3	2.2	**Equity**
equity	**1910**	2.9		5.6	7.9	1.7	2.9	4.0	3.5	2.8	3.4	3.2	2.4	2.3	**premium**
total	**1920**	–2.8	–8.1		10.2	–0.2	2.0	3.5	3.0	2.3	3.1	2.9	2.0	2.0	**vs bonds**
returns	**1930**	0.5	–0.7	7.3		–9.6	–1.8	1.4	1.3	0.8	2.0	1.9	1.1	1.1	
	1940	–1.2	–2.5	0.5	–5.9		6.6	7.4	5.2	3.6	4.5	4.0	2.7	2.5	
	1950	–1.1	–2.1	0.1	–3.4	–0.8		8.2	4.6	2.6	4.0	3.4	2.0	2.0	
	1960	0.6	0.2	2.4	0.7	4.2	9.6		1.1	–0.1	2.6	2.3	0.9	1.0	
	1970	0.6	0.2	2.0	0.7	3.0	4.9	0.5		–1.2	3.4	2.7	0.8	1.0	
	1980	0.4	0.0	1.4	0.3	1.9	2.8	–0.4	–1.2		8.2	4.7	1.5	1.5	
	1990	2.0	1.8	3.4	2.7	4.5	5.9	4.7	6.9	15.7		1.3	–1.7	–0.5	
	2000	2.7	2.6	4.1	3.6	5.3	6.6	5.8	7.6	12.4	9.2		–4.6	–1.3	
	2010	2.4	2.3	3.6	3.1	4.5	5.4	4.6	5.6	8.0	4.3	–0.3		1.6	
	2022	2.8	2.8	3.9	3.6	4.8	5.6	4.9	5.8	7.6	5.1	3.4	6.5		
Real	**1900**		0.3	0.8	4.2	0.9	2.7	3.4	2.6	1.9	2.8	3.0	2.6	3.2	**Equity**
equity	**1910**	–1.5		1.4	6.1	1.1	3.3	4.0	2.9	2.2	3.1	3.3	2.8	3.5	**premium**
capital	**1920**	–6.1	–10.5		11.1	1.0	4.0	4.7	3.3	2.3	3.3	3.5	3.0	3.7	**vs bills**
gains	**1930**	–3.0	–3.8	3.4		–8.3	0.6	2.6	1.4	0.6	2.1	2.5	2.0	2.9	
	1940	–4.6	–5.7	–3.2	–9.3		10.3	8.5	4.8	3.0	4.3	4.4	3.6	4.3	
	1950	–4.3	–5.0	–3.1	–6.2	–2.9		6.8	2.2	0.7	2.8	3.3	2.5	3.5	
	1960	–2.8	–3.1	–1.2	–2.6	0.9	4.8		–2.3	–2.3	1.5	2.4	1.7	3.0	
	1970	–2.9	–3.2	–1.6	–2.9	–0.6	0.5	–3.5		–2.3	3.5	4.0	2.7	4.1	
	1980	–3.4	–3.6	–2.4	–3.6	–2.1	–1.8	–4.9	–6.2		9.7	7.3	4.4	5.6	
	1990	–2.0	–2.1	–0.8	–1.5	0.1	0.9	–0.4	1.3	9.4		4.9	1.8	4.4	
	2000	–1.2	–1.2	0.0	–0.5	1.1	1.9	1.2	2.9	7.7	6.1		–1.1	4.2	
	2010	–1.4	–1.4	–0.3	–0.7	0.6	1.1	0.4	1.4	4.1	1.6	–2.7		8.8	
	2022	–0.9	–0.9	0.1	–0.2	1.0	1.5	1.0	1.9	3.9	2.3	0.6	3.4		
Real	**1900**		–1.2	–2.6	–1.5	–0.8	0.1	–0.1	–0.6	–0.7	–0.4	0.0	0.3	0.9	**Bond**
bonds	**1910**	1.4		–4.0	–1.6	–0.6	0.4	0.1	–0.5	–0.6	–0.4	0.1	0.4	1.1	**maturity**
	1920	–6.1	–13.0		0.8	1.1	1.9	1.1	0.2	0.0	0.2	0.6	0.9	1.6	**premium**
	1930	–5.0	–8.0	–2.6		1.5	2.5	1.2	0.0	–0.2	0.1	0.6	1.0	1.7	
	1940	–2.8	–4.1	0.7	4.1		3.5	1.1	–0.4	–0.6	–0.2	0.4	0.9	1.8	
	1950	–3.6	–4.8	–1.9	–1.6	–7.0		–1.3	–2.3	–1.9	–1.1	–0.2	0.5	1.5	
	1960	–2.8	–3.6	–1.1	–0.6	–2.9	1.3		–3.3	–2.2	–1.0	0.1	0.8	2.0	
	1970	–2.5	–3.1	–1.0	–0.6	–2.1	0.4	–0.6		–1.1	0.1	1.3	1.9	3.1	
	1980	–2.2	–2.7	–0.9	–0.5	–1.6	0.2	–0.3	0.0		1.4	2.5	2.9	4.1	
	1990	–1.2	–1.5	0.2	0.7	0.0	1.9	2.0	3.4	6.9		3.6	3.6	4.9	
	2000	–0.4	–0.6	1.1	1.7	1.3	3.0	3.5	4.8	7.3	7.8		3.6	5.5	
	2010	0.1	–0.1	1.5	2.0	1.7	3.3	3.7	4.8	6.4	6.2	4.6		7.1	
	2022	0.5	0.5	1.9	2.4	2.2	3.5	3.9	4.8	6.0	5.7	4.7	4.8		
Real	**1900**		1.4	8.3	8.3	5.8	7.3	6.4	5.9	6.1	5.9	5.5	5.2	4.9	**Inflation**
bills	**1910**	2.6		15.7	11.9	7.3	8.9	7.5	6.7	6.7	6.5	6.0	5.6	5.2	
	1920	–3.6	–9.4		8.3	3.4	6.7	5.5	5.0	5.3	5.2	4.8	4.5	4.2	
	1930	–3.5	–6.5	–3.4		–1.3	6.0	4.6	4.2	4.8	4.8	4.4	4.1	3.8	
	1940	–2.0	–3.5	–0.5	2.6		13.8	7.7	6.1	6.3	6.0	5.3	4.9	4.4	
	1950	–3.7	–5.2	–3.8	–4.0	–10.1		2.0	2.4	4.0	4.2	3.7	3.5	3.2	
	1960	–2.7	–3.7	–2.2	–1.8	–4.0	2.6		2.8	4.9	4.9	4.2	3.7	3.4	
	1970	–1.9	–2.6	–1.2	–0.7	–1.7	2.7	2.8		7.1	5.9	4.6	4.0	3.5	
	1980	–1.5	–2.1	–0.8	–0.3	–1.0	2.2	2.0	1.1		4.8	3.4	3.0	2.7	
	1990	–0.8	–1.2	0.0	0.6	0.2	3.0	3.1	3.3	5.5		2.1	2.1	2.0	
	2000	–0.3	–0.6	0.5	1.1	0.9	3.2	3.3	3.5	4.7	4.0		2.1	2.0	
	2010	–0.2	–0.5	0.6	1.1	0.9	2.8	2.9	2.9	3.4	2.4	0.9		2.0	
	2022	–0.4	–0.7	0.2	0.6	0.4	2.0	1.9	1.7	1.8	0.7	–0.8	–2.2		
Real	**1900**		0.2	–3.5	–6.2	–4.2	–4.7	–3.7	–3.2	–2.1	–2.1	–2.0	–1.5	–1.6	**Exchange**
exchange	**1910**	0.5		–7.0	–9.2	–5.7	–5.9	–4.4	–3.7	–2.4	–2.4	–2.3	–1.7	–1.7	**rate**
rate	**1920**	0.4	0.3		–11.3	–5.0	–5.5	–3.8	–3.0	–1.6	–1.7	–1.6	–1.1	–1.2	**vs USD**
vs USD	**1930**	–0.8	–1.4	–3.1		1.8	–2.5	–1.1	–0.8	0.5	0.0	–0.2	0.3	0.0	
	1940	0.1	–0.1	–0.3	2.6		–6.6	–2.5	–1.7	0.2	–0.4	–0.5	0.1	–0.2	
	1950	0.2	0.2	0.1	1.7	0.9		1.7	0.9	2.5	1.3	0.8	1.2	0.7	
	1960	0.4	0.4	0.4	1.6	1.2	1.5		0.1	2.9	1.1	0.5	1.2	0.5	
	1970	0.4	0.4	0.4	1.3	0.9	0.9	0.3		5.9	1.7	0.7	1.4	0.6	
	1980	1.1	1.1	1.3	2.2	2.1	2.4	2.9	5.7		–2.4	–1.8	0.0	–0.6	
	1990	0.6	0.6	0.7	1.3	1.1	1.1	1.0	1.4	–2.7		–1.2	1.2	0.0	
	2000	0.4	0.3	0.4	0.9	0.6	0.5	0.3	0.2	–2.4	–2.0		3.7	0.6	
	2010	0.6	0.6	0.7	1.1	0.9	0.9	0.8	1.0	–0.5	0.5	3.2		–2.0	
	2022	0.3	0.3	0.3	0.7	0.5	0.4	0.3	0.3	–1.0	–0.5	0.3	–2.1		

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Brazil



Brazil ranks 81st (between Colombia and Armenia) in the latest Human Development Index and is the World's leading producer of coffee and oranges. Soya beans are now most important in revenue terms and forests cover about three-fifths of Brazil's land area. The second half of the 20th century saw heavy government involvement in several key industries such as shipbuilding, petrochemicals, motor vehicles and even aircraft.

Sadly, this soon gave way to extremely high inflation, serious unemployment and financial instability. The country is a leader in price indexation with only a limited number of local currency bonds. It is also a leading producer of alternative energy sources such as ethanol and has won the football World Cup five times.

Brazil has the world's 19th largest equity market, now dominated by the Sao Paulo Stock Exchange (BVSP). The Rio de Janeiro Stock Exchange (BDRJ) was founded in 1820 and through the early 1970s was the leading exchange with its IBV index, before losing ground to BVSP (now known as the B3 exchange) and the Bovespa index.

In Brazil, basic materials and financials each account for 22% of the market capitalization of the FTSE World Brazil Index. The largest companies are Vale (16% of the index), followed by Petrobras (13%), Itau Unibanco and Banco Bradesco (both 5%).

Our Brazilian data starts in 1951, except for bonds, which begin in 1995.

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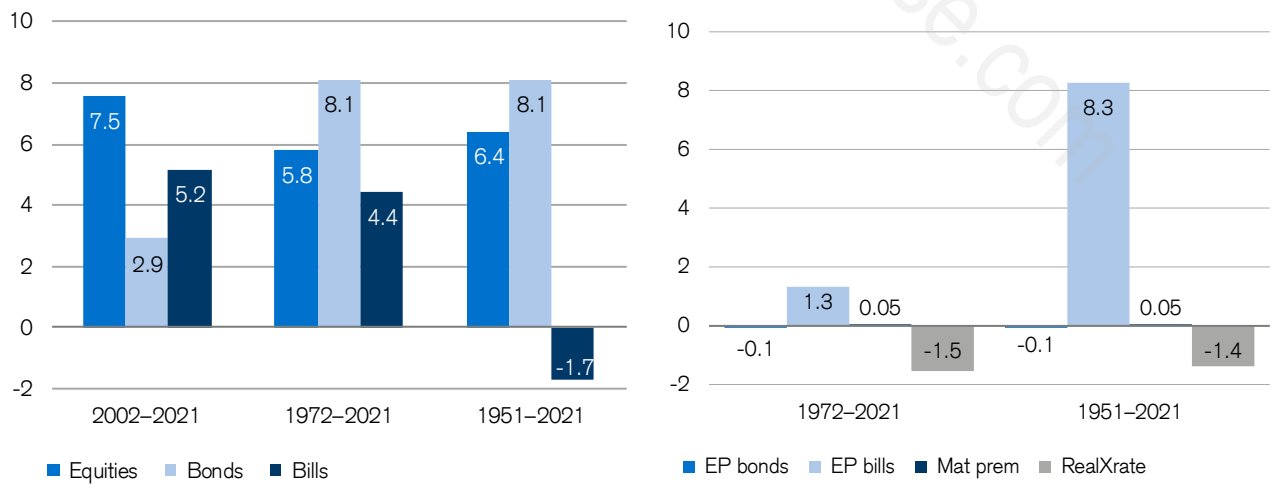
Figure 75: Annualized real returns and risk premiums (%) for Brazil, 1951–2021 (bonds from 1995)



Note: The three asset classes are equities, long-term government bonds, and Treasury bills. All returns include reinvested income, are adjusted for inflation, and are expressed as geometric mean returns.

Note: EP bonds and EP bills denote the equity premium relative to bonds and to bills; Mat prem denotes the maturity premium for bonds relative to bills; RealXRate denotes the inflation-adjusted change in the exchange rate against the US dollar.

Source: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

Figure 76: Real returns on Brazilian asset classes, 1951–2021 (bonds from 1995)

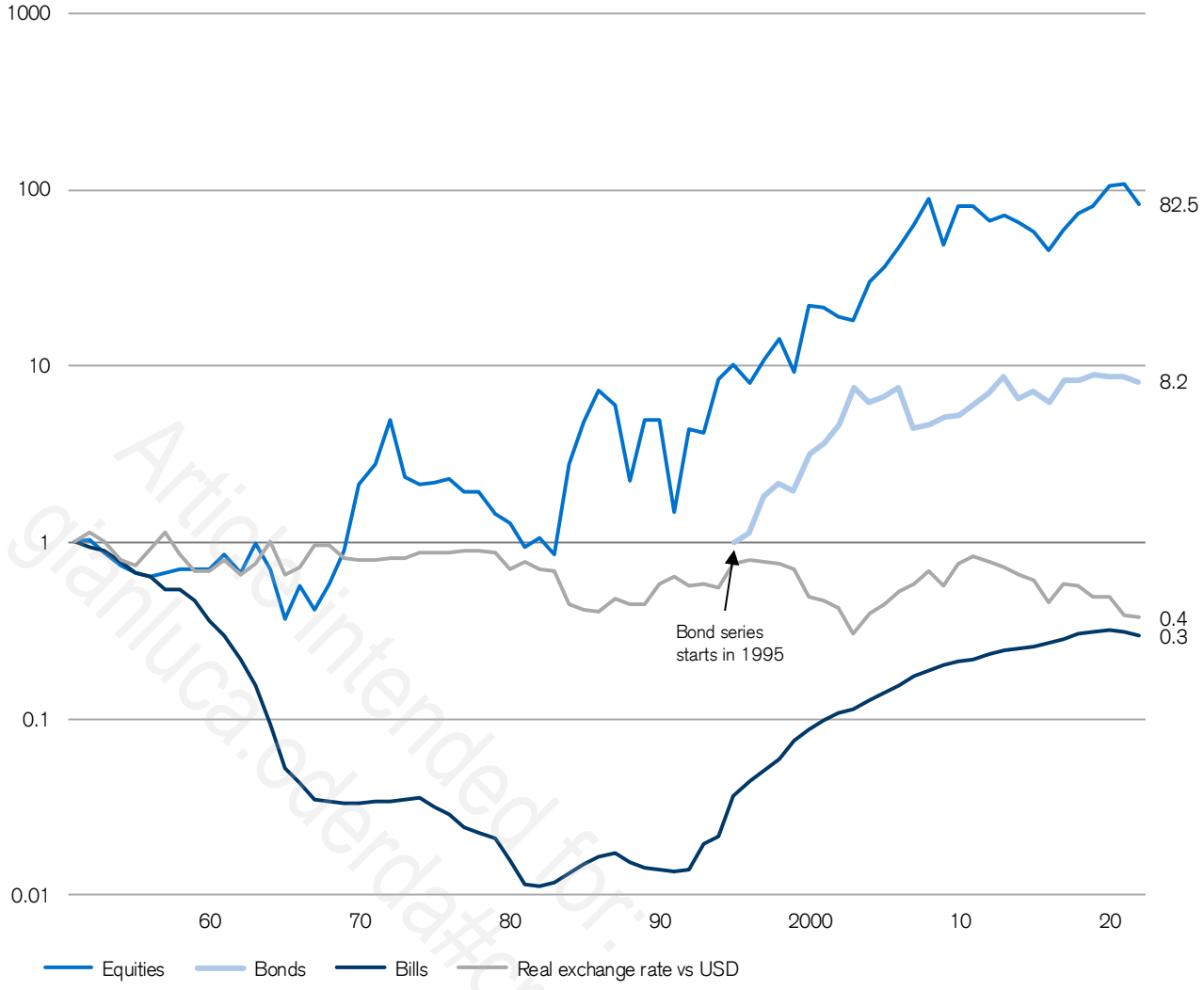


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Table 20: Returns on Brazilian asset classes, 1951–2021 (bonds from 1995)

		Mean returns % p.a.					Annual returns %				10-year returns % p.a.				Current
Return	Asset	GM	AM	SE	SD	SC	Lowest		Highest		Lowest		Highest		year rank
Nominal	Equities	74.9	243.0	86.8	731.5	0.41	–44.4	1972	5127	1993	3.9	2017	814.3	1994	73
	Bonds	15.5	18.7	5.4	28.1	–0.03	–38.2	2006	81.8	2002	3.8	2015	31.7	2004	23
	Bills	61.6	183.5	59.7	502.9	0.75	3.1	2021	2735	1993	6.8	1960	825.7	1994	71
	Inflation	64.4	169.8	53.5	450.9	0.70	1.7	1998	2477	1993	5.4	2014	748.1	1994	48
Real	Equities	6.4	16.4	6.4	53.6	–0.12	–70.1	1990	224.8	1983	–14.3	1981	30.6	2000	63
	Bonds	8.1	10.7	4.7	24.4	–0.09	–40.1	2006	64.4	1999	–2.0	2015	20.9	2004	24
	Bills	–1.7	–0.3	2.0	16.6	0.70	–43.8	1964	66.8	1994	–24.1	1967	22.6	2001	53
	Exchange rate	–1.4	0.1	2.0	17.2	–0.04	–36.2	1964	36.4	1994	–7.4	1985	9.2	2012	45
Premiums	Equities vs bills	8.3	17.5	5.9	49.9	–0.22	–69.3	1990	188.1	1983	–9.8	1998	46.8	1971	59
	Equities vs bonds	–0.1	6.4	7.8	40.5	–0.08	–51.1	2008	120.2	2006	–7.6	2017	12.8	2012	22
	Bonds vs bills	0.0	2.3	4.1	21.5	–0.26	–46.3	2006	52.4	2002	–7.0	2015	6.4	2005	18

GM=geometric mean; AM=arithmetic mean, SE=standard error of mean; SD=standard deviation; SC=serial correlation; 10-year returns to end of given year. Source: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

Table 21: Brazilian real returns, inflation and premiums, 1951–2021 (bonds from 1995)

Real equity total returns

1 Jan	1900	1910	1920	1930	1940	1951	1960	1970	1980	1990	2000	2010	2022
1900													
1910													
1920													
1930													
1940													
1951													
1960						−3.7							
1970						4.0	11.5						
1980						0.9	3.0	−4.9					
1990						4.2	6.7	4.4	14.6		−7.5	2.8	−0.1
2000						6.5	9.0	8.1	15.3	16.0		8.4	1.7
2010						7.7	10.0	9.6	14.9	15.0	14.0		−3.5
2022						6.4	8.0	7.3	10.4	9.2	6.2	0.1	

Equity premium vs bonds

Real equity capital gains

1 Jan	1900	1910	1920	1930	1940	1951	1960	1970	1980	1990	2000	2010	2022
1900													
1910													
1920													
1930													
1940													
1951							7.9	24.4	16.4	16.3	12.0	10.6	8.3
1960						−7.1		41.4	20.4	18.9	12.9	11.1	8.3
1970						−2.5	1.8		2.5	9.1	4.7	4.6	2.9
1980						−5.6	−4.9	−11.2		16.1	5.9	5.4	3.0
1990						−1.9	−0.3	−1.3	9.7		−3.5	0.4	−0.8
2000						0.7	2.5	2.8	10.6	11.5		4.3	0.4
2010						2.1	3.9	4.4	10.2	10.4	9.3		−2.7
2022						1.2	2.4	2.6	6.1	5.0	2.2	−3.3	

Equity premium vs bills

Real bonds

1 Jan	1900	1910	1920	1930	1940	1951	1960	1970	1980	1990	2000	2010	2022
1900													
1910													
1920													
1930													
1940													
1951													
1960													
1970													
1980													
1990											5.8	−0.6	0.0
2000										26.1		−3.7	−1.3
2010										11.7	5.2		0.8
2022										8.1	4.4	3.7	

Bond maturity premium

Real bills

1 Jan	1900	1910	1920	1930	1940	1951	1960	1970	1980	1990	2000	2010	2022
1900													
1910													
1920													
1930													
1940													
1951							19.5	31.3	31.7	70.6	99.9	79.7	64.4
1960						−10.8		42.8	37.6	89.9	124.5	93.4	72.2
1970						−16.4	−21.1		32.6	118.9	161.0	108.7	78.5
1980						−13.3	−14.5	−7.2		261.5	266.1	142.7	91.6
1990						−10.4	−10.3	−4.3	−1.3		270.8	98.9	57.1
2000						−4.9	−3.5	3.2	8.9	20.2		6.6	6.3
2010						−2.6	−1.1	4.7	9.0	14.6	9.3		6.1
2022						−1.7	−0.3	4.3	7.2	10.0	5.7	2.9	

Inflation

Real exchange rate vs USD

1 Jan	1900	1910	1920	1930	1940	1951	1960	1970	1980	1990	2000	2010	2022
1900													
1910													
1920													
1930													
1940													
1951							−18.3	−23.1	−22.1	−39.7	−48.7	−42.6	−37.9
1960						−4.1		−27.1	−23.7	−45.0	−53.8	−46.1	−40.4
1970						−1.2	1.6		−20.1	−52.2	−60.4	−50.0	−42.6
1980						−1.2	0.1	−1.4		−71.4	−72.1	−57.2	−47.0
1990						−1.4	−0.5	−1.5	−1.7		−72.7	−47.7	−35.7
2000						−1.4	−0.8	−1.6	−1.7	−1.7		0.4	−5.0
2010						−0.5	0.2	−0.1	0.3	1.3	4.4		−9.2
2022						−1.4	−1.0	−1.5	−1.5	−1.4	−1.3	−5.8	

Exchange rate vs USD

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Canada



Canada is the world's second-largest country by land mass (after Russia), and its economy is the tenth largest. It is blessed with natural resources, having the world's second-largest oil reserves, while its mines are leading producers of nickel, gold, diamonds, uranium and lead. It is also a major exporter of soft commodities, especially grains and wheat, as well as lumber, pulp and paper.

The Canadian equity market dates back to the opening of the Toronto Stock Exchange in 1861. It is now the world's seventh-largest stock market by capitalization. Canada's bond market also ranks as the seventh largest in the world.

Forty-two percent of the market capitalization of the FTSE World Canada index is accounted for by financials, mostly banks (29%). Given Canada's natural resource endowment, it is no surprise that oil and gas have a 14% weighting, with a further 6% in mining stocks.

The largest stocks are currently Shopify, Royal Bank of Canada, Toronto-Dominion Bank, Bank of Nova Scotia, Brookfield Asset Management, and Enbridge.

Canadian equities have performed well over the long run, with a real return of 5.8% per year. The real return on bonds has been 2.2% per year. These figures are close to those we report for the USA.

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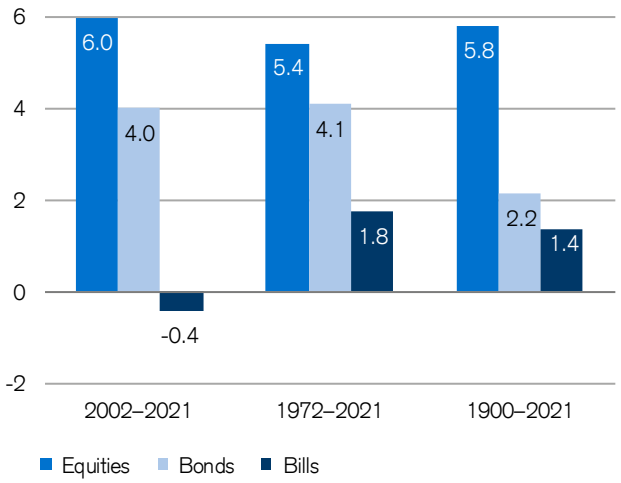
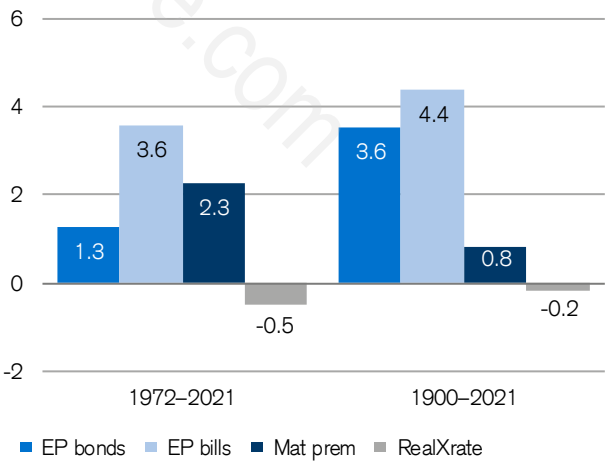
Figure 77: Annualized real returns and risk premiums (%) for Canada, 1900–2021



Note: The three asset classes are equities, long-term government bonds, and Treasury bills. All returns include reinvested income, are adjusted for inflation, and are expressed as geometric mean returns.



Note: EP bonds and EP bills denote the equity premium relative to bonds and to bills; Mat prem denotes the maturity premium for bonds relative to bills; RealXRate denotes the inflation-adjusted change in the exchange rate against the US dollar.

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Figure 78: Real returns on Canadian asset classes, 1900–2021

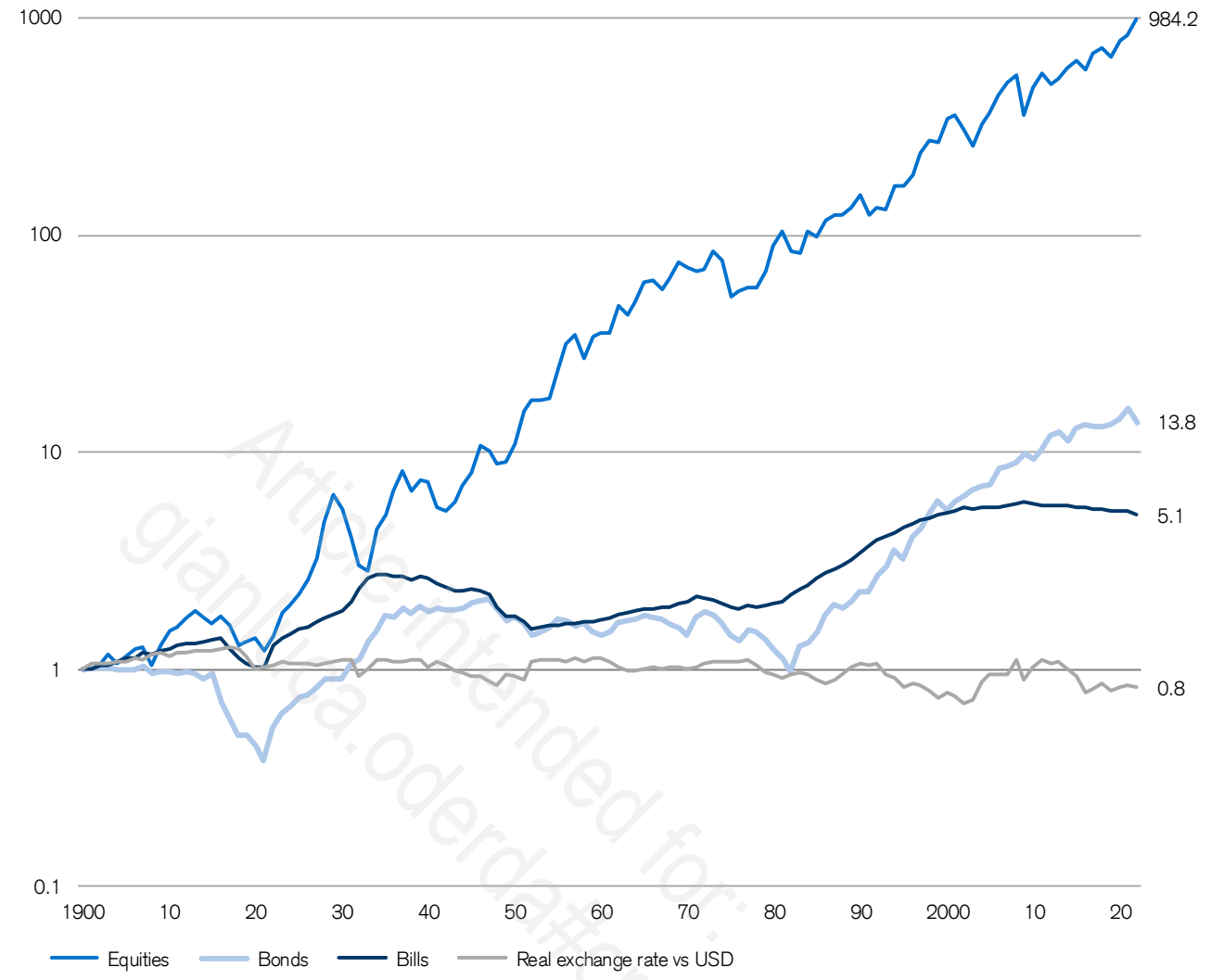

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Table 22: Returns on Canadian asset classes, 1900–2021

		Mean returns % p.a.					Annual returns %				10-year returns % p.a.				Current
Return	Asset	GM	AM	SE	SD	SC	Lowest		Highest		Lowest		Highest		year rank
Nominal	Equities	8.9	10.2	1.5	16.8	0.08	–33.0	2008	51.6	1933	–0.2	1938	18.1	1951	23
	Bonds	5.2	5.5	0.8	8.8	0.02	–23.9	1915	43.0	1982	–2.1	1920	16.2	1991	120
	Bills	4.3	4.4	0.3	3.6	0.91	0.4	1945	20.4	1981	0.5	1950	12.1	1990	122
	Inflation	2.9	3.0	0.4	4.4	0.56	–15.8	1921	15.1	1917	–2.5	1933	9.7	1982	30
Real	Equities	5.8	7.2	1.5	16.8	0.09	–33.8	2008	55.2	1933	–2.5	1920	16.7	1928	28
	Bonds	2.2	2.7	0.9	10.3	0.14	–25.9	1915	41.7	1921	–8.8	1920	11.2	1998	117
	Bills	1.4	1.5	0.4	4.7	0.55	–12.5	1947	27.1	1921	–4.3	1951	7.3	1930	112
	Exchange rate	–0.2	0.0	0.5	6.0	–0.03	–19.2	2008	22.5	2003	–4.0	2001	4.2	2011	85
Premiums	Equities vs bills	4.4	5.8	1.5	16.8	0.10	–34.7	2008	49.1	1933	–4.1	1990	17.5	1951	15
	Equities vs bonds	3.6	5.2	1.6	18.2	0.03	–40.5	2008	48.6	1950	–5.9	1938	16.4	1956	8
	Bonds vs bills	0.8	1.1	0.7	8.3	0.01	–26.4	1915	24.1	1982	–6.7	1920	6.5	2011	114

GM=geometric mean; AM=arithmetic mean, SE=standard error of mean; SD=standard deviation; SC=serial correlation; 10-year returns to end of given year.
Source: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

Table 23: Canadian real returns, inflation and premiums, 1900–2021

	1 Jan	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000	2010	2022	
Real equity total returns	**1900**		4.4	5.9	6.2	3.5	3.7	5.5	5.7	5.5	4.8	4.2	3.6	3.6	**Equity premium vs bonds**
	1910	4.1		7.4	7.1	3.2	3.6	5.7	5.9	5.7	4.8	4.2	3.6	3.5	
	1920	1.7	–0.6		6.7	1.1	2.3	5.3	5.6	5.4	4.5	3.8	3.2	3.1	
	1930	5.8	6.7	14.5		–4.3	0.2	4.9	5.4	5.1	4.1	3.4	2.7	2.7	
	1940	5.1	5.4	8.6	2.9		4.9	9.7	8.8	7.6	5.9	4.7	3.8	3.6	
	1950	4.9	5.1	7.1	3.6	4.2		14.8	10.8	8.5	6.1	4.7	3.6	3.4	
	1960	6.1	6.5	8.4	6.5	8.3	12.5		7.0	5.5	3.4	2.3	1.5	1.7	
	1970	6.3	6.6	8.2	6.6	7.9	9.8	7.1		4.0	1.6	0.8	0.1	0.7	
	1980	5.8	6.0	7.2	5.8	6.5	7.2	4.7	2.4		–0.8	–0.8	–1.2	–0.1	
	1990	5.8	6.0	6.9	5.7	6.3	6.8	5.0	3.9	5.6		–0.7	–1.4	0.2	
	2000	6.0	6.2	7.1	6.1	6.6	7.1	5.8	5.4	6.9	8.3		–2.0	0.6	
	2010	5.8	5.9	6.7	5.8	6.2	6.5	5.3	4.9	5.8	5.9	3.5		2.8	
	2022	5.8	6.0	6.6	5.8	6.2	6.4	5.5	5.2	5.9	6.0	4.9	6.2		
Real equity capital gains	**1900**		1.8	1.6	3.6	2.6	3.7	5.2	5.2	4.9	4.3	4.3	4.1	4.4	**Equity premium vs bills**
	1910	–1.0		1.3	4.6	2.8	4.2	5.9	5.8	5.3	4.6	4.5	4.3	4.6	
	1920	–3.8	–6.6		7.9	3.6	5.2	7.1	6.7	6.0	5.1	4.9	4.7	5.0	
	1930	0.2	0.8	8.7		–0.5	3.9	6.8	6.4	5.6	4.6	4.5	4.3	4.7	
	1940	–0.5	–0.3	3.0	–2.5		8.4	10.6	8.8	7.2	5.7	5.4	5.0	5.3	
	1950	–0.7	–0.6	1.5	–1.9	–1.4		12.9	9.0	6.8	5.0	4.8	4.4	4.9	
	1960	0.7	1.0	3.0	1.2	3.0	7.6		5.2	3.9	2.6	2.9	2.8	3.6	
	1970	1.1	1.5	3.1	1.8	3.3	5.7	3.7		2.5	1.3	2.1	2.2	3.3	
	1980	0.7	1.0	2.3	1.1	2.0	3.1	0.9	–1.8		0.0	1.9	2.1	3.5	
	1990	0.8	1.1	2.2	1.2	1.9	2.8	1.2	0.0	1.8		3.8	3.1	4.7	
	2000	1.3	1.6	2.6	1.8	2.5	3.3	2.3	1.8	3.7	5.6		2.4	5.0	
	2010	1.3	1.6	2.5	1.7	2.4	3.0	2.1	1.7	2.9	3.4	1.3		7.3	
	2022	1.5	1.7	2.6	1.9	2.5	3.0	2.3	2.0	2.9	3.3	2.3	3.1		
Real bonds	**1900**		–2.5	–4.1	–2.4	–0.9	0.0	–0.3	–0.5	–0.6	–0.5	0.0	0.4	0.8	**Bond maturity premium**
	1910	–0.3		–5.7	–2.3	–0.3	0.6	0.1	–0.2	–0.3	–0.2	0.3	0.7	1.1	
	1920	–4.0	–7.5		1.1	2.5	2.8	1.7	1.0	0.6	0.6	1.1	1.5	1.8	
	1930	–0.3	–0.4	7.3		3.9	3.7	1.8	0.9	0.5	0.5	1.1	1.5	1.9	
	1940	1.6	2.2	7.4	7.5		3.4	0.8	0.0	–0.4	–0.1	0.6	1.2	1.6	
	1950	1.1	1.5	4.7	3.4	–0.6		–1.7	–1.7	–1.6	–1.0	0.1	0.8	1.4	
	1960	0.6	0.8	2.9	1.5	–1.3	–2.1		–1.7	–1.6	–0.8	0.5	1.3	1.9	
	1970	0.5	0.7	2.4	1.2	–0.8	–1.0	0.1		–1.4	–0.3	1.3	2.1	2.6	
	1980	0.3	0.3	1.7	0.6	–1.0	–1.2	–0.7	–1.6		0.8	2.7	3.3	3.6	
	1990	0.9	1.1	2.4	1.6	0.4	0.7	1.6	2.3	6.4		4.6	4.5	4.5	
	2000	1.7	1.9	3.2	2.6	1.8	2.3	3.4	4.5	7.7	9.1		4.4	4.4	
	2010	2.0	2.3	3.4	3.0	2.3	2.8	3.8	4.8	7.0	7.3	5.5		4.4	
	2022	2.2	2.4	3.4	3.0	2.5	2.9	3.7	4.4	5.9	5.8	4.3	3.3		
Real bills	**1900**		2.5	4.6	2.7	1.6	2.2	2.2	2.3	2.9	3.3	3.2	3.1	2.9	**Inflation**
	1910	2.2		6.7	2.8	1.3	2.1	2.1	2.2	3.0	3.4	3.2	3.1	3.0	
	1920	0.1	–1.9		–0.9	–1.3	0.6	1.0	1.4	2.4	2.9	2.8	2.7	2.6	
	1930	2.1	2.0	6.1		–1.8	1.3	1.7	1.9	3.0	3.5	3.3	3.2	3.0	
	1940	2.4	2.5	4.8	3.5		4.5	3.5	3.2	4.3	4.7	4.2	3.9	3.6	
	1950	1.1	0.9	1.8	–0.3	–3.9		2.4	2.5	4.2	4.7	4.2	3.8	3.5	
	1960	0.9	0.6	1.3	–0.3	–2.1	–0.3		2.6	5.1	5.5	4.6	4.1	3.7	
	1970	1.0	0.8	1.4	0.2	–0.8	0.7	1.9		7.6	6.9	5.3	4.5	3.9	
	1980	0.9	0.7	1.1	0.2	–0.7	0.4	0.8	–0.2		6.2	4.1	3.4	3.0	
	1990	1.4	1.3	1.7	1.0	0.5	1.7	2.4	2.6	5.5		2.1	2.1	2.0	
	2000	1.7	1.6	2.1	1.5	1.2	2.2	2.9	3.2	4.9	4.3		2.1	2.0	
	2010	1.6	1.6	1.9	1.4	1.2	2.0	2.5	2.7	3.6	2.7	1.1		1.9	
	2022	1.4	1.3	1.6	1.1	0.8	1.5	1.8	1.8	2.3	1.3	–0.1	–1.1		
Real exchange rate vs USD	**1900**		0.0	–0.5	0.0	–0.2	–0.2	0.1	–0.1	–0.2	–0.2	–0.4	0.0	–0.2	**Exchange rate vs USD**
	1910	1.5		–0.9	–0.1	–0.3	–0.3	0.1	–0.1	–0.2	–0.2	–0.4	0.0	–0.2	
	1920	0.0	–1.4		0.8	0.0	–0.1	0.4	0.0	–0.1	–0.1	–0.3	0.1	–0.1	
	1930	0.3	–0.2	0.9		–0.9	–0.6	0.2	–0.1	–0.3	–0.2	–0.5	0.0	–0.3	
	1940	0.1	–0.4	0.1	–0.7		–0.2	0.7	0.1	–0.1	–0.1	–0.5	0.1	–0.2	
	1950	–0.1	–0.5	–0.3	–0.8	–1.0		1.7	0.3	–0.1	–0.1	–0.5	0.1	–0.2	
	1960	0.2	–0.1	0.3	0.1	0.4	1.9		–1.2	–1.0	–0.7	–1.0	–0.2	–0.5	
	1970	0.0	–0.2	0.0	–0.2	–0.1	0.4	–1.1		–0.8	–0.4	–1.0	0.1	–0.3	
	1980	–0.1	–0.3	–0.1	–0.3	–0.2	0.1	–0.9	–0.7		0.1	–1.1	0.4	–0.2	
	1990	0.1	–0.1	0.1	–0.1	0.1	0.3	–0.2	0.2	1.2		–2.2	0.5	–0.3	
	2000	–0.2	–0.4	–0.3	–0.5	–0.5	–0.3	–0.9	–0.9	–0.9	–3.0		3.3	0.6	
	2010	0.0	–0.1	0.0	–0.1	0.0	0.2	–0.2	0.1	0.3	–0.1	2.8		–1.6	
	2022	–0.2	–0.3	–0.2	–0.3	–0.3	–0.2	–0.5	–0.4	–0.3	–0.8	0.2	–1.9		

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Chile



Chile ranks 43rd (between Qatar and Brunei) in the latest UN Human development Index. It stretches over 4,200 kilometers north to south, and only 177 kilometers east to west on average, encompassing a remarkable variety of climates and landscapes. The country is rich in mineral resources, especially copper (producing one third of the world's copper) and lithium.

During the 1960s and 1970s, Chile experienced severe political polarization and turmoil. In 1973, the democratically elected left-wing government under Salvador Allende was replaced by a coup d'état that instituted right-wing military dictatorship under General Augusto Pinochet until 1990. The decades following the Pinochet dictatorship have seen a more stable emerging market economy with strong investment and growth.

Recently elected Gabriel Boric, Chile's youngest president, will oversee the drafting of a new constitution that is expected to result in significant changes for Chile.

The Santiago Stock Exchange was founded in 1893. Basic materials account for 27% of the FTSE World Chile index, followed by financials with 22%. The largest companies are SQM (19% of the index) followed by Empresas Copec (11%) and Banco de Chile (10%).

Our Chilean data starts in 1960, except for bonds, which begin in 1993.

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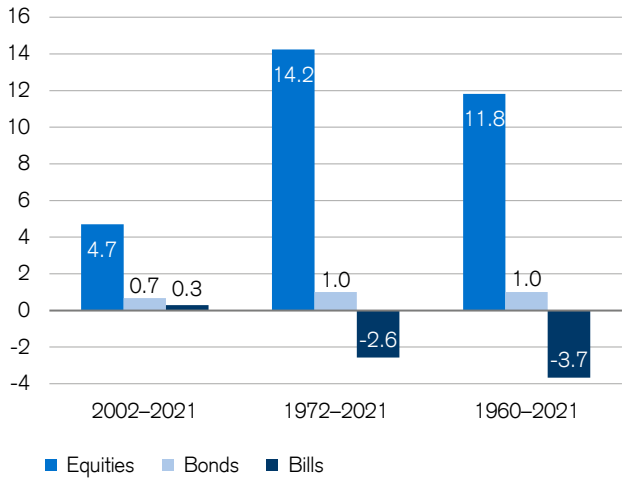
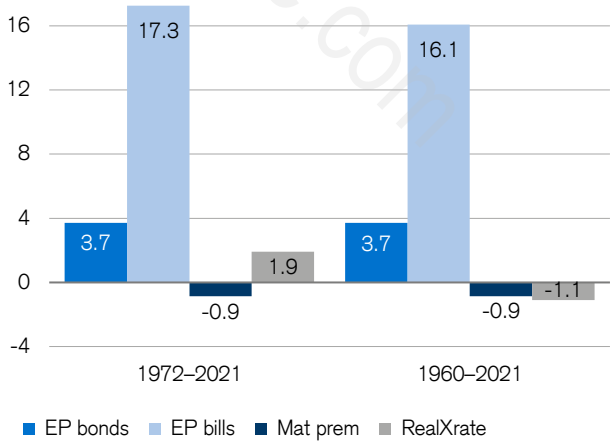
Figure 79: Annualized real returns and risk premiums (%) for Chile, 1960–2021 (bonds from 1993)



Note: The three asset classes are equities, long-term government bonds, and Treasury bills. All returns include reinvested income, are adjusted for inflation, and are expressed as geometric mean returns.



Note: EP bonds and EP bills denote the equity premium relative to bonds and to bills; Mat prem denotes the maturity premium for bonds relative to bills; RealXRate denotes the inflation-adjusted change in the exchange rate against the US dollar.

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Figure 80: Real returns on Chilean asset classes, 1960–2021 (bonds from 1993)

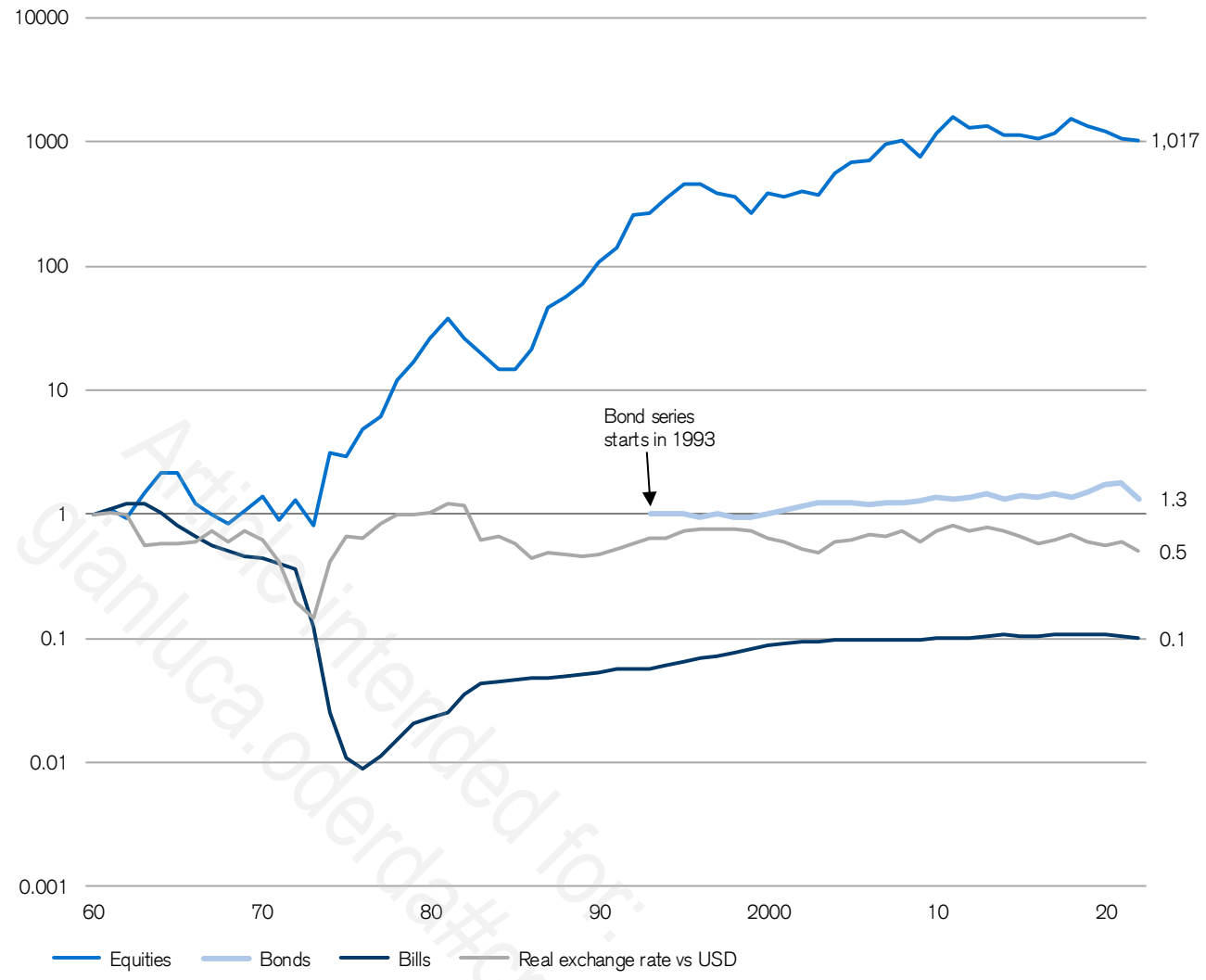

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Table 24: Returns on Chilean asset classes, 1960–2021 (bonds from 1993)

		Mean returns % p.a.					Annual returns %				10-year returns % p.a.				Current
Return	Asset	GM	AM	SE	SD	SC	Lowest		Highest		Lowest		Highest		year rank
Nominal	Equities	42.8	95.1	43.1	339.1	0.17	–22.6	1998	2602	1973	–0.9	2020	262.3	1980	44
	Bonds	5.3	5.5	1.4	7.5	–0.07	–20.2	2021	19.2	2019	3.9	2013	8.0	2002	31
	Bills	23.0	28.7	6.5	51.3	0.83	0.7	2021	280.7	1976	3.7	2020	98.3	1982	63
	Inflation	27.7	43.0	13.0	102.4	0.79	–1.4	2009	606.1	1973	2.7	2018	149.8	1979	39
Real	Equities	11.8	18.7	6.1	48.0	–0.06	–43.9	1965	282.7	1973	–5.9	1972	45.4	1980	42
	Bonds	1.0	1.3	1.4	7.5	–0.08	–25.2	2021	15.7	2019	0.5	2013	3.1	2009	31
	Bills	–3.7	–0.8	2.4	18.9	0.77	–79.0	1973	36.5	1981	–35.1	1974	18.3	1985	51
	Exchange rate	–1.1	2.0	3.7	29.4	0.17	–53.5	1971	179.6	1973	–15.0	1971	19.6	1981	57
Premiums	Equities vs bills	16.1	43.9	27.9	220.0	0.09	–48.1	1981	1724	1973	–4.5	2020	91.2	1980	36
	Equities vs bonds	3.7	6.2	4.3	23.4	–0.06	–29.0	2008	46.0	2003	–6.7	2020	13.3	2010	9
	Bonds vs bills	42.8	95.1	43.1	339.1	0.17	–22.6	1998	2602	1973	–0.9	2020	262.3	1980	44

GM=geometric mean; AM=arithmetic mean, SE=standard error of mean; SD=standard deviation; SC=serial correlation; 10-year returns to end of given year.
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Table 25: Chilean real returns, inflation and premiums, 1960–2021 (bonds from 1993)

	1 Jan	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000	2010	2022	
Real equity total returns	**1900**														**Equity premium vs bonds**
	1910														
	1920														
	1930														
	1940														
	1950														
	1960														
	1970							3.4							
	1980							17.8	34.1						
	1990							16.9	24.3	15.1		5.8	7.1	3.7	
	2000							16.1	20.7	14.5	13.8		8.1	3.1	
	2010							15.2	18.3	13.5	12.6	11.5		–0.9	
	2022							11.8	13.5	9.1	7.3	4.4	–1.1		
Real equity capital gains	**1900**														**Equity premium vs bills**
	1910														
	1920														
	1930														
	1940														
	1950														
	1960								12.4	42.2	28.9	23.4	20.6	16.1	
	1970							–4.9		79.9	38.0	27.3	22.7	16.8	
	1980							7.6	21.8		5.9	7.1	8.0	5.4	
	1990							7.7	14.7	7.9		8.4	9.1	5.2	
	2000							8.2	12.9	8.8	9.6		9.8	3.8	
	2010							8.2	11.7	8.6	8.9	8.2		–1.0	
	2022							5.7	7.9	4.8	3.9	1.4	–4.0		
Real bonds	**1900**														**Bond maturity premium**
	1910														
	1920														
	1930														
	1940														
	1950														
	1960														
	1970														
	1980														
	1990											–5.7	–1.5	–0.9	
	2000										0.0		1.6	0.7	
	2010										1.8	3.1		0.0	
	2022										1.0	1.3	–0.2		
Real bills	**1900**														**Inflation**
	1910														
	1920														
	1930														
	1940														
	1950														
	1960								27.3	78.3	56.5	43.5	34.4	27.7	
	1970							–8.0		149.8	73.5	49.3	36.2	27.8	
	1980							–17.2	–25.4		20.5	15.4	11.2	8.9	
	1990							–9.3	–10.0	8.7		10.6	6.9	5.6	
	2000							–5.9	–5.2	6.8	5.0		3.3	3.4	
	2010							–4.5	–3.6	5.0	3.2	1.5		3.4	
	2022							–3.7	–2.8	3.5	1.9	0.6	–0.1		
Real exchange rate vs USD	**1900**														**Exchange rate vs USD**
	1910														
	1920														
	1930														
	1940														
	1950														
	1960								–23.3	–41.1	–34.6	–28.0	–23.0	–19.7	
	1970							–4.7		–54.7	–39.6	–29.5	–23.0	–19.0	
	1980							0.2	5.4		–19.4	–12.0	–8.0	–7.0	
	1990							–2.5	–1.3	–7.6		–3.9	–1.8	–2.7	
	2000							–1.1	0.2	–2.3	3.2		0.4	–2.1	
	2010							–0.6	0.4	–1.2	2.2	1.2		–4.2	
	2022							–1.1	–0.4	–1.7	0.2	–1.1	–3.0		

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China



Despite the occasional wobble, China's economic expansion has had a huge cumulative impact. According to the International Monetary Fund, China now has the world's largest GDP measured using PPP exchange rates, although at market exchange rates, the USA is still the world's largest economy. The world's most populous country, China has over 1.3 billion inhabitants and more millionaires and billionaires than any country other than the USA.

After the Qing Dynasty, it became the Republic of China (ROC) in 1911. The ROC nationalists lost control of the Mainland at the end of the 1946–49 civil war, after which their jurisdiction was limited to Taiwan (Chinese Taipei) and a few islands. Following the communist victory in 1949, privately owned assets were expropriated and government debt was repudiated.

The People's Republic of China (PRC) has been a single-party state since then. We therefore distinguish between (1) the Qing period and the ROC, (2) the PRC until economic reforms were introduced, and (3) the modern period following the second stage of China's economic reforms of the late 1980s and early 1990s.

The communist takeover led to total losses for local investors. Chinese returns from 1900 are incorporated into the world and world ex-US indexes, including these total losses. However, a minuscule proportion of foreign assets retained some value (some UK bondholders received a tiny settlement in 1987).

As discussed in the 2019 Yearbook, China's astonishing GDP growth was not accompanied by superior investment returns. Today, technology and consumer discretionary each make up 26% of the FTSE World China index, followed by financials (16%). Tencent Holdings is the biggest holding in the index, followed by Alibaba Group, Meituan-Dianping, China Construction Bank and Ping An Insurance.

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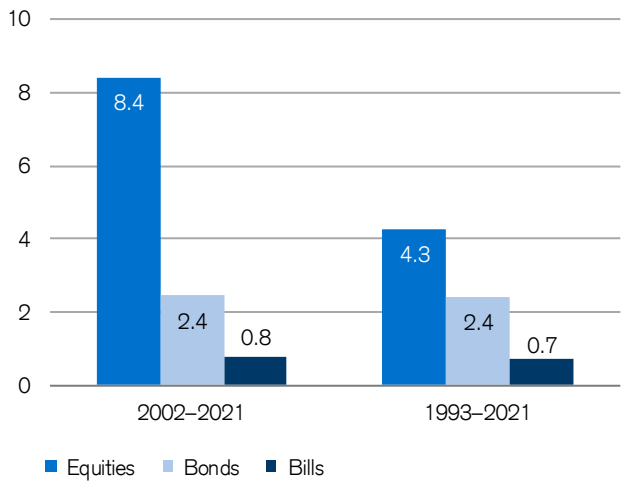
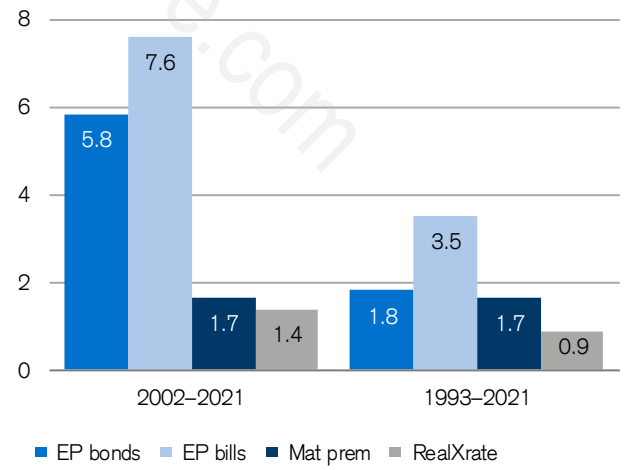
Figure 81: Annualized real returns and risk premiums (%) for China, 1993–2021



Note: The three asset classes are equities, long-term government bonds, and Treasury bills. All returns include reinvested income, are adjusted for inflation, and are expressed as geometric mean returns.



Note: EP bonds and EP bills denote the equity premium relative to bonds and to bills; Mat prem denotes the maturity premium for bonds relative to bills; RealXRate denotes the inflation-adjusted change in the exchange rate against the US dollar.

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Figure 82: Real returns on Chinese asset classes, 1900–2021

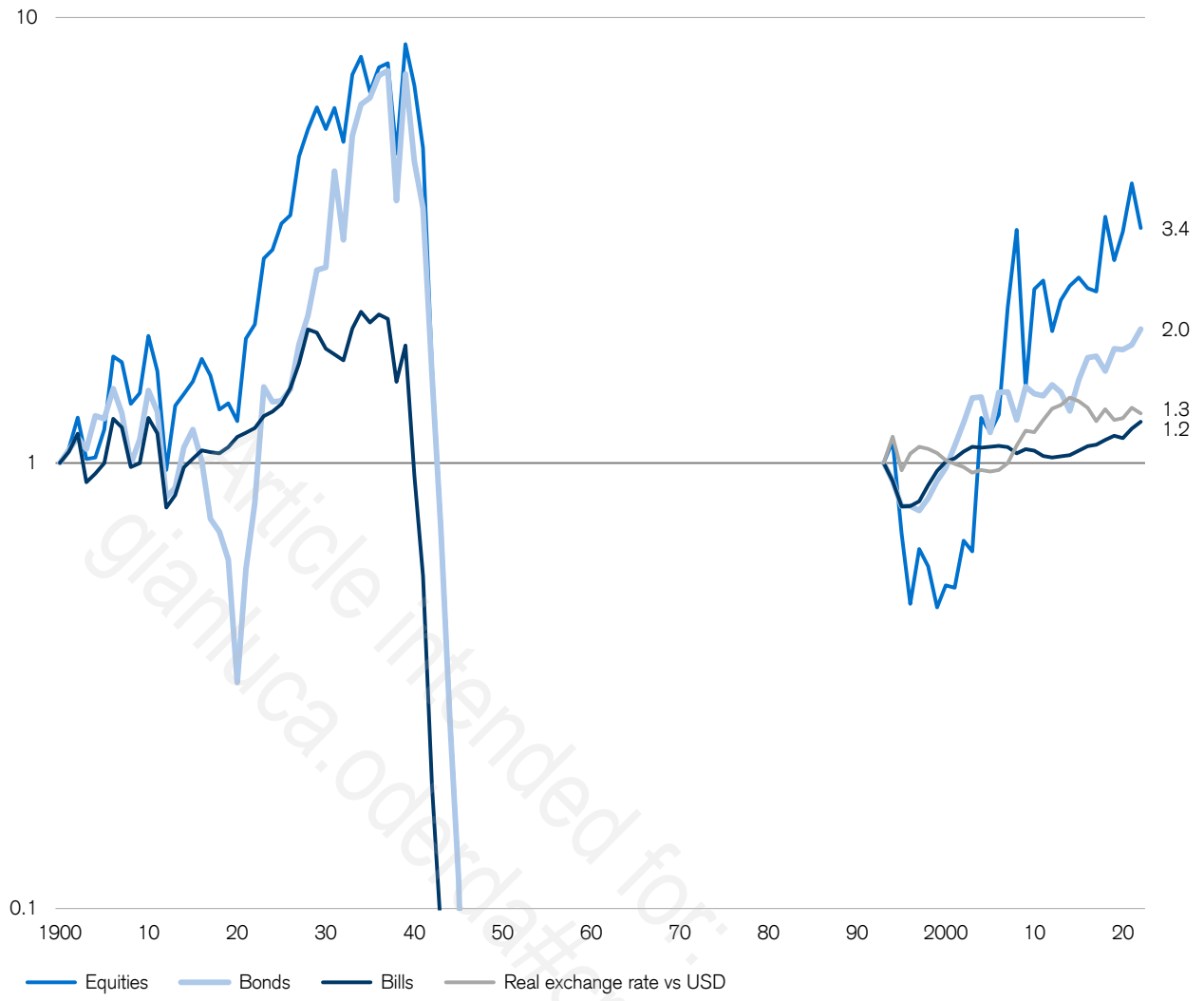

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Table 26: Returns on Chinese asset classes, 1993–2021

		Mean returns % p.a.					Annual returns %				10-year returns % p.a.				Current
Return	**Asset**	**GM**	**AM**	**SE**	**SD**	**SC**	**Lowest**		**Highest**		**Lowest**		**Highest**		**year rank**
Nominal	Equities	8.0	13.2	6.5	35.2	–0.31	–55.3	2008	105.9	2003	1.0	2002	20.8	2007	29
	Bonds	6.1	6.5	1.6	8.9	–0.31	–14.8	2004	25.2	2005	2.2	2013	9.3	2002	12
	Bills	4.4	4.4	0.5	2.6	0.90	1.1	2009	10.3	1995	2.5	2010	6.6	2002	8
	Inflation	3.6	3.8	1.1	5.7	0.73	–1.0	1998	25.5	1994	0.9	2006	5.7	2002	21
Real	Equities	4.3	9.4	6.4	34.3	–0.26	–55.8	2008	99.5	2003	–4.5	2002	19.0	2007	27
	Bonds	2.4	2.9	1.9	10.2	–0.12	–16.8	2004	23.3	2005	–0.7	2013	6.3	2006	11
	Bills	0.7	0.8	0.8	4.2	0.59	–12.3	1994	8.6	1997	–0.5	2012	3.2	2005	6
	Exchange rate	0.9	1.1	1.1	6.0	–0.29	–16.1	1994	14.7	1993	–1.7	2003	3.8	2013	26
Premiums	Equities vs bills	3.5	8.7	6.5	34.8	–0.26	–56.8	2008	100.5	2003	–5.3	2002	17.1	2010	27
	Equities vs bonds	1.8	8.2	7.1	38.3	–0.28	–62.8	2008	98.5	2003	–7.6	2002	14.3	2007	26
	Bonds vs bills	1.7	2.0	1.6	8.7	–0.28	–17.2	2004	22.7	2005	–0.3	2013	3.8	2008	11

GM=geometric mean; AM=arithmetic mean, SE=standard error of mean; SD=standard deviation; SC=serial correlation; 10-year returns to end of given year. Source: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

Denmark



The concept of hygge is best described as the Danish ritual of enjoying life's simple pleasures. There are doubtless cultural and social features of the country that contribute to its quality of life, but it also seems that Danish citizens find their country's social democratic policy to be to their liking. In the 2022 World Happiness Report, Denmark was ranked as the world's second happiest country.

The unified kingdom of Denmark emerged in the eighth century, and an absolute monarchy that had begun in 1660 came to an end in 1849 when the country's constitution was signed. In the early 20th century, Denmark adopted a welfare state model. It joined the European Union in 1973, but has retained its own currency.

Denmark's contentment has been enhanced by its financial market performance. Since 1900, Danish equities gave an annualized real local currency return of 5.9%.

Danish bonds also performed well, with an annualized local currency real return of 2.3%, the fifth-highest among the Yearbook countries. In real common currency (USD) terms, the return was 2.7%, making Denmark the second-best bond market after Switzerland.

The Copenhagen Stock Exchange was formally established in 1808, but traces its roots back to the late 17th century. The Danish equity market is relatively small. The FTSE World Denmark index has a very high weighting in healthcare (58%). Over one-third (38%) of the Danish equity market is represented by one company, Novo-Nordisk. Other large companies include DSV, AP Moller Maersk, and Vestas Wind Systems.

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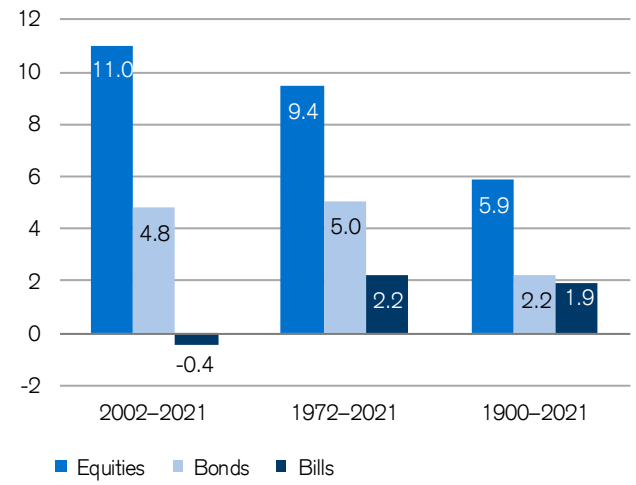
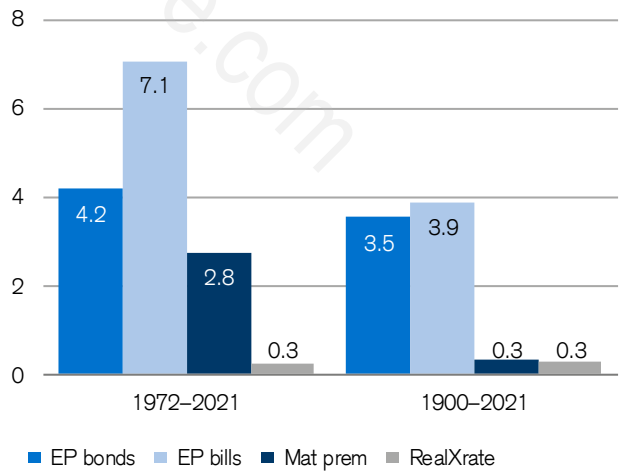
Figure 83: Annualized real returns and risk premiums (%) for Denmark, 1900–2021



Note: The three asset classes are equities, long-term government bonds, and Treasury bills. All returns include reinvested income, are adjusted for inflation, and are expressed as geometric mean returns.



Note: EP bonds and EP bills denote the equity premium relative to bonds and to bills; Mat prem denotes the maturity premium for bonds relative to bills; RealXRate denotes the inflation-adjusted change in the exchange rate against the US dollar.

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Figure 84: Real returns on Danish asset classes, 1900–2021

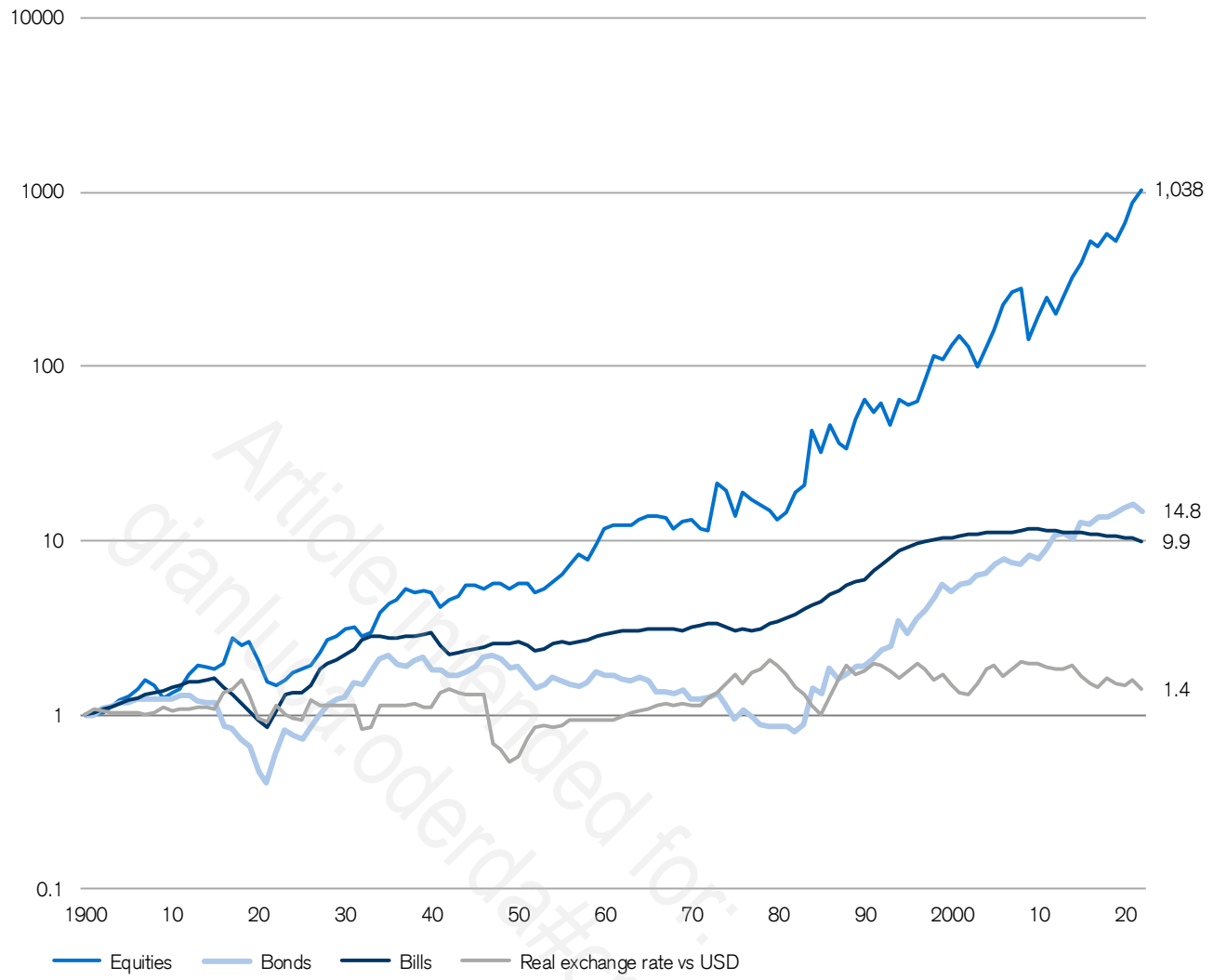

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Table 27: Returns on Danish asset classes, 1900–2021

		Mean returns % p.a.					Annual returns %				10-year returns % p.a.				Current
Return	Asset	GM	AM	SE	SD	SC	Lowest		Highest		Lowest		Highest		year rank
Nominal	Equities	9.7	11.6	2.0	21.8	–0.08	–48.0	2008	120.4	1983	–0.3	1928	24.7	1989	29
	Bonds	6.0	6.5	1.1	11.7	–0.14	–14.5	1915	73.5	1983	–0.6	1920	16.5	1991	110
	Bills	5.6	5.7	0.3	3.7	0.94	–0.6	2019	17.6	1980	–0.2	2020	14.2	1986	118
	Inflation	3.6	3.8	0.5	5.9	0.58	–15.1	1926	24.4	1940	–5.0	1930	11.6	1920	52
Real	Equities	5.9	7.7	1.9	20.7	–0.12	–49.2	2008	107.8	1983	–2.0	1922	17.1	1989	29
	Bonds	2.2	3.0	1.2	13.4	0.04	–27.6	1915	63.6	1983	–10.9	1920	14.3	1930	103
	Bills	1.9	2.1	0.5	5.9	0.55	–15.8	1940	25.1	1921	–5.6	1920	11.1	1930	109
	Exchange rate	0.3	1.0	1.1	11.7	0.13	–47.5	1946	34.6	1933	–7.0	1948	6.0	1978	107
Premiums	Equities vs bills	3.9	5.8	1.9	20.5	–0.06	–50.3	2008	95.3	1983	–5.8	1928	14.9	2018	22
	Equities vs bonds	3.5	5.2	1.7	18.6	–0.05	–55.0	2008	76.6	1972	–5.9	1930	15.1	1919	9
	Bonds vs bills	0.3	0.9	1.0	10.7	–0.15	–18.8	1915	53.8	1983	–6.0	1982	8.5	2019	92

GM=geometric mean; AM=arithmetic mean, SE=standard error of mean; SD=standard deviation; SC=serial correlation; 10-year returns to end of given year.
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Table 28: Danish real returns, inflation and premiums, 1900–2021

	1 Jan	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000	2010	2022	
Real equity total returns	**1900**		0.7	7.7	3.0	2.6	2.3	3.3	3.4	3.5	4.0	3.3	3.0	3.5	**Equity premium vs bonds**
	1910	2.9		15.1	4.2	3.3	2.6	3.8	3.9	3.9	4.4	3.6	3.2	3.8	
	1920	3.7	4.5		–5.6	–2.2	–1.2	1.2	1.8	2.1	2.9	2.3	1.9	2.8	
	1930	3.9	4.3	4.2		1.4	1.1	3.5	3.7	3.7	4.4	3.4	2.9	3.7	
	1940	4.2	4.6	4.6	5.0		0.7	4.6	4.5	4.3	5.1	3.8	3.1	4.0	
	1950	3.6	3.7	3.4	3.1	1.2		8.6	6.4	5.5	6.2	4.4	3.5	4.4	
	1960	4.2	4.5	4.4	4.5	4.3	7.5		4.2	4.0	5.4	3.4	2.6	3.8	
	1970	3.7	3.9	3.7	3.6	3.2	4.2	1.0		3.9	5.9	3.1	2.2	3.7	
	1980	3.3	3.3	3.1	2.9	2.4	2.8	0.5	0.1		8.0	2.7	1.6	3.7	
	1990	4.7	5.0	5.0	5.2	5.2	6.2	5.8	8.3	17.1		–2.4	–1.5	2.4	
	2000	5.0	5.2	5.3	5.5	5.6	6.5	6.2	8.0	12.2	7.5		–0.6	4.6	
	2010	4.9	5.1	5.2	5.3	5.3	6.0	5.7	6.9	9.4	5.7	3.8		9.1	
	2022	5.9	6.1	6.3	6.5	6.7	7.5	7.5	8.8	11.0	9.1	9.8	15.1		
Real equity capital gains	**1900**		–0.7	4.0	1.2	1.4	1.6	2.4	2.0	1.7	2.7	2.6	2.6	3.9	**Equity premium vs bills**
	1910	–2.0		9.1	2.1	2.1	2.2	3.0	2.5	2.1	3.1	3.0	2.9	4.3	
	1920	–1.7	–1.4		–4.4	–1.2	0.0	1.6	1.2	0.9	2.3	2.2	2.2	3.9	
	1930	–2.0	–2.1	–2.7		2.0	2.2	3.6	2.7	2.0	3.4	3.2	3.1	4.8	
	1940	–1.7	–1.6	–1.6	–0.5		2.4	4.4	2.9	2.0	3.7	3.4	3.3	5.1	
	1950	–1.9	–1.9	–2.0	–1.7	–2.8		6.4	3.2	1.9	4.0	3.6	3.4	5.5	
	1960	–1.3	–1.2	–1.1	–0.6	–0.6	1.7		0.0	–0.3	3.2	2.9	2.8	5.4	
	1970	–1.6	–1.6	–1.6	–1.3	–1.5	–0.9	–3.4		–0.6	4.9	3.9	3.5	6.4	
	1980	–2.0	–2.0	–2.1	–2.0	–2.4	–2.3	–4.2	–4.9		10.6	6.2	4.9	8.2	
	1990	–0.5	–0.3	–0.1	0.3	0.5	1.4	1.3	3.7	13.0		1.9	2.2	7.4	
	2000	0.2	0.4	0.6	1.1	1.4	2.2	2.4	4.4	9.4	5.8		2.5	10.0	
	2010	0.3	0.5	0.7	1.1	1.4	2.1	2.2	3.6	6.7	3.6	1.5		16.8	
	2022	1.4	1.7	2.1	2.6	3.0	3.8	4.2	5.7	8.4	6.9	7.5	12.7		
Real bonds	**1900**		–1.4	–3.4	–1.8	–1.2	–0.7	–0.9	–1.3	–1.7	–1.3	–0.7	–0.4	0.3	**Bond maturity premium**
	1910	2.2		–5.2	–2.0	–1.2	–0.5	–0.8	–1.3	–1.8	–1.2	–0.6	–0.3	0.5	
	1920	–3.7	–9.2		1.3	1.0	1.2	0.4	–0.5	–1.2	–0.7	0.0	0.3	1.1	
	1930	0.8	0.1	10.4		0.6	1.1	0.1	–1.0	–1.6	–1.0	–0.2	0.2	1.0	
	1940	1.5	1.2	6.9	3.5		1.7	–0.2	–1.5	–2.2	–1.3	–0.4	0.1	1.1	
	1950	1.3	1.0	4.7	2.0	0.5		–2.0	–3.0	–3.4	–2.0	–0.8	–0.1	1.0	
	1960	0.9	0.6	3.2	1.0	–0.3	–1.0		–4.0	–4.2	–2.0	–0.5	0.2	1.5	
	1970	0.3	0.0	1.9	–0.1	–1.2	–2.0	–3.1		–4.3	–1.0	0.8	1.3	2.6	
	1980	–0.2	–0.5	1.0	–0.8	–1.8	–2.6	–3.4	–3.7		2.4	3.4	3.3	4.3	
	1990	0.7	0.5	2.0	0.7	0.1	0.0	0.4	2.2	8.4		4.4	3.7	5.0	
	2000	1.6	1.6	3.0	2.0	1.7	2.0	2.8	4.8	9.3	10.2		3.1	5.2	
	2010	1.9	1.9	3.2	2.3	2.1	2.4	3.1	4.7	7.6	7.3	4.4		7.0	
	2022	2.2	2.2	3.4	2.7	2.6	2.9	3.6	4.9	7.0	6.6	5.0	5.5		
Real bills	**1900**		1.3	5.5	2.6	2.1	2.7	2.9	3.3	4.1	4.3	4.1	3.9	3.6	**Inflation**
	1910	3.7		9.7	3.3	2.4	3.1	3.3	3.6	4.4	4.7	4.4	4.2	3.8	
	1920	–0.3	–4.2		–2.9	–1.1	1.0	1.7	2.4	3.6	4.0	3.8	3.6	3.3	
	1930	2.7	2.2	8.9		0.8	2.9	3.3	3.8	4.9	5.2	4.7	4.4	4.0	
	1940	2.7	2.4	5.9	2.9		5.1	4.5	4.8	6.0	6.1	5.4	4.9	4.4	
	1950	1.9	1.5	3.5	0.8	–1.2		4.0	4.7	6.3	6.3	5.5	4.9	4.3	
	1960	1.8	1.4	2.8	0.9	–0.1	1.0		5.4	7.5	7.1	5.8	5.1	4.3	
	1970	1.7	1.3	2.5	0.9	0.3	1.0	1.0		9.6	8.0	6.0	5.0	4.1	
	1980	1.5	1.2	2.2	0.9	0.4	0.9	0.8	0.7		6.5	4.2	3.5	2.9	
	1990	2.0	1.8	2.7	1.7	1.4	2.1	2.5	3.2	5.9		2.1	2.0	1.8	
	2000	2.4	2.2	3.0	2.2	2.1	2.8	3.2	4.0	5.7	5.5		2.0	1.6	
	2010	2.3	2.1	2.8	2.1	2.0	2.5	2.8	3.3	4.2	3.4	1.3		1.3	
	2022	1.9	1.7	2.3	1.6	1.5	1.9	2.0	2.2	2.6	1.6	–0.2	–1.4		
Real exchange rate vs USD	**1900**		0.2	–1.5	0.1	–0.7	–1.7	–1.0	–0.9	–0.4	–0.6	–0.6	–0.3	–0.4	**Exchange rate vs USD**
	1910	0.5		–3.2	0.1	–1.0	–2.2	–1.2	–1.1	–0.5	–0.7	–0.7	–0.3	–0.5	
	1920	–0.2	–0.9		3.5	0.2	–1.9	–0.7	–0.7	0.0	–0.3	–0.4	0.0	–0.2	
	1930	0.4	0.3	1.5		–3.0	–4.5	–2.0	–1.7	–0.7	–0.9	–1.0	–0.4	–0.6	
	1940	0.2	0.1	0.6	–0.2		–5.9	–1.5	–1.3	–0.1	–0.5	–0.6	0.0	–0.3	
	1950	–1.1	–1.5	–1.7	–3.2	–6.1		3.0	1.1	1.9	0.9	0.5	1.0	0.5	
	1960	–0.1	–0.3	–0.1	–0.6	–0.8	4.8		–0.8	1.3	0.2	–0.2	0.6	0.1	
	1970	0.2	0.1	0.3	0.0	0.1	3.4	2.0		3.4	0.6	0.0	0.9	0.3	
	1980	0.8	0.9	1.2	1.1	1.4	4.1	3.7	5.5		–2.0	–1.6	0.1	–0.5	
	1990	0.7	0.7	0.9	0.8	1.0	2.9	2.2	2.3	–0.8		–1.2	1.2	0.0	
	2000	0.4	0.4	0.5	0.4	0.5	1.9	1.1	0.9	–1.4	–2.0		3.7	0.6	
	2010	0.6	0.6	0.8	0.7	0.9	2.1	1.5	1.4	0.1	0.5	3.1		–2.0	
	2022	0.3	0.3	0.4	0.3	0.3	1.2	0.7	0.4	–0.7	–0.7	–0.1	–2.8		

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Finland



With its proximity to the Baltic States and Russia, Finland is a meeting place for Eastern and Western European cultures. This country of snow, swamps and forests – one of Europe's most sparsely populated nations – was part of the Kingdom of Sweden until sovereignty transferred in 1809 to the Russian Empire.

In 1917, Finland became an independent country. A member of the European Union since 1995, Finland is the only Nordic state in the Eurozone. The country has shifted from a farm and forestry community to a more industrial economy. Per capita income is among the highest in Western Europe. In the 2022 World Happiness Report, Finland was ranked as the world's happiest country.

Finnish securities were initially traded over-the-counter or overseas. Trading began at the Helsinki Stock Exchange in 1912. Since 2003, the Helsinki exchange has been part of the OMX family of Nordic markets.

At its peak, Nokia represented 72% of the value-weighted HEX All Shares Index, and Finland was a particularly concentrated stock market.

Today, the largest Finnish companies are Nordea Bank (18% of the FTSE World Finland Index), Nokia (14%), Kone (11%) and Sampo (10%).

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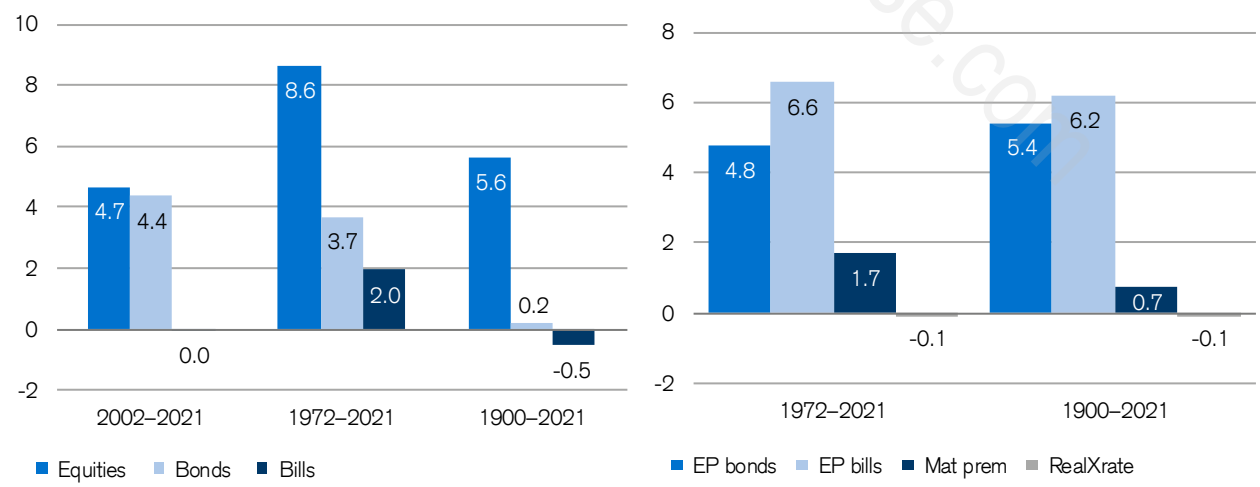
Figure 85: Annualized real returns and risk premiums (%) for Finland, 1900–2021



Note: The three asset classes are equities, long-term government bonds, and Treasury bills. All returns include reinvested income, are adjusted for inflation, and are expressed as geometric mean returns.

Note: EP bonds and EP bills denote the equity premium relative to bonds and to bills; Mat prem denotes the maturity premium for bonds relative to bills; RealXRate denotes the inflation-adjusted change in the exchange rate against the US dollar.

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Figure 86: Real returns on Finnish asset classes, 1900–2021

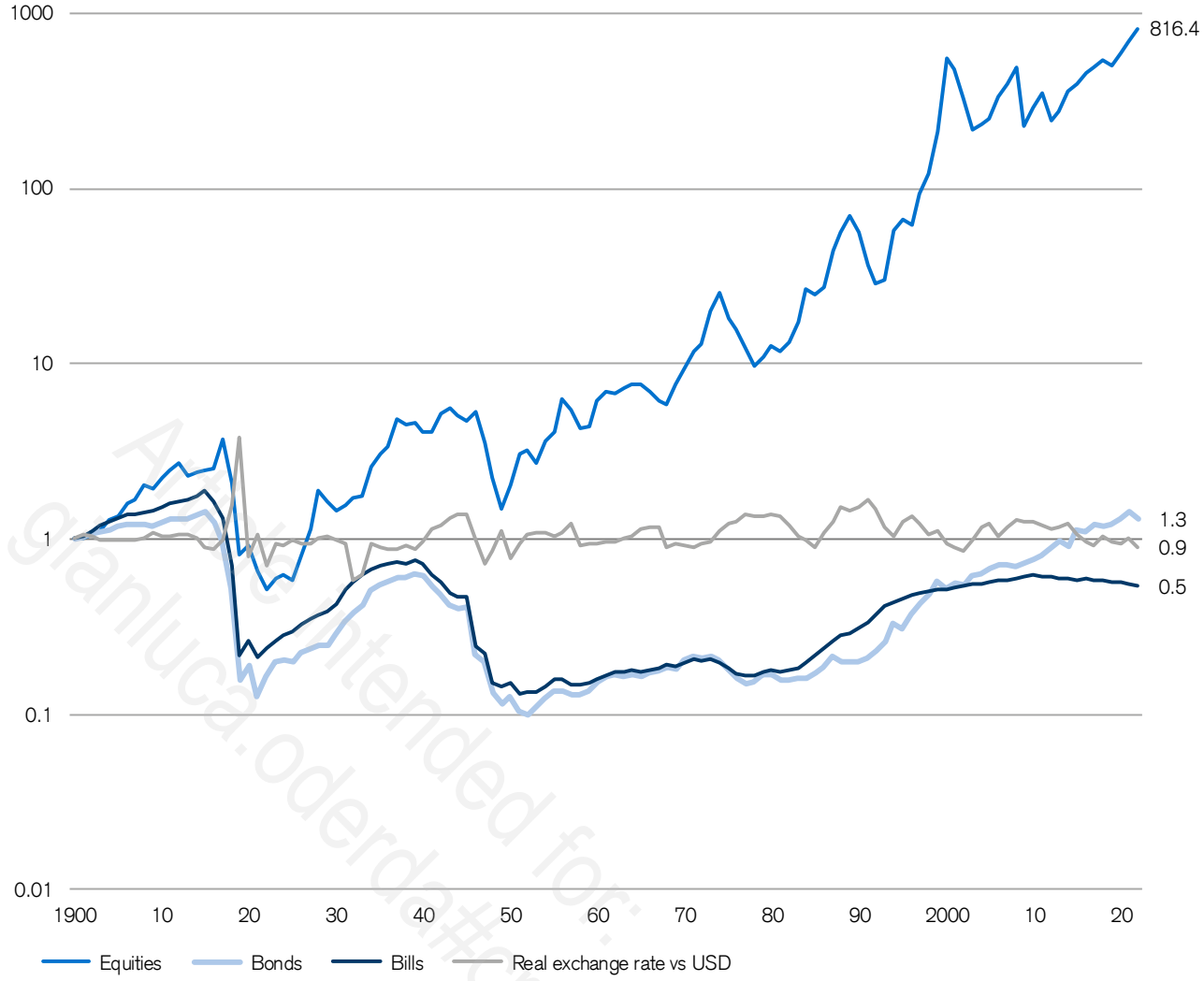

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Table 29: Returns on Finnish asset classes, 1900–2021

		Mean returns % p.a.					Annual returns %				10-year returns % p.a.				Current
Return	Asset	GM	AM	SE	SD	SC	Lowest		Highest		Lowest		Highest		year rank
Nominal	Equities	12.8	16.4	2.8	30.8	0.11	–51.3	2008	167.0	1999	–4.6	2009	31.7	2000	41
	Bonds	7.0	7.2	0.6	6.3	–0.06	–10.6	1920	28.8	1993	2.7	1920	13.9	1998	120
	Bills	6.2	6.3	0.3	3.6	0.94	–0.6	2020	17.8	1984	0.2	2020	13.7	1992	121
	Inflation	6.8	8.4	2.3	25.6	0.27	–11.3	1919	241.4	1918	–1.9	1934	29.7	1920	56
Real	Equities	5.6	9.4	2.7	29.3	0.22	–61.5	1918	161.7	1999	–15.3	1921	29.2	2000	36
	Bonds	0.2	1.4	1.2	13.5	0.26	–69.5	1918	30.2	1921	–20.8	1920	11.2	1998	107
	Bills	–0.5	0.4	1.0	11.4	0.38	–69.2	1918	19.9	1919	–18.4	1920	9.3	1930	105
	Exchange rate	–0.1	2.0	1.9	20.5	–0.14	–79.3	1919	146.9	1918	–12.3	1928	13.4	1918	104
Premiums	Equities vs bills	6.2	9.7	2.7	29.5	0.12	–54.0	2008	159.2	1999	–7.8	2009	23.7	2000	30
	Equities vs bonds	5.4	9.0	2.7	30.2	0.07	–55.5	2008	186.5	1999	–9.6	2009	18.6	1988	19
	Bonds vs bills	0.7	0.9	0.6	6.1	0.00	–17.4	1920	22.7	2014	–3.8	1989	6.8	2020	112

GM=geometric mean; AM=arithmetic mean, SE=standard error of mean; SD=standard deviation; SC=serial correlation; 10-year returns to end of given year.
Source: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

Table 30: Finnish real returns, inflation and premiums, 1900–2021

	1 Jan	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000	2010	2022	
Real equity total returns	**1900**		6.1	8.3	5.6	4.8	5.7	6.3	5.6	5.5	6.5	7.2	5.6	5.4	**Equity premium vs bonds**
	1910	8.5		10.5	5.3	4.4	5.6	6.4	5.6	5.5	6.5	7.3	5.5	5.4	
	1920	–0.4	–8.5		0.4	1.5	4.0	5.4	4.6	4.7	6.0	6.9	5.0	4.9	
	1930	1.2	–2.2	4.5		2.6	5.9	7.1	5.7	5.5	6.9	7.9	5.5	5.4	
	1940	3.6	2.0	7.6	10.8		9.4	9.4	6.7	6.3	7.8	8.8	6.0	5.7	
	1950	1.4	–0.3	2.6	1.7	–6.7		9.5	5.4	5.3	7.4	8.7	5.4	5.2	
	1960	3.1	2.0	4.8	4.9	2.1	11.7		1.5	3.2	6.7	8.5	4.6	4.5	
	1970	3.3	2.4	4.8	4.8	2.9	8.0	4.4		4.9	9.4	11.0	5.4	5.1	
	1980	3.2	2.5	4.5	4.4	2.9	6.3	3.7	3.0		14.1	14.1	5.6	5.2	
	1990	4.6	4.1	6.0	6.3	5.4	8.7	7.6	9.3	16.0		14.1	1.5	2.5	
	2000	6.5	6.3	8.3	8.9	8.5	11.9	11.9	14.5	20.7	25.6		–9.6	–2.3	
	2010	5.3	5.0	6.6	6.9	6.3	8.6	8.0	8.9	11.0	8.6	–6.1		4.2	
	2022	5.6	5.4	6.9	7.1	6.7	8.7	8.2	9.0	10.4	8.7	1.8	9.0		
Real equity capital gains	**1900**		3.9	6.5	4.1	4.4	5.3	6.3	5.7	5.5	5.9	7.2	5.7	6.2	**Equity premium vs bills**
	1910	3.6		9.2	4.2	4.5	5.7	6.8	6.0	5.7	6.2	7.6	5.9	6.4	
	1920	–4.8	–12.5		–0.5	2.3	4.6	6.2	5.3	5.1	5.8	7.4	5.6	6.1	
	1930	–4.1	–7.8	–2.8		5.1	7.2	8.5	6.9	6.3	6.9	8.6	6.4	6.9	
	1940	–2.1	–3.9	0.8	4.4		9.3	10.2	7.4	6.6	7.2	9.1	6.5	7.1	
	1950	–3.6	–5.3	–2.8	–2.8	–9.5		11.1	6.5	5.7	6.7	9.1	6.1	6.8	
	1960	–1.9	–3.0	–0.5	0.3	–1.7	6.9		2.1	3.1	5.3	8.6	5.1	6.1	
	1970	–1.9	–2.8	–0.8	–0.3	–1.8	2.3	–2.0		4.1	6.9	10.9	5.9	6.9	
	1980	–2.0	–2.7	–1.0	–0.6	–1.8	0.8	–2.0	–2.1		9.8	14.4	6.5	7.6	
	1990	–0.6	–1.1	0.7	1.2	0.6	3.3	2.2	4.3	11.1		19.2	4.8	6.9	
	2000	1.5	1.3	3.2	4.1	4.0	7.0	7.0	10.2	16.8	22.8		–7.8	1.7	
	2010	0.5	0.2	1.7	2.3	2.0	4.1	3.5	4.9	7.4	5.5	–9.3		10.4	
	2022	0.9	0.6	2.0	2.6	2.4	4.1	3.7	4.8	6.5	5.1	–2.1	4.4		
Real bonds	**1900**		–2.0	–1.6	–1.4	–0.4	–0.3	0.0	0.0	–0.1	–0.5	0.0	0.2	0.7	**Bond maturity premium**
	1910	2.3		–1.2	–1.0	0.1	0.1	0.4	0.4	0.2	–0.3	0.2	0.4	1.0	
	1920	–8.0	–17.2		–0.9	0.8	0.5	0.7	0.7	0.5	–0.2	0.4	0.6	1.2	
	1930	–4.1	–7.1	4.1		2.5	1.2	1.3	1.1	0.7	0.0	0.6	0.8	1.4	
	1940	–1.2	–2.3	6.1	8.1		–0.1	0.7	0.7	0.3	–0.5	0.3	0.5	1.3	
	1950	–4.1	–5.6	–1.3	–4.0	–14.7		1.5	1.0	0.4	–0.7	0.4	0.6	1.5	
	1960	–3.1	–4.1	–0.5	–2.0	–6.7	2.0		0.6	–0.1	–1.4	0.1	0.5	1.5	
	1970	–2.2	–3.0	0.1	–0.8	–3.6	2.4	2.8		–0.8	–2.3	–0.1	0.4	1.7	
	1980	–2.2	–2.8	–0.2	–1.0	–3.2	1.0	0.5	–1.8		–3.8	0.3	0.8	2.2	
	1990	–1.8	–2.3	0.1	–0.6	–2.2	1.1	0.9	–0.1	1.6		4.5	3.2	4.2	
	2000	–0.6	–1.0	1.3	0.9	–0.3	2.9	3.1	3.2	5.8	10.1		2.0	4.1	
	2010	–0.2	–0.5	1.6	1.2	0.3	3.0	3.2	3.3	5.1	6.9	3.8		5.9	
	2022	0.2	0.0	1.9	1.7	0.9	3.3	3.5	3.6	5.0	6.0	4.2	4.6		
Real bills	**1900**		1.1	12.8	9.4	6.9	9.9	9.2	8.6	8.8	8.6	8.0	7.4	6.8	**Inflation**
	1910	4.4		25.9	13.9	8.9	12.2	10.9	9.9	10.0	9.6	8.8	8.0	7.3	
	1920	–6.5	–16.2		3.0	1.3	8.0	7.5	6.9	7.5	7.5	6.8	6.2	5.6	
	1930	–2.8	–6.2	5.1		–0.3	10.6	9.0	8.0	8.5	8.2	7.3	6.6	5.9	
	1940	–0.8	–2.5	5.3	5.4		22.6	14.0	10.9	10.8	10.0	8.7	7.6	6.7	
	1950	–3.7	–5.7	–1.8	–5.1	–14.6		6.0	5.4	7.1	7.1	6.1	5.3	4.7	
	1960	–3.0	–4.4	–1.2	–3.3	–7.4	0.5		4.8	7.7	7.5	6.1	5.2	4.4	
	1970	–2.3	–3.4	–0.6	–1.9	–4.3	1.4	2.2		10.6	8.8	6.5	5.3	4.4	
	1980	–2.1	–3.0	–0.6	–1.8	–3.5	0.6	0.6	–1.1		7.1	4.5	3.6	3.0	
	1990	–1.3	–2.0	0.2	–0.6	–1.7	1.8	2.2	2.3	5.7		2.0	1.8	1.7	
	2000	–0.7	–1.2	0.9	0.3	–0.6	2.5	3.0	3.3	5.5	5.4		1.6	1.5	
	2010	–0.4	–0.9	1.0	0.5	–0.2	2.4	2.8	2.9	4.3	3.6	1.8		1.4	
	2022	–0.5	–0.9	0.7	0.2	–0.4	1.8	2.0	1.9	2.7	1.7	0.1	–1.2		
Real exchange rate vs USD	**1900**		0.2	–8.9	–6.5	–5.4	–7.6	–6.6	–6.1	–5.2	–4.7	–4.6	–3.9	–3.7	**Exchange rate vs USD**
	1910	0.2		–17.1	–9.7	–7.2	–9.4	–7.9	–7.1	–5.9	–5.3	–5.1	–4.3	–4.0	
	1920	–1.2	–2.6		–1.7	–1.8	–6.7	–5.5	–4.9	–3.9	–3.5	–3.5	–2.8	–2.7	
	1930	–0.1	–0.2	2.2		–1.9	–9.2	–6.7	–5.7	–4.4	–3.8	–3.8	–2.9	–2.8	
	1940	–0.1	–0.2	1.0	–0.2		–15.9	–9.0	–6.9	–5.0	–4.2	–4.1	–3.0	–2.9	
	1950	–0.5	–0.7	0.0	–1.2	–2.1		–1.6	–2.1	–1.0	–1.0	–1.5	–0.7	–0.9	
	1960	–0.1	–0.2	0.5	–0.1	0.0	2.0		–2.7	–0.7	–0.8	–1.5	–0.5	–0.8	
	1970	–0.1	–0.2	0.3	–0.2	–0.2	0.8	–0.4		1.2	0.2	–1.2	0.0	–0.4	
	1980	0.4	0.4	0.9	0.7	0.9	1.9	1.9	4.2		–0.8	–2.3	–0.4	–0.8	
	1990	0.5	0.5	0.9	0.7	0.9	1.7	1.6	2.6	1.1		–3.8	–0.1	–0.8	
	2000	0.0	–0.1	0.2	0.0	0.0	0.4	0.0	0.2	–1.8	–4.6		3.7	0.6	
	2010	0.2	0.2	0.5	0.3	0.4	0.8	0.6	0.8	–0.3	–1.0	2.8		–2.0	
	2022	–0.1	–0.1	0.1	–0.1	–0.1	0.2	–0.1	0.0	–1.0	–1.6	–0.2	–2.6		

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France



As financial centers, Paris and London competed vigorously in the 19th century. After the Franco-Prussian War in 1870, London achieved domination. But Paris remained important, especially (to its later disadvantage) in loans to Russia and the Mediterranean region, including the Ottoman Empire. As Kindelberger, the famous economic historian put it, "London was a world financial center; Paris was a European financial center."

Paris has continued to be an important financial center, while France remains at the center of Europe, being a founder of the European Union and the Eurozone. France is the second most populous country in the European Union and is ranked second by GDP. It has the largest equity market in Continental Europe and the fifth-largest bond market in the world.

Long-run French asset returns have been disappointing. France ranks in the bottom quartile of countries with a complete history for equity and bill performance, while, for bonds, it ranked seventh worst. However, France had the sixth-highest inflation rate among the Yearbook countries with continuous histories – hence the poor fixed income returns.

However, the inflationary episodes and poor performance date back to the first half of the 20th century and are linked to the world wars. Since 1950, French equities have achieved mid-ranking returns.

At the start of 2022, France's largest listed companies were LVMH (11%), TotalEnergies (6%), L'Oreal (6%) and Schneider Electric (5%).

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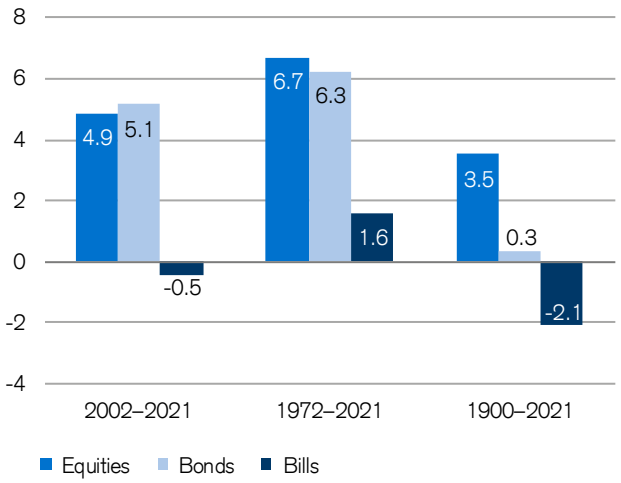
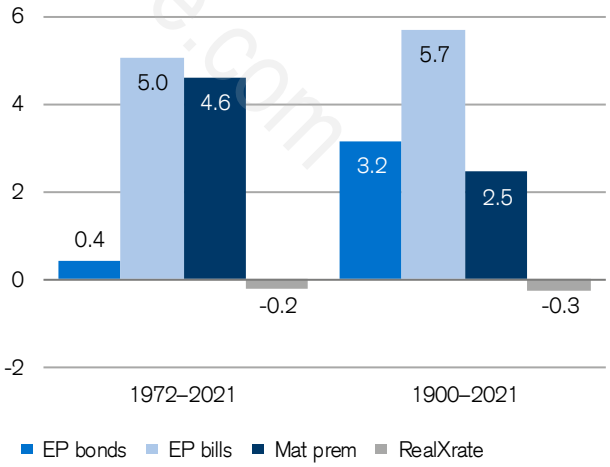
Figure 87: Annualized real returns and risk premiums (%) for France, 1900–2021



Note: The three asset classes are equities, long-term government bonds, and Treasury bills. All returns include reinvested income, are adjusted for inflation, and are expressed as geometric mean returns.



Note: EP bonds and EP bills denote the equity premium relative to bonds and to bills; Mat prem denotes the maturity premium for bonds relative to bills; RealXRate denotes the inflation-adjusted change in the exchange rate against the US dollar.

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Figure 88: Real returns on French asset classes, 1900–2021

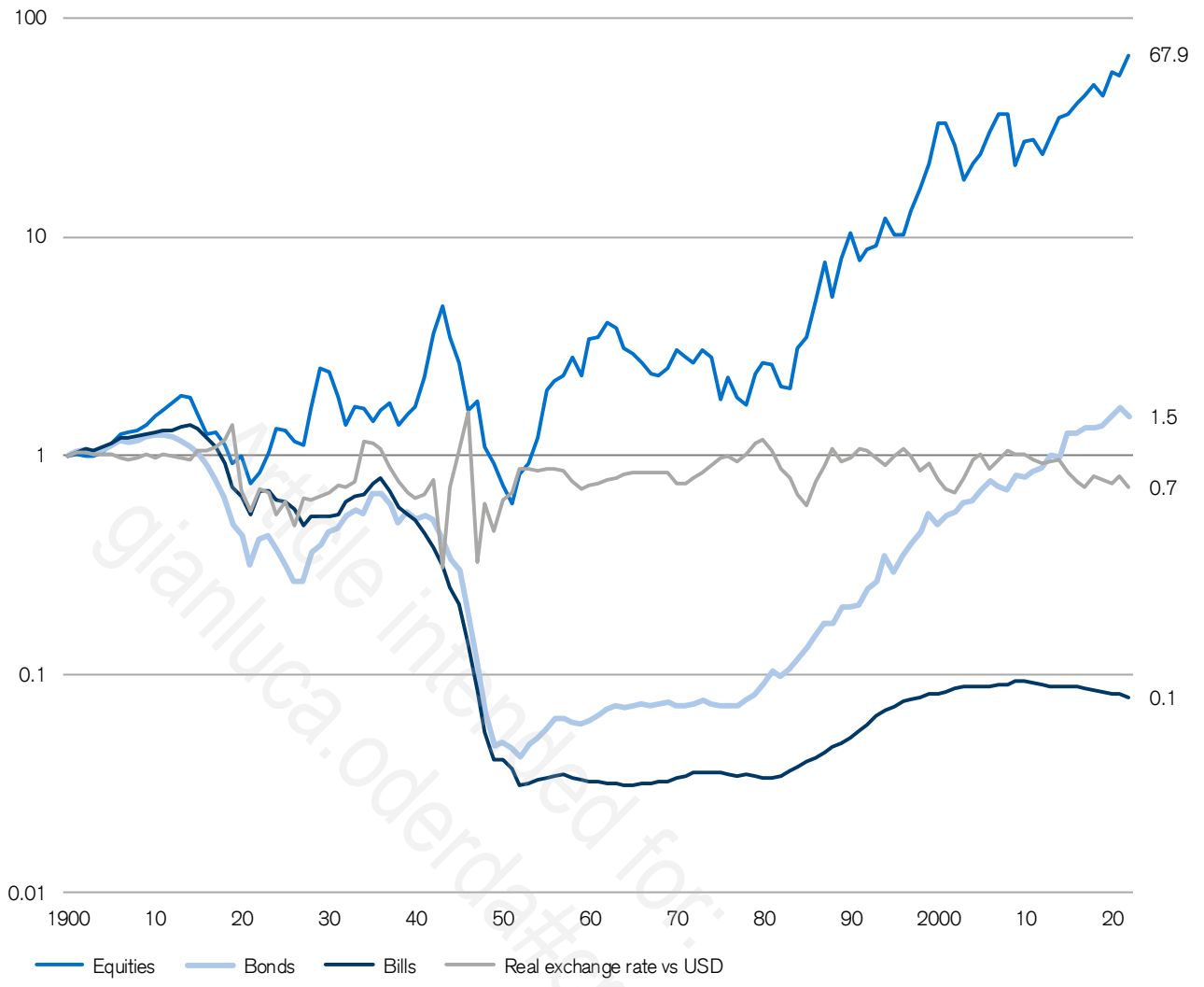

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Table 31: Returns on French asset classes, 1900–2021

		Mean returns % p.a.					Annual returns %				10-year returns % p.a.				Current
Return	**Asset**	**GM**	**AM**	**SE**	**SD**	**SC**	**Lowest**		**Highest**		**Lowest**		**Highest**		**year rank**
Nominal	Equities	10.4	12.9	2.2	24.5	0.10	–40.9	2008	89.1	1941	–2.4	1938	26.2	1947	25
	Bonds	7.0	7.4	0.8	9.0	0.16	–14.3	1994	32.4	1993	–0.2	1920	18.9	1986	118
	Bills	4.4	4.5	0.3	3.5	0.93	–0.7	2017	16.4	1981	–0.2	2020	11.8	1985	120
	Inflation	6.6	7.2	1.1	11.9	0.71	–18.4	1921	65.1	1946	–0.7	1936	31.7	1948	62
Real	Equities	3.5	6.0	2.1	22.8	0.14	–41.5	2008	66.1	1954	–15.2	1952	19.1	1960	26
	Bonds	0.3	1.2	1.2	13.0	0.40	–43.5	1947	35.9	1927	–22.2	1951	11.4	1993	102
	Bills	–2.1	–1.6	0.8	9.2	0.65	–38.5	1946	29.7	1921	–22.8	1948	6.2	1993	96
	Exchange rate	–0.3	2.2	2.0	22.1	–0.24	–79.4	1946	136.3	1943	–9.5	1946	11.0	1952	103
Premiums	Equities vs bills	5.7	8.2	2.1	23.7	0.10	–43.1	2008	85.7	1941	–5.8	1974	23.9	1947	18
	Equities vs bonds	3.2	5.4	2.0	22.4	0.01	–49.3	2008	84.3	1946	–7.7	1938	21.3	1948	9
	Bonds vs bills	2.5	2.8	0.7	8.0	0.05	–19.2	1994	27.8	2014	–4.7	1925	8.3	2020	112

GM=geometric mean; AM=arithmetic mean, SE=standard error of mean; SD=standard deviation; SC=serial correlation; 10-year returns to end of given year.
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Table 32: French real returns, inflation and premiums, 1900–2021

	1 Jan	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000	2010	2022	
Real equity total returns	**1900**		2.0	4.3	5.8	3.0	5.6	6.9	5.5	4.3	4.5	4.3	3.3	3.2	**Equity premium vs bonds**
	1910	4.3		6.6	7.7	3.3	6.5	7.9	6.1	4.6	4.8	4.6	3.4	3.3	
	1920	0.0	–4.1		8.8	1.7	6.4	8.2	6.0	4.3	4.5	4.3	3.0	3.0	
	1930	3.0	2.3	9.2		–5.0	5.3	8.1	5.3	3.4	3.9	3.7	2.3	2.3	
	1940	1.3	0.3	2.6	–3.7		16.7	15.2	9.0	5.7	5.7	5.2	3.4	3.3	
	1950	–0.6	–1.8	–1.0	–5.7	–7.8		13.8	5.3	2.2	3.1	3.1	1.4	1.5	
	1960	2.1	1.6	3.1	1.2	3.7	16.5		–2.5	–3.1	–0.2	0.6	–0.9	–0.3	
	1970	1.6	1.2	2.3	0.6	2.1	7.4	–1.0		–3.8	1.0	1.6	–0.5	0.1	
	1980	1.2	0.8	1.6	0.2	1.2	4.3	–1.3	–1.5		6.0	4.4	0.6	1.0	
	1990	2.6	2.4	3.4	2.5	3.8	6.9	3.8	6.3	14.8		2.9	–2.0	–0.4	
	2000	3.6	3.5	4.5	3.8	5.1	7.9	5.9	8.3	13.5	12.3		–6.7	–1.9	
	2010	3.1	2.9	3.7	3.1	4.1	6.2	4.3	5.6	8.1	4.9	–1.9		2.3	
	2022	3.5	3.5	4.2	3.7	4.6	6.5	5.0	6.1	8.0	6.0	3.3	7.9		
Real equity capital gains	**1900**		1.7	2.2	5.2	3.0	6.0	8.1	6.7	5.6	6.1	6.2	5.3	5.7	**Equity premium vs bills**
	1910	–0.1		2.6	6.9	3.4	7.1	9.4	7.5	6.2	6.6	6.7	5.7	6.1	
	1920	–4.0	–7.7		11.4	3.8	8.6	11.2	8.5	6.8	7.2	7.2	6.0	6.4	
	1930	–1.1	–1.5	5.1		–3.3	7.2	11.1	7.8	5.9	6.5	6.6	5.4	5.9	
	1940	–2.8	–3.8	–1.7	–8.0		18.8	19.0	11.8	8.3	8.6	8.4	6.7	7.0	
	1950	–4.2	–5.2	–4.4	–8.8	–9.6		19.2	8.4	5.0	6.2	6.4	4.8	5.5	
	1960	–1.7	–2.1	–0.6	–2.4	0.5	11.7		–1.3	–1.5	2.2	3.4	2.1	3.5	
	1970	–2.1	–2.4	–1.3	–2.8	–1.0	3.6	–3.9		–1.7	4.0	5.1	3.0	4.4	
	1980	–2.6	–3.0	–2.2	–3.6	–2.4	0.1	–5.3	–6.6		10.0	8.6	4.5	5.9	
	1990	–1.3	–1.5	–0.6	–1.5	–0.1	2.4	–0.5	1.3	9.8		7.2	1.9	4.7	
	2000	–0.3	–0.4	0.6	0.0	1.4	3.7	1.8	3.8	9.4	9.0		–3.1	3.5	
	2010	–0.7	–0.8	0.0	–0.6	0.5	2.3	0.5	1.6	4.5	1.9	–4.7		9.4	
	2022	–0.2	–0.3	0.5	0.0	1.1	2.6	1.2	2.3	4.5	2.9	0.2	4.5		
Real bonds	**1900**		–0.3	–2.0	–0.6	0.0	0.4	1.1	1.1	1.2	1.5	1.8	2.0	2.5	**Bond maturity premium**
	1910	2.2		–3.8	–0.7	0.1	0.6	1.4	1.3	1.5	1.8	2.0	2.2	2.7	
	1920	–4.1	–10.0		2.4	2.1	2.0	2.7	2.4	2.4	2.6	2.8	2.9	3.4	
	1930	–2.7	–5.0	0.3		1.8	1.8	2.8	2.4	2.3	2.6	2.8	2.9	3.5	
	1940	–1.6	–2.9	0.9	1.4		1.8	3.3	2.6	2.5	2.7	3.0	3.1	3.7	
	1950	–5.9	–7.8	–7.0	–10.5	–21.0		4.7	2.9	2.7	3.0	3.2	3.3	3.9	
	1960	–4.5	–5.8	–4.7	–6.4	–10.0	2.4		1.2	1.7	2.4	2.8	3.0	3.8	
	1970	–3.7	–4.6	–3.5	–4.5	–6.4	1.9	1.5		2.2	3.0	3.4	3.5	4.3	
	1980	–3.0	–3.7	–2.6	–3.1	–4.2	2.1	1.9	2.4		3.8	4.0	4.0	4.8	
	1990	–1.8	–2.2	–1.1	–1.3	–1.9	3.6	4.0	5.3	8.3		4.2	4.0	5.1	
	2000	–0.7	–1.0	0.1	0.1	–0.1	4.7	5.3	6.6	8.7	9.1		3.8	5.5	
	2010	–0.2	–0.4	0.7	0.7	0.6	4.8	5.2	6.2	7.5	7.1	5.1		7.0	
	2022	0.3	0.2	1.2	1.3	1.3	4.9	5.3	6.0	6.9	6.5	5.3	5.5		
Real bills	**1900**		0.6	5.9	6.4	5.5	10.2	9.5	8.7	8.7	8.5	7.8	7.3	6.6	**Inflation**
	1910	2.5		11.5	9.5	7.2	12.8	11.4	10.1	9.9	9.6	8.7	8.0	7.2	
	1920	–2.1	–6.5		7.5	5.2	13.2	11.4	9.8	9.7	9.3	8.3	7.6	6.8	
	1930	–2.1	–4.3	–2.0		2.9	16.1	12.7	10.4	10.1	9.6	8.4	7.6	6.7	
	1940	–1.7	–3.0	–1.2	–0.4		31.1	17.9	13.1	12.0	11.0	9.4	8.3	7.2	
	1950	–6.2	–8.3	–8.9	–12.1	–22.4		6.0	5.0	6.3	6.4	5.5	4.9	4.2	
	1960	–5.6	–7.1	–7.2	–8.9	–12.9	–2.2		4.0	6.4	6.6	5.4	4.6	3.9	
	1970	–4.7	–5.9	–5.8	–6.7	–8.7	–1.0	0.3		8.8	7.9	5.8	4.8	3.9	
	1980	–4.1	–5.1	–4.8	–5.4	–6.6	–0.6	0.2	0.2		6.9	4.4	3.5	2.8	
	1990	–3.2	–3.9	–3.6	–3.8	–4.5	0.6	1.6	2.2	4.4		1.9	1.8	1.6	
	2000	–2.5	–3.0	–2.6	–2.6	–3.0	1.4	2.4	3.0	4.5	4.7		1.7	1.4	
	2010	–2.1	–2.6	–2.1	–2.2	–2.4	1.4	2.1	2.6	3.4	2.9	1.2		1.2	
	2022	–2.1	–2.5	–2.1	–2.1	–2.3	0.9	1.4	1.7	2.0	1.3	–0.2	–1.4		
Real exchange rate vs USD	**1900**		0.2	–3.6	–5.1	–5.2	–8.3	–7.3	–6.4	–5.3	–5.1	–4.7	–4.0	–3.8	**Exchange rate vs USD**
	1910	–0.2		–7.2	–7.6	–6.9	–10.3	–8.7	–7.5	–6.0	–5.7	–5.2	–4.4	–4.1	
	1920	–1.9	–3.5		–8.1	–6.7	–11.3	–9.1	–7.6	–5.8	–5.5	–5.0	–4.1	–3.8	
	1930	–1.3	–1.9	–0.2		–5.3	–12.8	–9.4	–7.4	–5.4	–5.1	–4.5	–3.5	–3.3	
	1940	–1.1	–1.4	–0.4	–0.6		–19.7	–11.4	–8.1	–5.4	–5.0	–4.4	–3.3	–3.1	
	1950	–0.9	–1.1	–0.3	–0.4	–0.1		–2.1	–1.7	–0.1	–0.9	–1.0	–0.2	–0.5	
	1960	–0.5	–0.6	0.1	0.3	0.7	1.5		–1.2	1.0	–0.5	–0.7	0.1	–0.3	
	1970	–0.4	–0.5	0.2	0.3	0.5	0.9	0.2		3.3	–0.2	–0.5	0.5	–0.1	
	1980	0.2	0.3	0.9	1.1	1.6	2.1	2.4	4.7		–3.6	–2.4	–0.4	–0.9	
	1990	0.0	0.0	0.5	0.6	0.8	1.1	1.0	1.3	–1.9		–1.2	1.2	0.0	
	2000	–0.3	–0.3	0.1	0.2	0.3	0.4	0.1	0.1	–2.1	–2.2		3.7	0.6	
	2010	0.0	0.0	0.4	0.5	0.7	0.8	0.7	0.8	–0.5	0.3	2.8		–2.0	
	2022	–0.3	–0.3	0.0	0.1	0.1	0.2	0.0	–0.1	–1.2	–0.9	–0.3	–2.9		

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Germany



Germany is a social market economy as well as Europe's most populous nation, with a skilled and affluent (albeit aging) workforce. It is a popular destination for migrants.

In the first half of the 20th century, German equities lost two-thirds of their value in World War I and, during 1922–23, inflation hit 209 billion percent. In World War II and its immediate aftermath, equities fell by 88% in real terms, while bonds fell by 91%.

After World War II, there was a remarkable transformation. In the early stages of its "economic miracle," German equities rose by 4,373% in real terms from 1949 to 1959. Germany rapidly became known as the "locomotive of Europe." Meanwhile, it built a reputation for fiscal and monetary prudence. From 1949 to date, it has had the world's second-lowest inflation rate and its strongest currency (now the euro), and an especially strong bond market.

Today, Germany is Europe's largest economy. Formerly the world's top exporter, it has been overtaken by China. Its stock market, which dates back to 1685, ranks eighth in the world by size, while its bond market ranks sixth largest.

The German stock market retains its bias toward manufacturing, with weightings in the FTSE World Germany index of 20% in consumer discretionary, 17% in industrials, and 8% in basic materials. Financials account for a further 14% of the index. The largest stocks are SAP, Siemens, Allianz, BASF, Deutsche Post and Adidas. Small and medium enterprises are also important.

In the statistics below, we omit the 1922–23 hyperinflationary period for every series except real equity returns and the real exchange rate.

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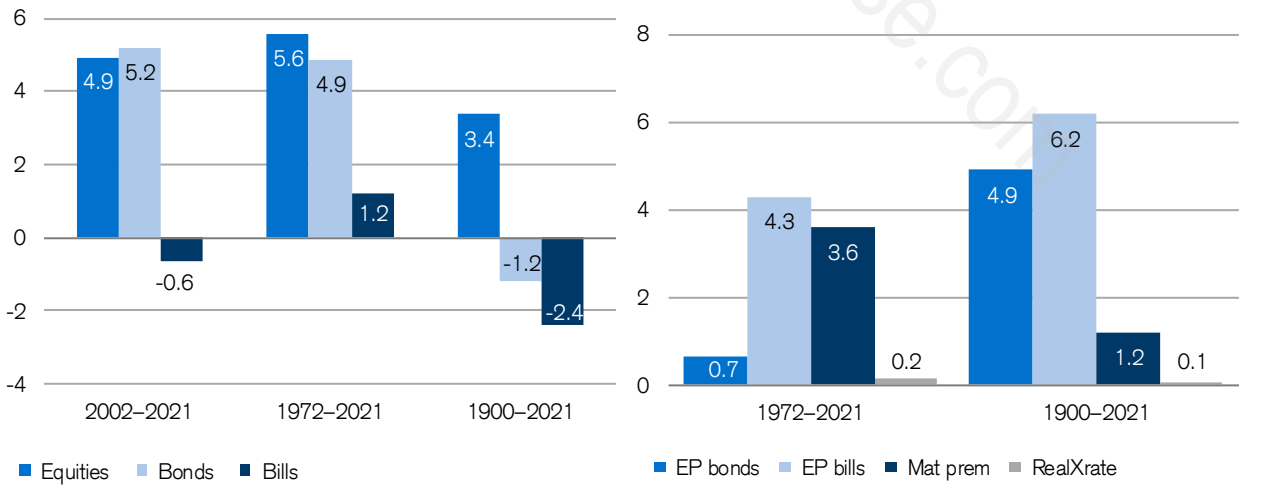
Figure 89: Annualized real returns and risk premiums (%) for Germany, 1900–2021



Note: The three asset classes are equities, long-term government bonds, and Treasury bills. All returns include reinvested income, are adjusted for inflation, and are expressed as geometric mean returns.

Note: EP bonds and EP bills denote the equity premium relative to bonds and to bills; Mat prem denotes the maturity premium for bonds relative to bills; RealXRate denotes the inflation-adjusted change in the exchange rate against the US dollar.

Real bond and bill returns and the three premiums exclude 1922–23. Source: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

Figure 85: Real returns on German asset classes, 1900–2021

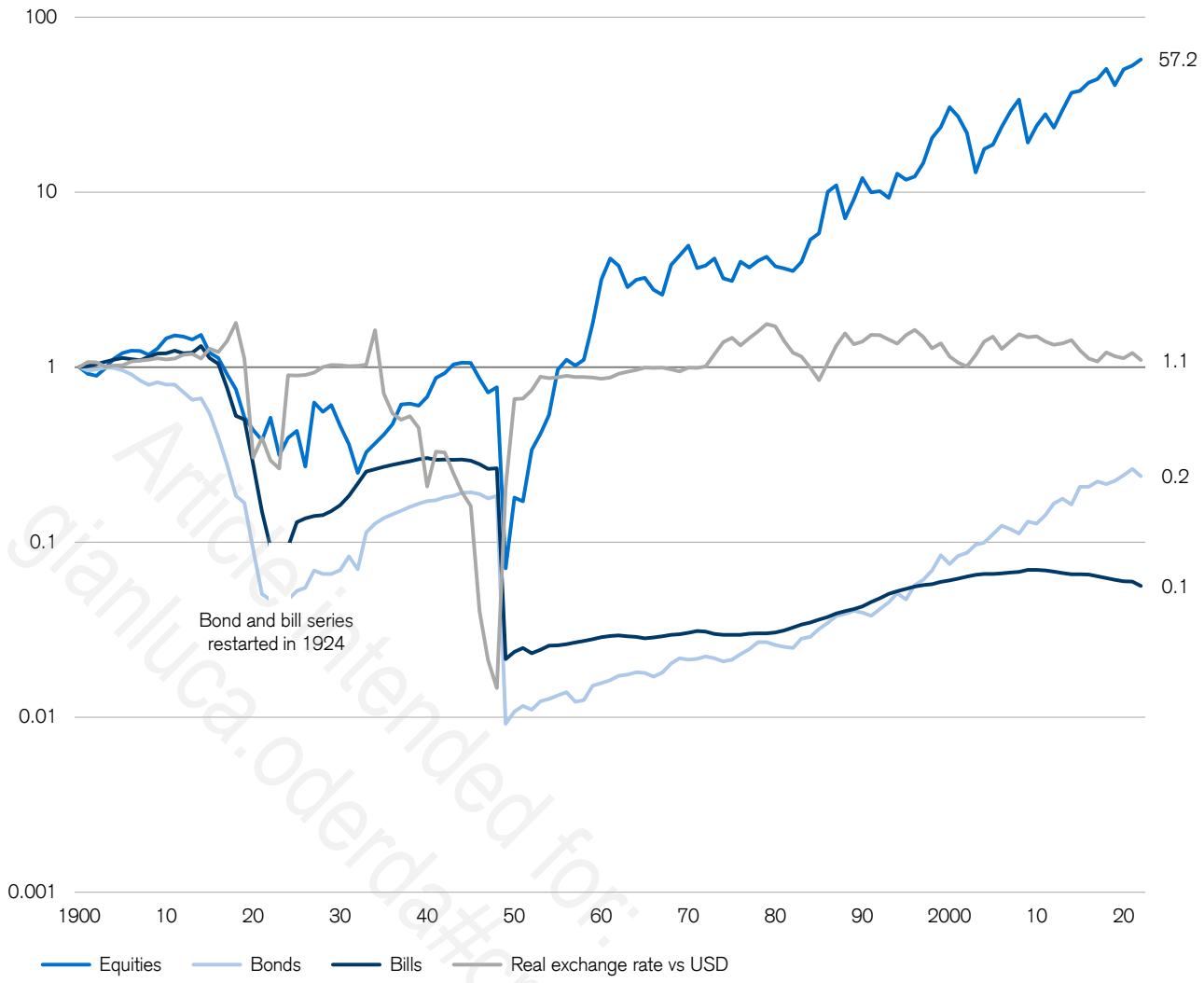


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Table 33: Returns on German asset classes, 1900–2021 (including 1922–23 only for the real equity and exchange rate series)

		Mean returns % p.a.					Annual returns %				10-year returns % p.a.				Current
Return	Asset	GM	AM	SE	SD	SC	Lowest		Highest		Lowest		Highest		year rank
Nominal	Equities	8.3	13.3	3.0	33.0	–0.07	–88.4	1948	137.8	1926	–14.9	1948	40.1	1960	50
	Bonds	3.3	5.4	1.2	13.4	–0.05	–93.7	1948	54.8	1921	–21.6	1957	10.7	2000	111
	Bills	2.0	3.4	0.8	9.3	0.10	–89.8	1948	32.0	1924	–19.0	1949	9.0	1933	117
	Inflation	4.5	5.3	1.3	14.5	0.72	–9.5	1932	93.0	1920	–2.1	1938	39.2	1921	22
Real	Equities	3.4	8.1	2.8	31.1	–0.13	–90.8	1948	154.6	1949	–19.3	1948	38.0	1958	57
	Bonds	–1.2	1.4	1.4	15.6	0.14	–95.0	1948	62.5	1932	–25.1	1948	10.5	1933	108
	Bills	–2.4	–0.5	1.2	12.8	0.31	–91.9	1948	38.8	1924	–28.2	1923	10.8	1933	110
	Exchange rate	0.1	12.8	11.1	122.4	0.13	–75.0	1945	1298	1948	–30.1	1947	50.6	1957	97
Premiums	Equities vs bills	6.2	9.8	2.8	30.9	0.05	–44.7	2008	131.4	1949	–13.4	1931	35.5	1960	36
	Equities vs bonds	4.9	8.2	2.6	28.1	0.06	–51.5	2008	116.6	1949	–10.2	1933	35.6	1957	32
	Bonds vs bills	1.2	1.7	1.0	10.4	–0.05	–38.6	1948	48.3	1921	–7.4	1915	7.6	2017	92

GM=geometric mean; AM=arithmetic mean, SE=standard error of mean; SD=standard deviation; SC=serial correlation; 10-year returns to end of given year.
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Table 34: German real returns, inflation and premiums, 1900–2021

	1 Jan	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000	2010	2022	
Real equity total returns	**1900**		6.3	8.2	8.0	4.4	6.6	10.1	8.8	7.0	7.0	6.6	5.2	4.9	**Equity premium vs bonds**
	1910	3.8		10.1	9.0	3.7	6.7	10.9	9.2	7.1	7.1	6.7	5.1	4.8	
	1920	−4.0	−11.3		7.6	0.3	5.5	11.1	9.0	6.5	6.7	6.2	4.6	4.3	
	1930	−2.5	−5.6	0.5		−5.1	4.7	12.0	9.3	6.4	6.6	6.1	4.3	4.0	
	1940	−1.0	−2.5	2.2	3.9		15.5	21.8	14.6	9.5	9.1	8.0	5.7	5.1	
	1950	−3.4	−5.1	−2.9	−4.6	−12.4		28.3	14.1	7.5	7.5	6.6	4.1	3.8	
	1960	1.9	1.6	5.1	6.6	8.0	33.2		1.4	−1.6	1.4	1.8	−0.2	0.3	
	1970	2.3	2.1	5.0	6.1	6.9	18.0	4.6		−4.5	1.4	1.9	−0.5	0.1	
	1980	1.7	1.4	3.7	4.3	4.4	10.7	0.9	−2.7		7.6	5.3	0.8	1.2	
	1990	2.8	2.7	4.9	5.6	5.9	11.1	4.6	4.6	12.3		3.0	−2.4	−0.7	
	2000	3.5	3.4	5.5	6.2	6.6	10.8	5.8	6.3	11.0	9.8		−7.5	−2.4	
	2010	2.9	2.8	4.5	5.1	5.2	8.5	4.1	4.0	6.4	3.5	−2.4		2.1	
	2022	3.4	3.3	4.9	5.4	5.6	8.3	4.8	4.8	6.7	5.0	2.9	7.6		
Real equity capital gains	**1900**		2.0	2.3	4.8	2.9	4.9	8.9	8.2	6.7	6.9	6.8	5.8	6.2	**Equity premium vs bills**
	1910	−1.3		2.6	6.4	3.2	5.7	10.5	9.3	7.4	7.6	7.4	6.2	6.6	
	1920	−8.7	−15.6		11.2	3.5	6.8	12.6	10.8	8.3	8.3	8.0	6.6	7.0	
	1930	−7.1	−9.8	−3.7		−2.3	5.1	13.0	10.7	7.8	8.0	7.7	6.2	6.6	
	1940	−5.6	−7.1	−2.5	−1.2		13.1	21.5	15.4	10.5	10.1	9.5	7.5	7.8	
	1950	−7.3	−8.8	−6.4	−7.7	−13.8		30.6	16.5	9.7	9.4	8.7	6.6	7.0	
	1960	−2.0	−2.1	1.5	3.3	5.7	29.6		4.0	0.6	3.2	3.9	2.3	3.6	
	1970	−1.5	−1.6	1.5	2.8	4.2	14.5	1.2		−2.7	2.8	3.8	1.9	3.6	
	1980	−2.2	−2.3	0.1	0.9	1.4	7.0	−2.8	−6.6		8.6	7.3	3.5	5.2	
	1990	−1.1	−1.1	1.2	2.0	2.7	7.2	0.7	0.4	7.9		6.1	1.0	4.1	
	2000	−0.3	−0.2	1.9	2.7	3.4	7.3	2.3	2.7	7.6	7.4		−3.8	3.2	
	2010	−0.7	−0.7	1.2	1.8	2.2	5.2	0.9	0.8	3.3	1.1	−4.8		9.5	
	2022	−0.2	−0.1	1.5	2.1	2.6	5.1	1.6	1.6	3.7	2.4	0.2	4.6		
Real bonds	**1900**		−4.0	−5.4	−3.0	−1.5	−1.6	−1.0	−0.5	−0.2	−0.1	0.2	0.6	1.2	**Bond maturity premium**
	1910	−2.3		−6.8	−2.4	−0.5	−1.0	−0.4	0.1	0.4	0.4	0.7	1.0	1.7	
	1920	−11.3	−19.5		3.4	3.1	1.2	1.4	1.6	1.6	1.5	1.7	2.0	2.6	
	1930	−9.1	−12.7	−3.3		2.9	0.4	0.8	1.3	1.4	1.3	1.5	1.8	2.5	
	1940	−4.5	−5.3	3.6	9.5		−2.2	−0.2	0.7	1.0	1.0	1.3	1.7	2.5	
	1950	−9.0	−10.7	−7.3	−8.9	−24.2		1.8	2.2	2.1	1.8	2.0	2.3	3.1	
	1960	−6.9	−7.9	−4.5	−4.8	−11.3	3.8		2.5	2.2	1.8	2.1	2.5	3.4	
	1970	−5.5	−6.0	−3.0	−2.9	−6.7	3.5	3.1		1.9	1.4	1.9	2.4	3.5	
	1980	−4.6	−4.9	−2.1	−2.0	−4.6	2.9	2.5	1.9		0.9	1.9	2.6	3.9	
	1990	−3.6	−3.8	−1.2	−0.9	−2.9	3.3	3.1	3.1	4.4		3.0	3.5	4.9	
	2000	−2.6	−2.6	−0.2	0.1	−1.4	4.0	4.0	4.3	5.5	6.6		4.0	5.8	
	2010	−1.9	−1.8	0.4	0.8	−0.4	4.2	4.3	4.6	5.5	6.0	5.5		7.2	
	2022	−1.2	−1.1	1.0	1.4	0.4	4.4	4.5	4.8	5.4	5.8	5.4	5.4		
Real bills	**1900**		1.9	10.9	12.5	8.5	7.7	6.5	6.0	5.8	5.5	5.2	4.8	4.5	**Inflation**
	1910	1.8		20.7	19.0	11.0	9.3	7.5	6.7	6.4	6.0	5.6	5.1	4.7	
	1920	−6.2	−13.6		16.8	6.0	5.4	4.3	4.0	4.2	4.0	3.8	3.5	3.3	
	1930	−6.3	−10.5	−6.5		−2.0	1.2	1.2	1.6	2.3	2.4	2.4	2.3	2.2	
	1940	−3.1	−4.8	0.5	6.4		4.5	2.8	2.8	3.4	3.2	3.1	2.9	2.7	
	1950	−7.5	−9.8	−8.4	−9.2	−22.5		1.2	1.9	3.0	2.9	2.8	2.6	2.4	
	1960	−5.9	−7.5	−5.8	−5.6	−11.1	2.0		2.7	3.9	3.5	3.2	2.9	2.6	
	1970	−5.0	−6.1	−4.5	−4.1	−7.4	1.3	0.6		5.1	3.9	3.4	3.0	2.6	
	1980	−4.4	−5.3	−3.7	−3.3	−5.6	0.9	0.3	0.1		2.8	2.6	2.3	2.0	
	1990	−3.5	−4.2	−2.7	−2.2	−3.8	1.5	1.4	1.8	3.5		2.4	2.0	1.8	
	2000	−2.8	−3.3	−1.9	−1.4	−2.6	1.9	1.9	2.3	3.5	3.5		1.6	1.5	
	2010	−2.4	−2.9	−1.6	−1.1	−2.1	1.8	1.8	2.1	2.8	2.4	1.4		1.5	
	2022	−2.4	−2.7	−1.6	−1.1	−2.0	1.2	1.1	1.2	1.5	0.8	−0.3	−1.8		
Real exchange rate vs USD	**1900**		0.2	−11.6	−12.4	−13.0	−8.1	−6.2	−5.1	−3.6	−3.1	−3.0	−2.4	−2.3	**Exchange rate vs USD**
	1910	1.0		−21.9	−18.7	−17.3	−10.2	−7.5	−6.0	−4.1	−3.5	−3.3	−2.6	−2.5	
	1920	−5.8	−12.1		−14.4	−14.6	−5.6	−3.2	−2.3	−0.6	−0.5	−0.6	−0.1	−0.4	
	1930	0.1	−0.4	12.9		−14.8	−1.8	0.0	0.3	1.8	1.5	1.1	1.4	1.0	
	1940	−3.9	−5.4	−1.9	−14.8		13.1	8.4	5.9	6.4	5.1	4.0	4.0	3.1	
	1950	−0.8	−1.3	2.6	−2.2	12.2		3.8	2.5	4.3	3.2	2.3	2.5	1.8	
	1960	−0.3	−0.5	2.6	−0.6	7.4	2.7		1.2	4.5	3.1	1.9	2.3	1.4	
	1970	0.0	−0.2	2.4	−0.1	5.3	2.1	1.4		7.9	4.0	2.1	2.5	1.5	
	1980	0.7	0.6	2.9	1.0	5.4	3.2	3.5	5.6		0.2	−0.6	0.8	0.0	
	1990	0.4	0.3	2.2	0.5	3.9	1.9	1.6	1.7	−2.0		−1.4	1.1	−0.1	
	2000	0.1	0.0	1.7	0.2	2.9	1.1	0.7	0.5	−2.0	−1.9		3.7	0.6	
	2010	0.4	0.3	1.8	0.5	2.9	1.4	1.1	1.0	−0.4	0.4	2.7		−2.0	
	2022	0.1	0.0	1.3	0.1	2.1	0.7	0.4	0.2	−1.1	−0.8	−0.2	−2.6		

Real bond and bill returns and the three premiums exclude 1922–23. Source: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

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Greece



Greece ranks 33rd (between Cyprus and Poland) in the latest UN Human Development Index. While Greece was ruled by a far-right authoritarian military junta between 1967 and 1974, the Turkish invasion of Cyprus led to the collapse of the military regime and the restoration of democracy. The adoption of the Constitution of 1975 by the newly elected Hellenic Parliament marked a new era of democratic governance in a country known as the "birthplace of democracy."

The Greek economy is dominated by the service sector and the Greek Merchant Marine is the largest in the world. Greece entered the European Union in 1982 and adopted the euro in 2001. The resulting lack of monetary policy flexibility following the Global Financial Crisis in 2008 led to a decade of debt rescue packages/bailouts and a 25% drop in GDP accompanied by harsh austerity measures.

The Athens Stock Exchange (ATHEX) was founded in 1876. Financials account for 35% of the FTSE World Greece index, followed by consumer discretionary with 20%. The largest corporates are Hellenic Telecom (19% of the index), followed by OPAP (13%), Eurobank Ergasias and Alpha Bank (both 12%).

Our Greek data starts in 1954, except for bonds, which begin in 1993.

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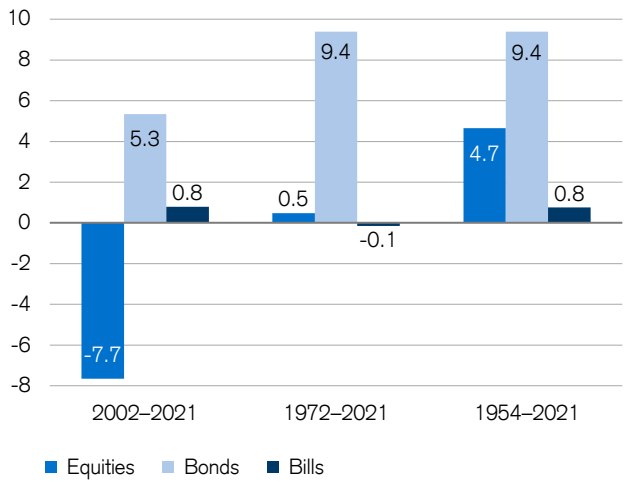
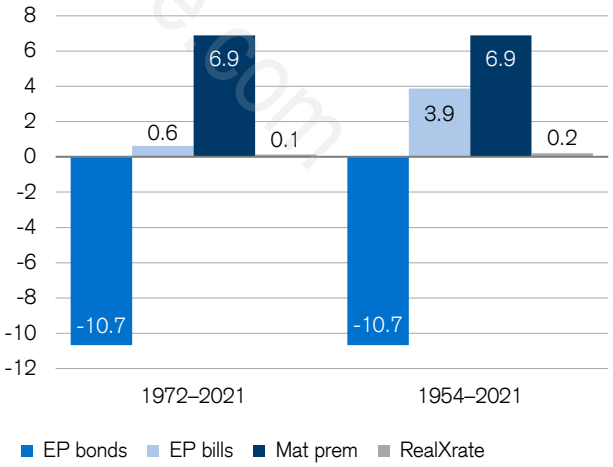
Figure 90: Annualized real returns and risk premiums (%) for Greece, 1954–2021 (bonds from 1993)



Note: The three asset classes are equities, long-term government bonds, and Treasury bills. All returns include reinvested income, are adjusted for inflation, and are expressed as geometric mean returns.



Note: EP bonds and EP bills denote the equity premium relative to bonds and to bills; Mat prem denotes the maturity premium for bonds relative to bills; RealXRate denotes the inflation-adjusted change in the exchange rate against the US dollar.

Source: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

Figure 91: Real returns on Greek asset classes, 1954–2021 (bonds from 1993)

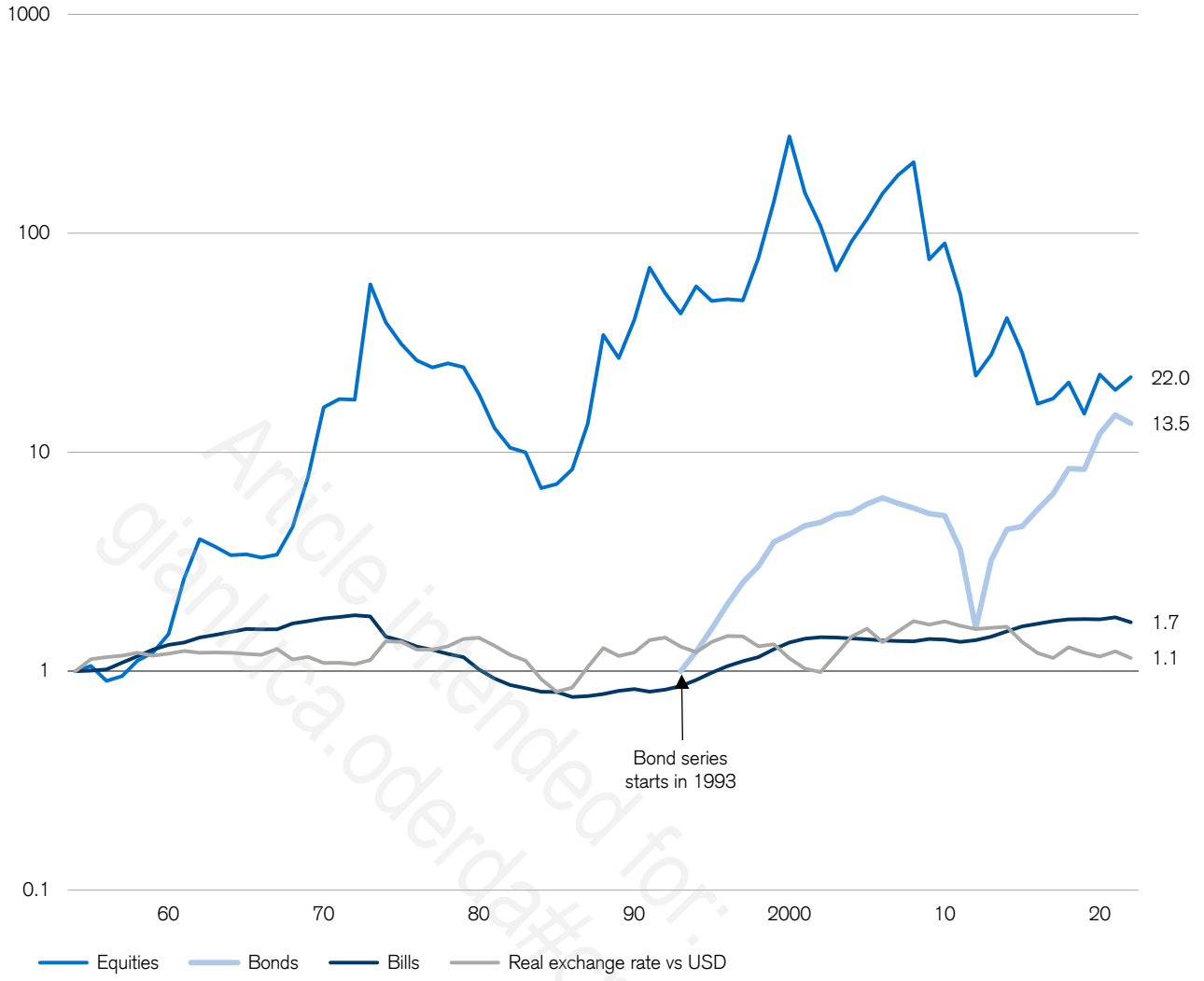


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Table 35: Returns on Greek asset classes, 1954–2021 (bonds from 1993)

		Mean returns % p.a.					Annual returns %				10-year returns % p.a.				Current
Return	Asset	GM	AM	SE	SD	SC	Lowest		Highest		Lowest		Highest		year rank
Nominal	Equities	12.2	21.4	6.4	52.8	0.11	–63.4	2008	258.3	1972	–20.0	2016	44.8	1993	28
	Bonds	12.7	16.1	5.2	27.8	0.04	–55.6	2011	107.3	2012	–7.7	2011	24.8	2002	29
	Bills	8.1	8.2	0.7	5.9	0.97	–0.3	2021	20.4	1991	2.5	2020	18.7	1994	70
	Inflation	7.2	7.5	1.0	8.0	0.82	–2.6	2014	30.7	1973	–0.2	2020	20.2	1988	30
Real	Equities	4.7	13.2	5.9	49.1	0.09	–64.1	2008	236.1	1972	–20.9	2016	31.8	1972	29
	Bonds	9.4	12.7	5.0	27.2	0.03	–56.6	2011	105.7	2012	–10.5	2011	17.9	2002	29
	Bills	0.8	0.9	0.6	4.9	0.64	–19.1	1973	8.6	1998	–7.3	1982	5.7	2000	64
	Exchange rate	0.2	0.6	1.1	9.3	0.25	–17.5	1983	23.9	1986	–5.1	1984	5.6	1995	56
Premiums	Equities vs bills	3.9	12.0	5.8	47.9	0.08	–65.0	2008	240.9	1972	–22.6	2016	29.3	1972	23
	Equities vs bonds	–10.7	–4.8	6.2	33.6	0.05	–61.9	2008	83.3	1999	–23.9	2017	5.0	2006	7
	Bonds vs bills	6.9	9.8	4.7	25.3	–0.04	–57.4	2011	98.5	2012	–10.3	2011	12.2	2020	26

GM=geometric mean; AM=arithmetic mean, SE=standard error of mean; SD=standard deviation; SC=serial correlation; 10-year returns to end of given year.
Source: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

Table 36: Greek real returns, inflation and premiums, 1954–2021 (bonds from 1993)

	1 Jan	1900	1910	1920	1930	1940	1954	1960	1970	1980	1990	2000	2010	2022	
Real equity total returns	**1900**														**Equity premium vs bonds**
	1910														
	1920														
	1930														
	1940														
	1954														
	1960						6.7								
	1970						18.9	26.9							
	1980						11.9	13.4	1.4						
	1990						10.8	11.6	4.7	8.1		6.2	–5.1	–10.7	
	2000						13.0	14.0	10.0	14.5	21.3		–12.4	–15.5	
	2010						8.4	8.6	4.4	5.4	4.1	–10.6		–18.0	
	2022						4.7	4.5	0.6	0.4	–1.9	–10.9	–11.1		
Real equity capital gains	**1900**														**Equity premium vs bills**
	1910														
	1920														
	1930														
	1940														
	1954							1.9	14.9	11.8	11.4	12.3	7.7	3.9	
	1960						0.9		23.5	14.9	13.4	13.9	8.4	4.1	
	1970						13.4	21.6		6.9	8.7	10.9	5.0	0.7	
	1980						7.0	9.0	–2.3		10.4	12.9	4.3	–0.7	
	1990						3.8	4.4	–3.2	–4.1		15.5	1.4	–4.0	
	2000						6.4	7.3	2.9	5.6	16.2		–10.9	–11.7	
	2010						2.7	2.9	–1.3	–1.0	0.6	–13.0		–12.4	
	2022						–0.3	–0.5	–4.2	–4.6	–4.8	–13.1	–13.2		
Real bonds	**1900**														**Bond maturity premium**
	1910														
	1920														
	1930														
	1940														
	1954														
	1960														
	1970														
	1980														
	1990											15.1	7.0	6.9	
	2000										22.8		1.6	4.4	
	2010										10.1	2.0		6.8	
	2022										9.4	5.4	8.4		
Real bills	**1900**														**Inflation**
	1910														
	1920														
	1930														
	1940														
	1954							3.4	2.5	6.5	9.9	10.0	8.7	7.2	
	1960						4.7		2.0	7.4	11.2	11.0	9.4	7.6	
	1970						3.5	2.8		13.1	16.1	14.1	11.3	8.7	
	1980						0.1	–1.3	–5.2		19.2	14.6	10.7	7.7	
	1990						–0.5	–1.5	–3.6	–2.0		10.3	6.7	4.4	
	2000						0.7	0.1	–0.8	1.4	5.0		3.2	1.8	
	2010						0.6	0.1	–0.6	1.1	2.6	0.3		0.7	
	2022						0.8	0.4	–0.1	1.2	2.2	1.0	1.5		
Real exchange rate vs USD	**1900**														**Exchange rate vs USD**
	1910														
	1920														
	1930														
	1940														
	1954							1.2	0.1	–0.9	–4.5	–5.1	–3.6	–3.3	
	1960						3.1		–0.5	–1.5	–5.6	–6.0	–4.2	–3.7	
	1970						0.5	–1.0		–2.5	–8.0	–7.7	–5.1	–4.3	
	1980						1.4	0.8	2.7		–13.2	–10.3	–5.9	–4.8	
	1990						0.5	0.0	0.5	–1.5		–7.2	–2.1	–2.0	
	2000						0.3	–0.1	0.2	–1.1	–0.6		3.3	0.5	
	2010						0.9	0.7	1.1	0.6	1.6	4.0		–1.8	
	2022						0.2	–0.1	0.1	–0.5	–0.2	0.0	–3.2		

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Hong Kong SAR



This year marks exactly 200 years since British merchants first used Hong Kong's harbor to anchor their vessels. Subsequently Britain was granted a lease over the New Territories until 1997, when control would be returned to China. Hong Kong SAR is a major financial sector within the Asia-Pacific region and the services sector now makes up roughly 80% of current GDP. It is a free port, pursuing a free-trade policy with no tariffs charged on imports or exports.

Hong Kong SAR ranks fourth in the latest UN Human Development Index, behind only Norway, Switzerland and Ireland. In 2018, a four-bedroom house in the exclusive Peak neighborhood cost an eye-watering USD 450 million. On the other hand, its population density places it behind only Monaco and Singapore.

The Hong Kong stock market was formally established in 1891, renamed the Hong Kong Stock Exchange in 1914 and is now the world's 15th largest equity market. Financials account for 40% of the market capitalization of the FTSE World Hong Kong Index, with the largest companies being AIA Group (22%) and Hong Kong Exchanges (13%).

Our data for Hong Kong SAR starts in 1963, except for bonds, which begin in 1994.

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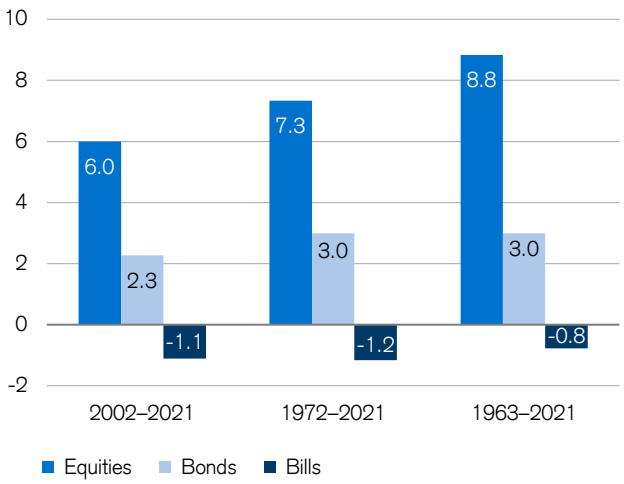
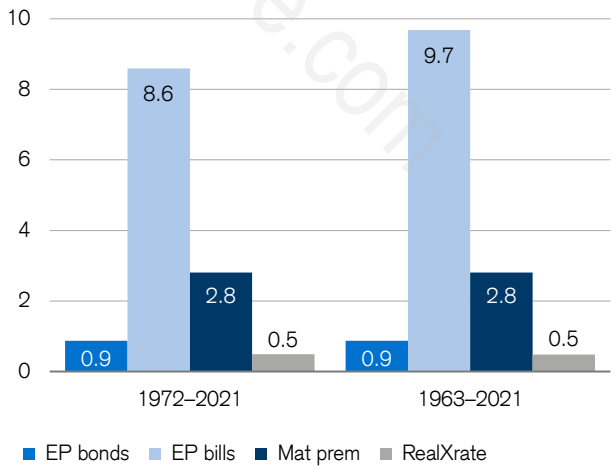
Figure 92: Annualized real returns & risk premiums (%) for Hong Kong SAR, 1963–2021 (bonds from 1994)



Note: The three asset classes are equities, long-term government bonds, and Treasury bills. All returns include reinvested income, are adjusted for inflation, and are expressed as geometric mean returns.



Note: EP bonds and EP bills denote the equity premium relative to bonds and to bills; Mat prem denotes the maturity premium for bonds relative to bills; RealXRate denotes the inflation-adjusted change in the exchange rate against the US dollar.

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Figure 93: Real returns on Hong Kong SAR asset classes, 1963–2021 (bonds from 1994)

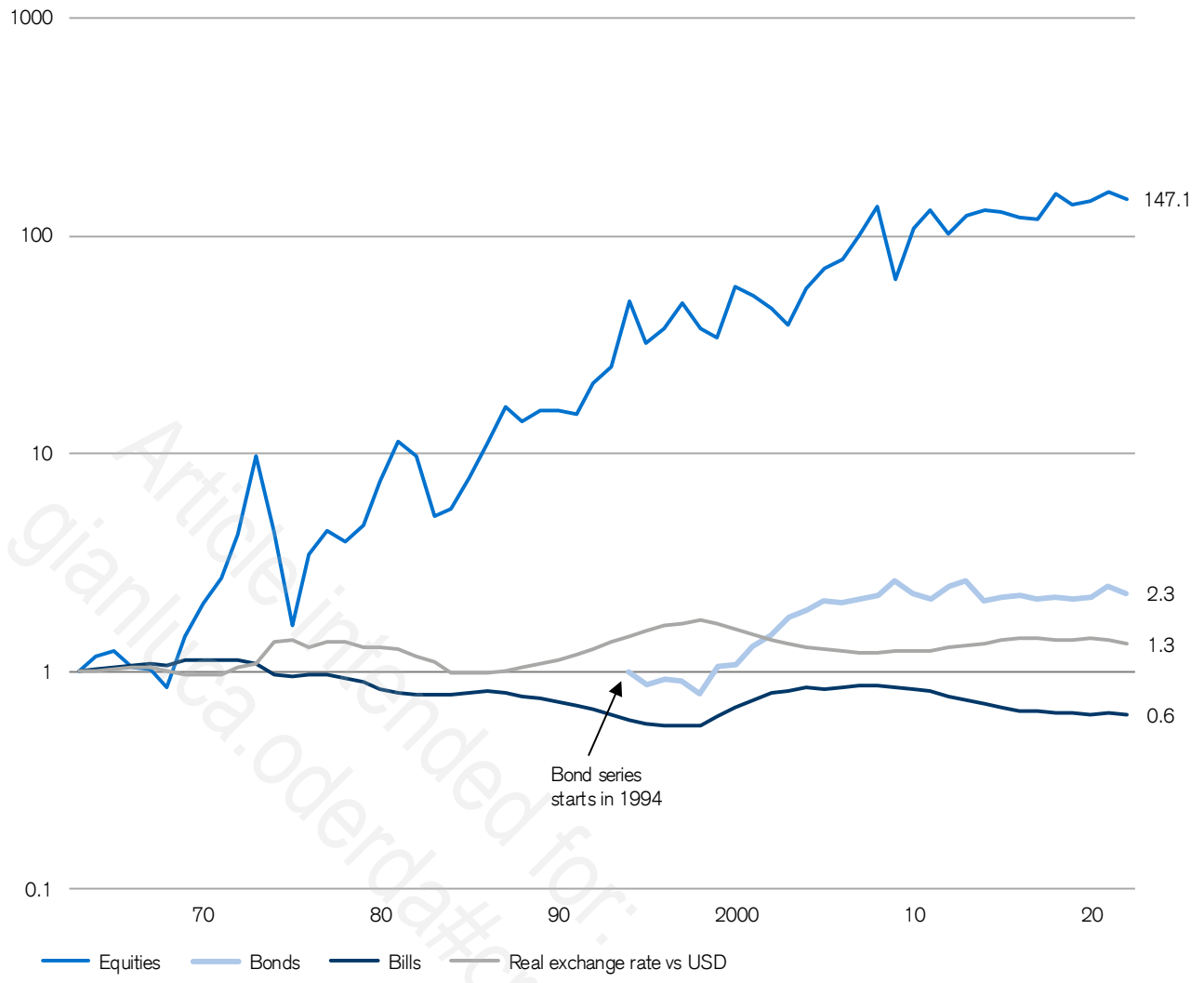

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Table 37: Returns on Hong Kong SAR asset classes, 1963–2021 (bonds from 1994)

		Mean returns % p.a.					Annual returns %				10-year returns % p.a.				Current
Return	Asset	GM	AM	SE	SD	SC	Lowest		Highest		Lowest		Highest		year rank
Nominal	Equities	14.1	20.9	5.3	40.9	–0.05	–58.3	1974	150.5	1972	2.6	2003	34.4	1993	48
	Bonds	5.1	5.6	2.0	10.7	–0.36	–14.9	2013	33.1	1998	1.1	2018	10.1	2007	27
	Bills	4.1	4.1	0.4	3.0	0.85	0.0	2015	11.1	1982	0.2	2017	7.4	1988	59
	Inflation	4.9	5.0	0.6	4.8	0.75	–4.1	1999	19.7	1973	–0.7	2007	10.1	1982	43
Real	Equities	8.8	15.4	5.0	38.6	–0.10	–62.2	1974	129.5	1972	–6.2	1982	25.7	1972	44
	Bonds	3.0	3.6	2.2	11.8	–0.14	–18.4	2013	35.4	1998	–1.9	2018	10.9	2007	26
	Bills	–0.8	–0.7	0.5	3.8	0.70	–11.1	1973	10.0	1999	–3.6	1981	4.4	2006	40
	Exchange rate	0.5	0.6	0.7	5.2	0.47	–11.2	1983	23.8	1973	–3.4	1984	5.1	1995	53
Premiums	Equities vs bills	9.7	16.2	5.1	39.1	–0.07	–61.7	1974	139.5	1972	–3.1	1982	27.9	1993	44
	Equities vs bonds	0.9	5.8	6.2	32.6	–0.34	–60.3	2008	95.5	2009	–5.0	2003	10.2	2018	17
	Bonds vs bills	2.8	3.3	1.9	10.1	–0.39	–15.0	2013	23.8	1998	0.8	2018	6.5	2007	25

GM=geometric mean; AM=arithmetic mean, SE=standard error of mean; SD=standard deviation; SC=serial correlation; 10-year returns to end of given year.
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Table 38: Hong Kong SAR real returns, inflation and premiums, 1963–2021 (bonds from 1994)

	1 Jan	1900	1910	1920	1930	1940	1950	1963	1970	1980	1990	2000	2010	2022	
Real equity total returns	**1900**														**Equity premium vs bonds**
	1910														
	1920														
	1930														
	1940														
	1950														
	1963														
	1970							10.8							
	1980							12.6	13.8						
	1990							10.7	10.7	7.7		1.0	–0.4	0.9	
	2000							11.6	11.8	10.8	13.9		–1.2	0.8	
	2010							10.5	10.4	9.3	10.1	6.4		2.6	
	2022							8.8	8.6	7.3	7.2	4.3	2.6		
Real equity capital gains	**1900**														**Equity premium vs bills**
	1910														
	1920														
	1930														
	1940														
	1950														
	1963								9.0	13.8	12.0	12.8	10.9	9.7	
	1970							5.6		17.3	13.1	13.6	11.2	9.8	
	1980							8.1	9.9		9.1	11.9	9.3	8.1	
	1990							6.4	6.6	3.4		14.7	9.4	7.7	
	2000							7.3	7.7	6.6	9.9		4.3	4.7	
	2010							6.4	6.5	5.4	6.4	3.1		5.1	
	2022							5.0	4.9	3.8	3.9	1.3	–0.2		
Real bonds	**1900**														**Bond maturity premium**
	1910														
	1920														
	1930														
	1940														
	1950														
	1963														
	1970														
	1980														
	1990											–0.8	3.1	2.8	
	2000										1.3		5.5	3.8	
	2010										5.2	7.6		2.4	
	2022										3.0	3.5	0.1		
Real bills	**1900**														**Inflation**
	1910														
	1920														
	1930														
	1940														
	1950														
	1963								3.5	6.2	7.1	6.9	5.4	4.9	
	1970							1.6		8.2	8.4	7.7	5.8	5.1	
	1980							–1.1	–2.9		8.7	7.4	5.0	4.3	
	1990							–1.2	–2.1	–1.3		6.1	3.1	3.0	
	2000							–1.0	–1.6	–1.0	–0.7		0.2	1.6	
	2010							–0.4	–0.7	0.0	0.7	2.0		2.8	
	2022							–0.8	–1.1	–0.7	–0.5	–0.4	–2.3		
Real exchange rate vs USD	**1900**														**Exchange rate vs USD**
	1910														
	1920														
	1930														
	1940														
	1950														
	1963								–0.9	0.9	–1.2	–0.8	–0.6	–0.5	
	1970							–0.6		2.2	–1.2	–0.8	–0.6	–0.5	
	1980							1.5	3.0		–4.5	–2.3	–1.5	–1.1	
	1990							0.5	0.8	–1.2		0.0	0.0	0.0	
	2000							1.2	1.6	0.9	3.2		0.0	0.0	
	2010							0.5	0.6	–0.1	0.4	–2.2		0.0	
	2022							0.5	0.6	0.1	0.5	–0.7	0.6		

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India



India is the second most populous country after China. It is the largest democracy in the world, with more than half the population under the age of 30. The enormous population makes it one of the poorest countries when judged by GNP per capita and hence India ranks 127th (between Guatemala and Namibia) in the latest UN Human Development Index.

Following the end of British colonial rule in 1947, the country emerged as one of the most ethnically diverse countries in the world. The heritage from the English language is an important part of its current strength in high technology and outsourcing.

While the agricultural sector employs about half of the workers and contributes around 18% to the country's GDP, the largest components of GDP are industry (~25%) and services (~50%). Industrial manufacturing includes companies active in machinery and equipment, electrical and metal products, construction materials, rubber and plastic products, and automation technology products. The services sector is the dominant sector and the largest recipient of foreign direct investment (e.g. information technology, telecommunications, finance, tourism and trade).

In India, the world's 11th largest equity market, technology accounts for 19% of the market capitalization of the FTSE World India index, while financials account for 19% and industrials for 12%. The largest companies are Reliance Industries (10% of the index), followed by Infosys (8%), Housing Development (6%) and Tata Consultancy Services (5%).

Our data for India starts in 1953.

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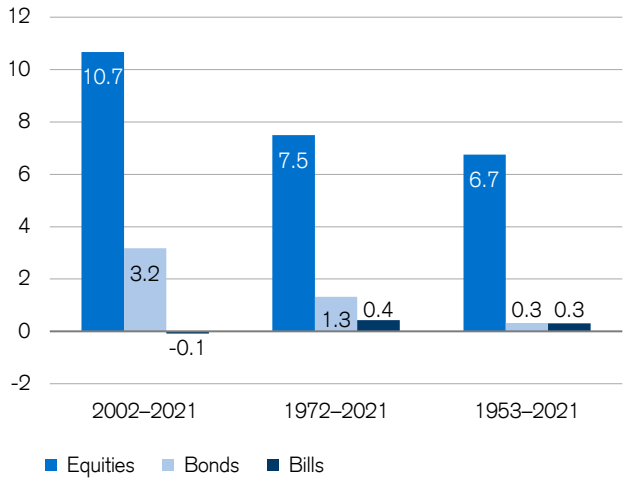
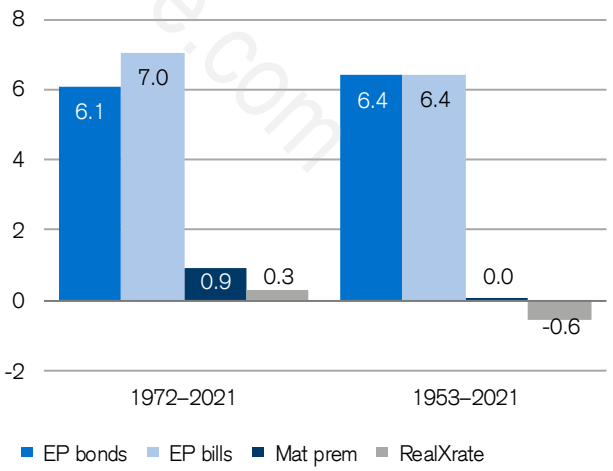
Figure 94: Annualized real returns and risk premiums (%) for India, 1953–2021



Note: The three asset classes are equities, long-term government bonds, and Treasury bills. All returns include reinvested income, are adjusted for inflation, and are expressed as geometric mean returns.



Note: EP bonds and EP bills denote the equity premium relative to bonds and to bills; Mat prem denotes the maturity premium for bonds relative to bills; RealXRate denotes the inflation-adjusted change in the exchange rate against the US dollar.

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Figure 85: Real returns on Indian asset classes, 1953–2021

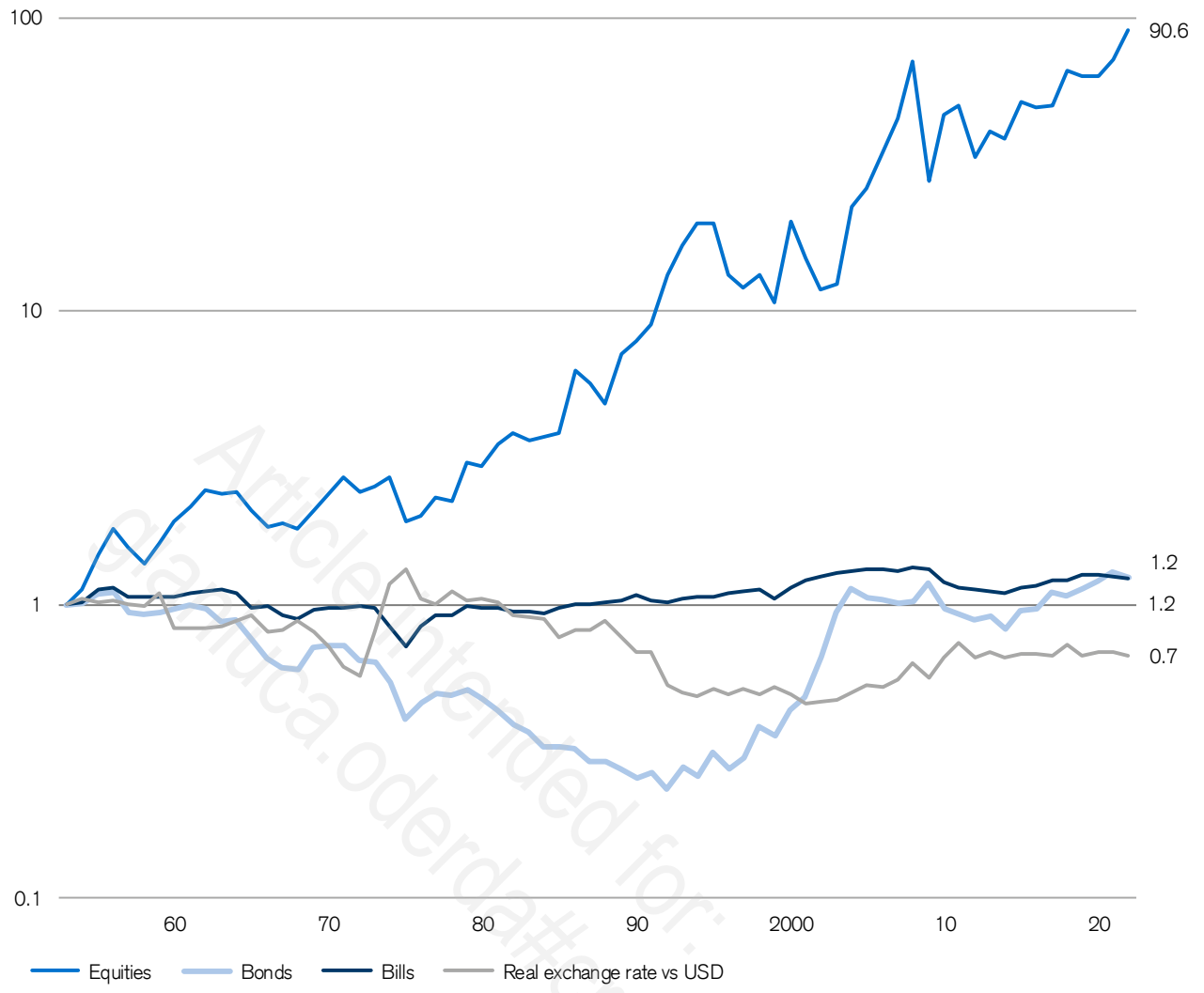

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Table 39: Returns on Indian asset classes, 1953–2021

		Mean returns % p.a.					Annual returns %				10-year returns % p.a.				Current
Return	Asset	GM	AM	SE	SD	SC	Lowest		Highest		Lowest		Highest		year rank
Nominal	Equities	14.1	17.2	3.3	27.2	–0.23	–57.0	2008	92.5	2009	3.9	2002	28.8	1994	19
	Bonds	7.2	7.8	1.4	11.4	0.21	–7.7	1965	45.7	2002	0.5	1965	23.6	2003	51
	Bills	7.2	7.2	0.3	2.5	0.87	3.5	1955	12.7	1996	3.8	1962	10.7	1996	70
	Inflation	6.9	7.0	0.7	5.5	0.25	–6.1	1975	25.4	1974	2.6	1962	10.0	1998	38
Real	Equities	6.7	9.8	3.1	26.1	–0.21	–60.8	2008	88.2	1999	–3.0	2002	18.3	1993	16
	Bonds	0.3	1.0	1.5	12.5	0.21	–24.5	1974	41.2	2002	–6.0	1989	15.9	2003	47
	Bills	0.3	0.4	0.6	4.9	0.16	–13.9	1974	16.1	1975	–3.0	1974	3.1	1984	53
	Exchange rate	–0.6	0.0	1.3	11.2	0.18	–23.7	1959	45.2	1973	–5.9	1993	5.2	1980	47
Premiums	Equities vs bills	6.4	9.4	3.1	25.5	–0.23	–60.2	2008	85.3	2009	–4.9	2002	16.9	1994	13
	Equities vs bonds	6.4	9.8	3.3	27.1	–0.17	–66.4	2008	104.9	2009	–14.2	2002	21.1	1993	12
	Bonds vs bills	0.0	0.5	1.3	10.4	0.19	–13.7	1995	37.0	2002	–6.9	1989	13.6	2003	45

GM=geometric mean; AM=arithmetic mean, SE=standard error of mean; SD=standard deviation; SC=serial correlation; 10-year returns to end of given year.
Source: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

Table 40: Indian real returns, inflation and premiums, 1953–2021

	1 Jan	1900	1910	1920	1930	1940	1953	1960	1970	1980	1990	2000	2010	2022	
Real equity total returns	**1900**														**Equity premium vs bonds**
	1910														
	1920														
	1930														
	1940														
	1953							10.3	7.2	7.0	9.7	8.5	7.0	6.4	
	1960						9.9		5.2	5.9	9.6	8.2	6.6	6.0	
	1970						5.2	2.1		6.6	11.9	9.2	6.9	6.1	
	1980						4.1	2.2	2.3		17.3	10.6	7.0	6.0	
	1990						5.8	4.8	6.2	10.3		4.2	2.2	2.7	
	2000						6.6	6.1	7.4	10.1	9.8		0.3	2.0	
	2010						7.0	6.6	7.7	9.6	9.2	8.7		3.5	
	2022						6.7	6.4	7.2	8.5	7.9	7.0	5.7		
Real equity capital gains	**1900**														**Equity premium vs bills**
	1910														
	1920														
	1930														
	1940														
	1953							8.8	5.4	4.2	5.6	6.3	6.7	6.4	
	1960						−0.8		3.0	2.7	4.8	5.9	6.4	6.2	
	1970						−4.4	−6.8		2.4	5.7	6.8	7.2	6.8	
	1980						−4.8	−6.1	−5.4		9.2	9.1	8.9	7.9	
	1990						−1.7	−1.9	0.7	7.2		9.1	8.7	7.5	
	2000						0.4	0.6	3.1	7.7	8.2		8.3	6.7	
	2010						1.4	1.8	4.0	7.4	7.5	6.7		5.4	
	2022						1.9	2.2	4.1	6.5	6.3	5.4	4.3		
Real bonds	**1900**														**Bond maturity premium**
	1910														
	1920														
	1930														
	1940														
	1953							−1.4	−1.8	−2.6	−3.8	−2.0	−0.3	0.0	
	1960						−0.4		−2.0	−3.0	−4.3	−2.2	−0.2	0.2	
	1970						−1.9	−2.9		−4.0	−5.5	−2.2	0.3	0.6	
	1980						−2.7	−3.5	−4.1		−6.9	−1.3	1.7	1.8	
	1990						−3.6	−4.3	−5.0	−6.0		4.7	6.3	4.6	
	2000						−1.8	−2.0	−1.7	−0.5	5.4		8.1	4.6	
	2010						0.0	0.0	0.7	2.4	6.9	8.4		1.8	
	2022						0.3	0.4	1.0	2.3	5.0	4.9	2.1		
Real bills	**1900**														**Inflation**
	1910														
	1920														
	1930														
	1940														
	1953							2.7	4.5	5.7	6.5	7.1	7.0	6.9	
	1960						1.0		5.8	6.8	7.4	7.9	7.6	7.4	
	1970						−0.1	−0.9		7.8	8.3	8.6	8.0	7.6	
	1980						−0.1	−0.5	−0.1		8.8	9.1	8.1	7.6	
	1990						0.2	0.0	0.5	1.0		9.4	7.8	7.3	
	2000						0.3	0.2	0.5	0.8	0.7		6.1	6.3	
	2010						0.3	0.2	0.5	0.7	0.5	0.3		6.4	
	2022						0.3	0.2	0.4	0.6	0.4	0.3	0.3		
Real exchange rate vs USD	**1900**														**Exchange rate vs USD**
	1910														
	1920														
	1930														
	1940														
	1953							−3.8	−4.2	−1.5	−3.1	−4.4	−3.7	−3.7	
	1960						−2.6		−4.5	−0.7	−2.9	−4.5	−3.7	−3.7	
	1970						−1.9	−1.4		3.3	−2.1	−4.5	−3.5	−3.6	
	1980						0.2	1.1	3.7		−7.2	−8.1	−5.7	−5.2	
	1990						−1.0	−0.6	−0.2	−4.0		−9.0	−4.9	−4.5	
	2000						−1.5	−1.3	−1.2	−3.6	−3.2		−0.6	−2.4	
	2010						−0.7	−0.5	−0.2	−1.5	−0.2	2.9		−3.9	
	2022						−0.6	−0.3	−0.1	−1.0	−0.1	1.4	0.1		

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Ireland



In 1800, the British and Irish parliaments approved Acts of Union that merged the Kingdom of Ireland and the Kingdom of Great Britain to create a United Kingdom of Great Britain and Ireland. After civil war in the early 20th century, the Republic of Ireland was born as an independent country in 1922, named the Irish Free State. Northern Ireland remained part of the United Kingdom.

Economic growth and stock-market performance were weak and, during the 1950s, Ireland experienced large-scale emigration. Ireland joined the European Union in 1973 and, from 1987, the country's economic situation improved. By the 1990s and early 2000s, Ireland saw great economic success and became known as the Celtic Tiger. By 2007, it had become the world's fifth-richest country in terms of GDP per capita, the second richest in the European Union, and was experiencing net immigration.

Over the period 1987–2006, Ireland had experienced the second-highest real equity return of any Yearbook country. The financial crisis changed that, and the country faced severe hardship. The country is one of the smallest Yearbook markets and, sadly, it has become smaller. Too much of the boom was based on real estate, financials and leverage, and Irish stocks were negatively affected after 2006. Many of the larger Irish corporations moved to a London listing. After a burgeoning deficit, austerity measures were introduced, which lasted until 2014. However, Ireland is now once again prospering. The export sector, dominated by multinationals, has become a key component of its economy.

There have been stock exchanges in Dublin and Cork since 1793. To monitor Irish stocks from 1900, we constructed an index based on stocks traded on these two exchanges. Currently, Ireland's largest index constituents are Kerry Group (47% of the FTSE World Ireland Index), and Kingspan (42%).

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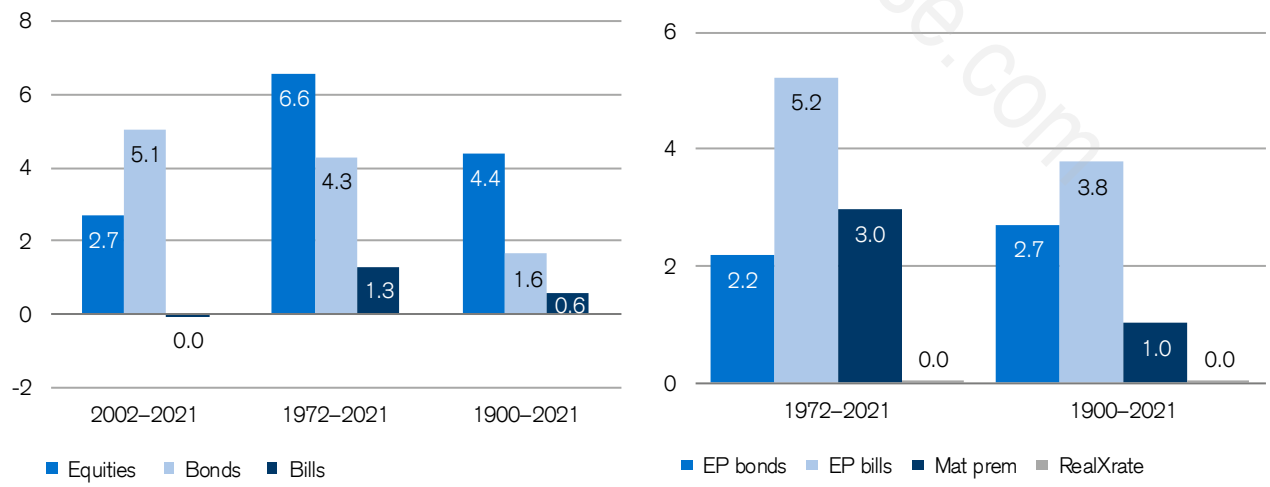
Figure 95: Annualized real returns and risk premiums (%) for Ireland, 1900–2021



Note: The three asset classes are equities, long-term government bonds, and Treasury bills. All returns include reinvested income, are adjusted for inflation, and are expressed as geometric mean returns.

Note: EP bonds and EP bills denote the equity premium relative to bonds and to bills; Mat prem denotes the maturity premium for bonds relative to bills; RealXRate denotes the inflation-adjusted change in the exchange rate against the US dollar.

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Figure 96: Real returns on Irish asset classes, 1900–2021

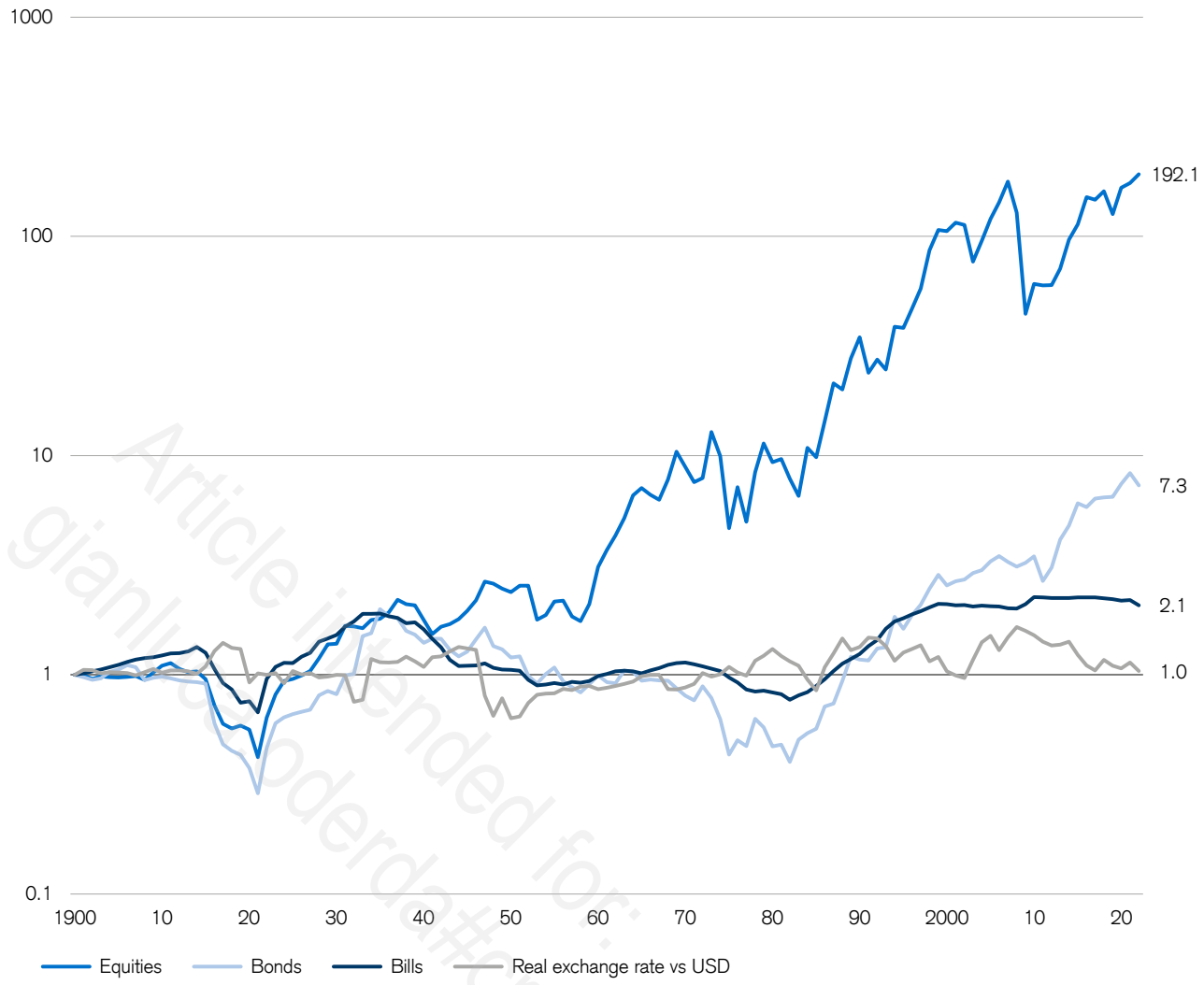

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Table 41: Returns on Irish asset classes, 1900–2021

		Mean returns % p.a.					Annual returns %				10-year returns % p.a.				Current
Return	Asset	GM	AM	SE	SD	SC	Lowest		Highest		Lowest		Highest		year rank
Nominal	Equities	8.5	10.9	2.1	22.9	–0.06	–65.0	2008	86.5	1977	–5.1	2008	28.6	1986	42
	Bonds	5.7	6.4	1.2	12.8	0.06	–21.8	2010	47.7	1977	–2.4	1956	19.1	1989	109
	Bills	4.6	4.7	0.4	4.1	0.93	–0.3	2018	17.6	1982	0.2	2020	13.7	1987	122
	Inflation	4.0	4.2	0.6	6.7	0.54	–26.0	1921	23.3	1981	–5.1	1930	15.8	1982	34
Real	Equities	4.4	7.0	2.1	22.7	–0.04	–65.4	2008	68.4	1977	–9.4	1920	17.4	1968	44
	Bonds	1.6	2.7	1.3	14.8	0.10	–34.1	1915	61.2	1921	–11.4	1920	13.2	1930	108
	Bills	0.6	0.8	0.6	6.4	0.41	–15.5	1915	42.2	1921	–6.0	1920	9.4	1930	105
	Exchange rate	0.0	0.6	1.0	10.9	0.03	–38.0	1946	53.2	1933	–6.1	1950	5.2	1942	106
Premiums	Equities vs bills	3.8	6.0	1.9	21.2	–0.10	–66.9	2008	72.0	1977	–8.4	2008	15.2	1968	37
	Equities vs bonds	2.7	4.7	1.8	19.7	–0.15	–66.8	2008	83.2	1972	–9.6	2008	17.9	1968	17
	Bonds vs bills	1.0	1.7	1.1	11.8	0.00	–26.4	1974	37.2	1932	–7.1	1974	12.3	2020	97

GM=geometric mean; AM=arithmetic mean, SE=standard error of mean; SD=standard deviation; SC=serial correlation; 10-year returns to end of given year.
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Table 42: Irish real returns, inflation and premiums, 1900–2021

	1 Jan	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000	2010	2022	
Real equity total returns	**1900**		1.1	2.0	1.8	0.6	1.4	1.9	3.5	3.8	3.8	3.8	2.6	2.7	**Equity premium vs bonds**
	1910	0.9		3.0	2.1	0.4	1.4	2.1	3.9	4.2	4.2	4.1	2.8	2.9	
	1920	–2.8	–6.5		1.3	–0.8	1.0	1.9	4.1	4.4	4.4	4.2	2.8	2.8	
	1930	1.1	1.2	9.5		–2.8	0.8	2.1	4.8	5.0	4.9	4.7	3.0	3.0	
	1940	1.5	1.6	5.9	2.5		4.6	4.6	7.5	7.1	6.5	6.0	3.8	3.8	
	1950	1.8	2.0	4.9	2.7	3.0		4.6	9.0	7.9	7.0	6.3	3.7	3.7	
	1960	1.9	2.1	4.4	2.7	2.8	2.7		13.5	9.7	7.8	6.7	3.5	3.5	
	1970	3.2	3.5	5.7	4.8	5.5	6.8	11.1		6.0	5.0	4.5	1.1	1.7	
	1980	2.8	3.1	4.8	3.9	4.2	4.7	5.7	0.5		4.1	3.8	–0.4	0.7	
	1990	4.0	4.4	6.1	5.5	6.1	6.9	8.4	7.0	14.0		3.4	–2.6	–0.4	
	2000	4.8	5.2	6.8	6.4	7.0	7.9	9.2	8.6	12.9	11.8		–8.2	–2.0	
	2010	3.8	4.1	5.3	4.8	5.2	5.5	6.1	4.9	6.4	2.8	–5.4		3.5	
	2022	4.4	4.7	5.9	5.5	5.9	6.3	6.9	6.1	7.5	5.5	2.8	10.1		
Real equity capital gains	**1900**		–1.1	–1.5	–0.3	0.2	1.6	1.9	3.0	3.1	3.8	4.0	3.0	3.8	**Equity premium vs bills**
	1910	–2.9		–1.9	0.1	0.7	2.3	2.5	3.7	3.7	4.4	4.6	3.5	4.2	
	1920	–7.2	–11.2		2.1	2.0	3.8	3.7	4.8	4.6	5.3	5.4	4.1	4.8	
	1930	–3.9	–4.4	2.9		1.9	4.6	4.2	5.5	5.1	5.9	5.9	4.3	5.1	
	1940	–3.4	–3.6	0.4	–2.0		7.4	5.4	6.7	6.0	6.7	6.6	4.7	5.5	
	1950	–2.9	–2.9	0.0	–1.4	–0.8		3.4	6.4	5.5	6.5	6.4	4.2	5.3	
	1960	–2.8	–2.8	–0.5	–1.7	–1.5	–2.2		9.5	6.6	7.5	7.2	4.4	5.6	
	1970	–1.6	–1.3	0.8	0.2	1.0	1.9	6.1		3.7	6.6	6.4	3.1	4.9	
	1980	–2.0	–1.8	–0.2	–0.8	–0.5	–0.4	0.5	–4.8		9.5	7.8	2.9	5.2	
	1990	–0.9	–0.7	0.9	0.6	1.1	1.6	2.9	1.4	7.9		6.1	–0.2	3.8	
	2000	0.0	0.3	1.8	1.7	2.3	2.9	4.3	3.7	8.2	8.4		–6.1	2.8	
	2010	–0.7	–0.5	0.7	0.5	0.8	1.1	1.8	0.7	2.6	0.1	–7.6		10.9	
	2022	0.1	0.4	1.6	1.4	1.9	2.2	3.0	2.4	4.2	3.0	0.6	8.0		
Real bonds	**1900**		–2.2	–3.5	–2.0	–0.4	0.3	0.0	–0.5	–0.7	–0.1	0.2	0.4	1.0	**Bond maturity premium**
	1910	–0.2		–4.7	–2.0	0.3	0.9	0.5	–0.2	–0.5	0.2	0.5	0.7	1.3	
	1920	–4.8	–9.2		0.8	2.8	2.8	1.8	0.7	0.2	0.9	1.1	1.3	1.9	
	1930	–0.7	–0.9	8.1		4.9	3.8	2.1	0.7	0.1	0.9	1.2	1.3	2.1	
	1940	0.8	1.2	6.8	5.5		2.7	0.7	–0.7	–1.0	0.2	0.6	0.8	1.7	
	1950	0.4	0.5	3.9	1.9	–1.5		–1.2	–2.4	–2.3	–0.5	0.1	0.5	1.6	
	1960	0.0	0.0	2.5	0.7	–1.7	–1.9		–3.5	–2.8	–0.2	0.5	0.8	2.0	
	1970	–0.3	–0.3	1.5	0.0	–1.8	–2.0	–2.1		–2.1	1.5	1.8	2.0	3.1	
	1980	–0.9	–1.0	0.4	–1.1	–2.7	–3.1	–3.7	–5.2		5.2	3.9	3.4	4.4	
	1990	0.2	0.2	1.6	0.6	–0.3	0.0	0.6	1.9	9.5		2.6	2.5	4.2	
	2000	0.9	1.1	2.4	1.6	1.0	1.5	2.4	3.9	8.8	8.1		2.3	4.9	
	2010	1.1	1.3	2.5	1.8	1.3	1.8	2.5	3.7	6.9	5.6	3.1		7.2	
	2022	1.6	1.8	3.0	2.4	2.0	2.5	3.3	4.3	6.7	5.9	4.9	6.4		
Real bills	**1900**		1.1	4.9	2.3	1.9	2.6	2.7	3.0	4.2	4.7	4.4	4.3	4.0	**Inflation**
	1910	2.0		8.9	2.9	2.2	2.9	3.1	3.3	4.6	5.1	4.8	4.6	4.2	
	1920	–1.4	–4.7		–2.7	–1.0	1.0	1.7	2.2	3.9	4.6	4.3	4.1	3.8	
	1930	1.4	1.1	7.2		0.7	2.9	3.2	3.5	5.3	5.9	5.4	5.0	4.5	
	1940	1.2	0.9	3.8	0.6		5.2	4.4	4.4	6.5	6.9	6.2	5.7	5.0	
	1950	0.1	–0.4	1.1	–1.8	–4.2		3.7	4.0	6.9	7.4	6.4	5.7	4.9	
	1960	0.0	–0.4	0.7	–1.4	–2.4	–0.7		4.3	8.6	8.6	7.0	6.2	5.1	
	1970	0.2	–0.1	0.8	–0.7	–1.2	0.4	1.4		13.1	10.9	8.0	6.6	5.3	
	1980	–0.2	–0.6	0.2	–1.2	–1.6	–0.8	–0.9	–3.1		8.7	5.5	4.6	3.5	
	1990	0.2	0.0	0.7	–0.3	–0.5	0.4	0.8	0.4	4.1		2.4	2.6	2.0	
	2000	0.7	0.6	1.3	0.5	0.4	1.4	1.9	2.1	4.8	5.4		2.7	1.8	
	2010	0.7	0.6	1.2	0.5	0.5	1.3	1.7	1.7	3.4	3.0	0.7		1.0	
	2022	0.6	0.5	1.0	0.3	0.3	0.9	1.2	1.2	2.2	1.6	–0.1	–0.7		
Real exchange rate vs USD	**1900**		0.1	–1.2	0.0	–0.4	–1.4	–0.9	–1.0	–1.0	–1.2	–1.3	–0.9	–1.0	**Exchange rate vs USD**
	1910	0.2		–2.6	0.0	–0.6	–1.8	–1.1	–1.2	–1.2	–1.4	–1.5	–1.0	–1.1	
	1920	–0.4	–1.0		2.7	0.4	–1.5	–0.7	–0.9	–0.9	–1.3	–1.3	–0.8	–0.9	
	1930	0.0	–0.1	0.8		–1.9	–3.5	–1.8	–1.8	–1.6	–1.9	–1.9	–1.2	–1.3	
	1940	0.2	0.2	0.8	0.8		–5.1	–1.8	–1.7	–1.6	–1.9	–1.9	–1.1	–1.2	
	1950	–0.9	–1.2	–1.3	–2.3	–5.3		1.6	0.0	–0.4	–1.1	–1.2	–0.4	–0.7	
	1960	–0.3	–0.3	–0.2	–0.5	–1.2	3.1		–1.5	–1.3	–1.9	–2.0	–0.9	–1.1	
	1970	–0.2	–0.3	–0.1	–0.3	–0.7	1.6	0.2		–1.1	–2.1	–2.1	–0.7	–1.0	
	1980	0.3	0.4	0.6	0.5	0.5	2.5	2.1	4.1		–3.1	–2.6	–0.5	–0.9	
	1990	0.3	0.3	0.5	0.5	0.4	1.9	1.5	2.2	0.2		–2.0	0.8	–0.2	
	2000	0.0	0.0	0.1	0.1	–0.1	1.0	0.5	0.6	–1.2	–2.5		3.7	0.6	
	2010	0.4	0.4	0.6	0.5	0.5	1.5	1.1	1.4	0.5	0.6	3.9		–2.0	
	2022	0.0	0.0	0.1	0.0	–0.1	0.7	0.3	0.3	–0.5	–0.8	0.0	–3.1		

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Italy



Italy is home to more artistic and globally important historical sites than any other country. It is also famous worldwide for its cuisine, fashion, automobiles and scenery. The International Organization of Vine and Wine estimates that Italy is the most prolific wine-producing country worldwide.

Italy is a member of the European Union and the Eurozone. After the global financial crisis took hold, debt levels increased until 2013, when concerns about the euro crisis peaked. Italy's GDP remains below its pre-crisis level and persistent problems include sluggish growth, high unemployment, corruption and disparities between southern Italy and the more prosperous north. Despite the setbacks, banking is still important in Italy. While banking can trace its roots back to Biblical times, Italy can claim a key role in its development.

In the Middle Ages, North Italian bankers, including the Medici family, dominated lending and trade financing throughout Europe. These bankers were known as Lombards, a name that was synonymous with Italians. Italy retains a large banking sector to this day, with banks still accounting for just over a fifth (23%) of the FTSE World Italy Index, and insurance for a further 7%. Consumer discretionary account for 20% and utilities for 18%. The largest stocks traded on the Milan Stock Exchange are Enel (13%), Intesa (9%), Stellantis (8%), Eni and Unicredit and Ferrari (each 7%).

Italy has experienced some of the lowest asset returns of any Yearbook country. Since 1900, the annualized real equity return has been 2.3%, the second lowest among all Yearbook countries with a 122-year history. Alongside Germany and Austria, which suffered severe hyperinflations, Italy had real bond and real bill returns that were among the very worst of the Yearbook countries, as well as high inflation and a weak currency.

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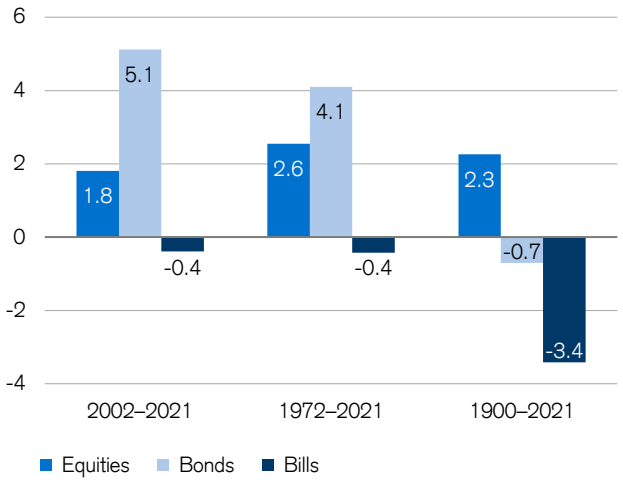
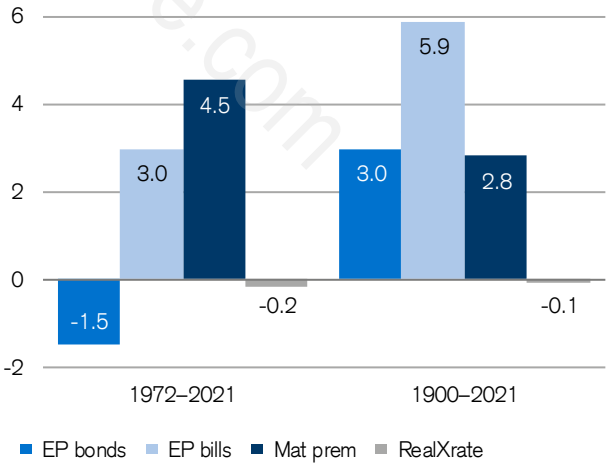
Figure 97: Annualized real returns and risk premiums (%) for Italy, 1900–2021



Note: The three asset classes are equities, long-term government bonds, and Treasury bills. All returns include reinvested income, are adjusted for inflation, and are expressed as geometric mean returns.



Note: EP bonds and EP bills denote the equity premium relative to bonds and to bills; Mat prem denotes the maturity premium for bonds relative to bills; RealXRate denotes the inflation-adjusted change in the exchange rate against the US dollar.

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Figure 98: Real returns on Italian asset classes, 1900–2021

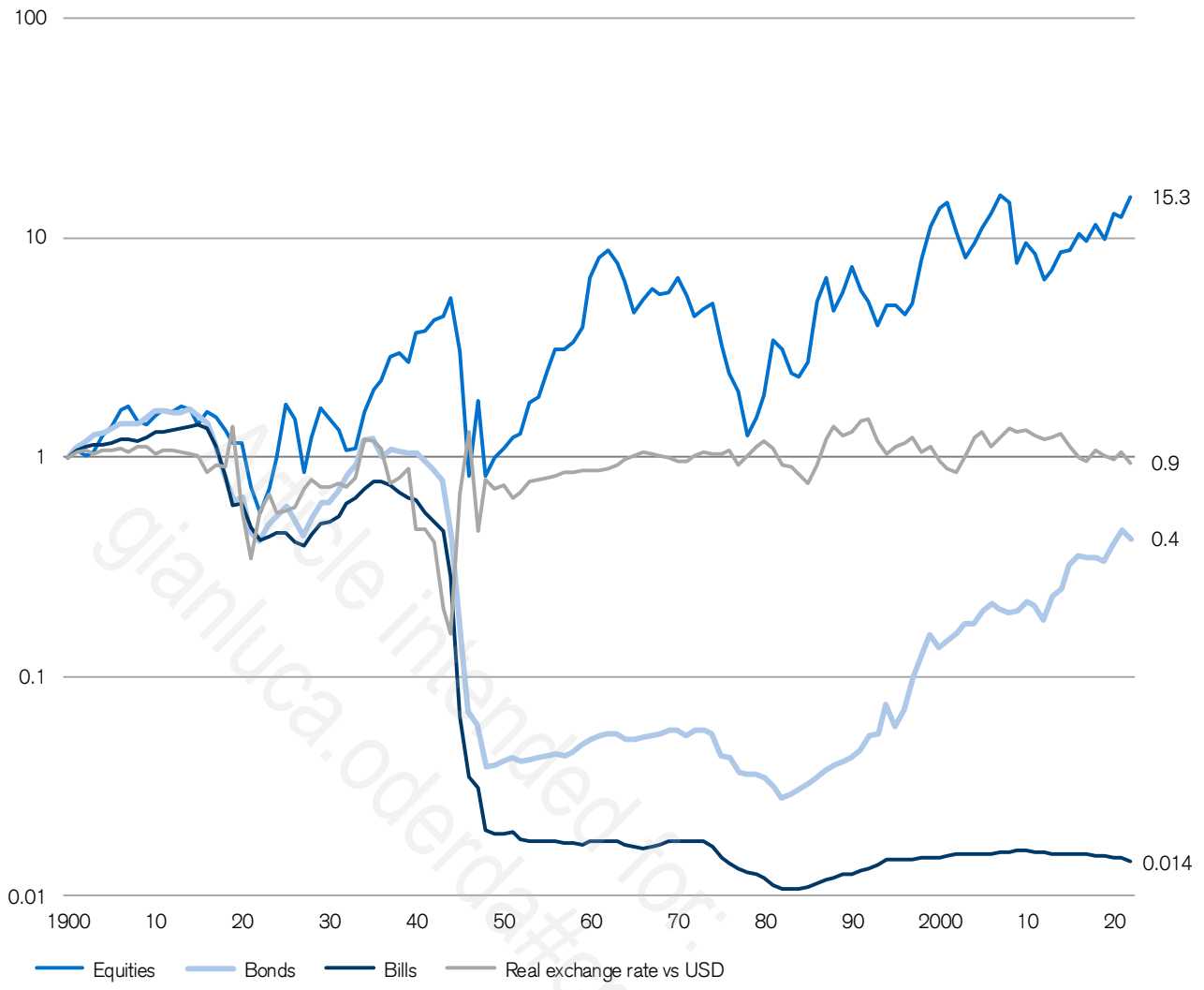

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Table 43: Returns on Italian asset classes, 1900–2021

		Mean returns % p.a.					Annual returns %				10-year returns % p.a.				Current
Return	Asset	GM	AM	SE	SD	SC	Lowest		Highest		Lowest		Highest		year rank
Nominal	Equities	10.2	14.1	2.9	32.6	0.05	–46.5	1945	160.4	1946	–5.2	1977	37.0	1944	25
	Bonds	7.0	7.5	1.0	10.9	–0.01	–18.1	1994	58.7	1944	0.3	1920	19.4	1998	113
	Bills	4.1	4.1	0.3	3.3	0.96	–0.4	2017	15.8	1982	0.3	2020	12.9	1985	122
	Inflation	7.8	10.0	3.0	33.5	0.42	–9.7	1931	344.4	1944	–3.3	1936	47.7	1947	58
Real	Equities	2.3	6.1	2.5	28.1	0.01	–72.9	1945	120.7	1946	–13.8	1977	21.3	1961	24
	Bonds	–0.7	0.7	1.4	15.2	0.48	–64.3	1944	40.0	1996	–28.2	1947	14.2	1998	101
	Bills	–3.4	–2.4	1.0	11.0	0.68	–76.6	1944	14.2	1931	–29.9	1947	6.5	1935	95
	Exchange rate	–0.1	3.5	3.3	36.1	0.07	–64.8	1946	334.4	1944	–18.4	1943	17.6	1953	101
Premiums	Equities vs bills	5.9	9.6	2.8	30.9	0.04	–48.6	1945	150.3	1946	–11.1	1977	32.9	1944	19
	Equities vs bonds	3.0	6.3	2.6	28.9	0.05	–48.1	2008	152.2	1946	–11.8	1996	28.1	1944	9
	Bonds vs bills	2.8	3.3	0.9	10.2	–0.05	–21.5	1994	52.3	1944	–2.6	1920	12.2	1998	108

GM=geometric mean; AM=arithmetic mean, SE=standard error of mean; SD=standard deviation; SC=serial correlation; 10-year returns to end of given year.
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Table 44: Italian real returns, inflation and premiums, 1900–2021

	1 Jan	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000	2010	2022	
Real equity total returns	**1900**		−0.4	2.9	2.9	3.2	6.8	8.4	7.0	5.1	5.9	4.7	3.5	3.0	**Equity premium vs bonds**
	1910	4.4		6.4	4.6	4.5	8.6	10.3	8.3	6.0	6.7	5.3	3.9	3.3	
	1920	0.8	−2.8		2.8	3.5	9.4	11.2	8.7	5.9	6.7	5.2	3.6	3.0	
	1930	1.3	−0.2	2.4		4.2	12.8	14.2	10.2	6.5	7.4	5.5	3.7	3.0	
	1940	3.3	2.9	5.9	9.6		22.2	19.6	12.3	7.1	8.1	5.7	3.6	2.9	
	1950	0.2	−0.9	−0.2	−1.5	−11.5		17.0	7.7	2.5	4.8	2.7	0.8	0.4	
	1960	3.2	2.9	4.4	5.1	2.9	19.7		−0.8	−4.0	1.0	−0.6	−2.1	−2.0	
	1970	2.7	2.5	3.5	3.8	2.0	9.5	0.1		−7.2	1.9	−0.5	−2.5	−2.2	
	1980	0.8	0.3	0.8	0.5	−1.6	1.9	−6.0	−11.7		11.9	3.0	−0.8	−1.0	
	1990	2.2	2.0	2.7	2.7	1.4	4.9	0.4	0.5	14.4		−5.1	−6.7	−4.7	
	2000	2.7	2.5	3.1	3.2	2.2	5.2	1.9	2.5	10.3	6.4		−8.2	−4.6	
	2010	2.1	1.8	2.3	2.3	1.3	3.7	0.7	0.9	5.4	1.2	−3.7		−1.5	
	2022	2.3	2.1	2.6	2.6	1.8	3.7	1.4	1.6	5.1	2.3	0.5	4.2		
Real equity capital gains	**1900**		1.7	3.3	3.6	4.5	8.4	10.3	8.8	6.5	7.3	7.0	6.0	5.9	**Equity premium vs bills**
	1910	0.2		4.8	4.6	5.4	10.2	12.2	10.0	7.3	8.1	7.7	6.4	6.3	
	1920	−4.0	−8.1		4.4	5.7	12.0	14.1	11.1	7.7	8.5	8.0	6.6	6.4	
	1930	−3.7	−5.6	−3.1		7.1	16.0	17.5	12.9	8.3	9.2	8.6	6.8	6.6	
	1940	−1.9	−2.6	0.2	3.6		25.7	23.1	14.9	8.6	9.7	8.8	6.8	6.6	
	1950	−4.3	−5.4	−4.5	−5.3	−13.4		20.5	9.8	3.5	6.0	5.7	3.9	4.2	
	1960	−1.6	−1.9	−0.3	0.7	−0.8	13.6		0.1	−4.1	1.5	2.3	0.9	1.7	
	1970	−1.8	−2.2	−0.9	−0.4	−1.7	4.7	−3.5		−8.1	2.3	3.0	1.1	2.1	
	1980	−3.6	−4.1	−3.4	−3.5	−5.2	−2.3	−9.4	−14.9		13.8	9.1	4.4	4.6	
	1990	−2.0	−2.3	−1.4	−1.1	−2.0	1.0	−2.9	−2.5	11.7		4.6	0.0	1.9	
	2000	−1.4	−1.6	−0.7	−0.4	−1.1	1.6	−1.2	−0.4	7.7	4.0		−4.4	0.7	
	2010	−1.9	−2.1	−1.4	−1.2	−1.9	0.1	−2.4	−2.1	2.6	−1.6	−6.9		5.2	
	2022	−1.7	−1.8	−1.2	−1.0	−1.5	0.2	−1.8	−1.4	2.1	−0.7	−2.8	0.7		
Real bonds	**1900**		2.1	0.3	0.7	1.2	1.5	1.8	1.7	1.3	1.4	2.2	2.4	2.8	**Bond maturity premium**
	1910	4.9		−1.5	0.0	0.9	1.4	1.7	1.6	1.2	1.3	2.2	2.4	2.9	
	1920	−2.1	−8.6		1.5	2.1	2.4	2.5	2.2	1.7	1.7	2.7	2.9	3.3	
	1930	−1.6	−4.6	−0.4		2.8	2.8	2.9	2.4	1.7	1.7	2.9	3.0	3.5	
	1940	0.1	−1.5	2.4	5.2		2.9	3.0	2.3	1.4	1.5	2.9	3.1	3.6	
	1950	−6.2	−8.8	−8.8	−12.7	−27.6		3.0	1.9	0.9	1.1	2.9	3.1	3.7	
	1960	−4.8	−6.6	−6.1	−8.0	−13.9	2.3		0.9	−0.1	0.5	2.9	3.1	3.8	
	1970	−4.0	−5.4	−4.8	−5.8	−9.2	1.6	0.9		−1.0	0.3	3.5	3.7	4.4	
	1980	−4.1	−5.3	−4.8	−5.6	−8.2	−0.6	−2.0	−4.8		1.7	5.9	5.3	5.7	
	1990	−3.4	−4.4	−3.8	−4.4	−6.2	0.1	−0.6	−1.4	2.2		10.3	7.1	7.0	
	2000	−2.0	−2.7	−1.9	−2.2	−3.3	2.4	2.4	2.9	7.1	12.2		4.1	5.6	
	2010	−1.4	−2.0	−1.2	−1.3	−2.2	2.8	2.9	3.4	6.3	8.5	4.9		6.8	
	2022	−0.7	−1.2	−0.4	−0.4	−1.1	3.3	3.5	4.0	6.2	7.4	5.3	5.7		
Real bills	**1900**		0.5	5.7	5.5	4.2	11.6	10.1	9.2	9.6	9.7	9.2	8.5	7.8	**Inflation**
	1910	2.7		11.1	8.1	5.4	14.5	12.1	10.7	10.9	11.0	10.2	9.3	8.4	
	1920	−2.4	−7.3		5.2	2.7	15.7	12.4	10.6	10.9	10.9	10.1	9.2	8.2	
	1930	−2.2	−4.6	−1.9		0.2	21.4	14.9	12.0	12.1	11.9	10.8	9.7	8.5	
	1940	−1.1	−2.3	0.2	2.4		47.0	23.1	16.2	15.3	14.4	12.6	11.1	9.6	
	1950	−7.6	−10.0	−10.9	−15.1	−29.7		3.1	3.4	6.3	7.5	6.8	6.0	5.2	
	1960	−6.5	−8.2	−8.5	−10.6	−16.4	−0.6		3.6	7.9	9.0	7.7	6.6	5.5	
	1970	−5.6	−6.9	−6.8	−8.0	−11.2	−0.3	0.0		12.4	11.8	9.1	7.4	5.9	
	1980	−5.4	−6.5	−6.3	−7.2	−9.5	−1.5	−1.9	−3.9		11.1	7.5	5.7	4.4	
	1990	−4.7	−5.6	−5.4	−6.0	−7.5	−1.0	−1.1	−1.7	0.5		4.1	3.1	2.4	
	2000	−4.1	−4.8	−4.5	−4.9	−6.1	−0.5	−0.4	−0.6	1.1	1.7		2.2	1.7	
	2010	−3.7	−4.3	−4.0	−4.2	−5.1	−0.3	−0.2	−0.2	1.0	1.2	0.7		1.2	
	2022	−3.4	−3.9	−3.6	−3.8	−4.5	−0.4	−0.3	−0.4	0.4	0.4	−0.2	−1.0		
Real exchange rate vs USD	**1900**		0.8	−4.2	−4.0	−4.6	−9.1	−7.5	−6.5	−6.0	−5.8	−5.7	−4.9	−4.6	**Exchange rate vs USD**
	1910	0.4		−9.0	−6.3	−6.4	−11.4	−9.1	−7.7	−6.9	−6.6	−6.4	−5.4	−5.0	
	1920	−2.7	−5.7		−3.5	−5.0	−12.2	−9.2	−7.4	−6.6	−6.3	−6.0	−5.0	−4.6	
	1930	−1.0	−1.7	2.5		−6.5	−16.3	−11.0	−8.4	−7.2	−6.8	−6.4	−5.2	−4.8	
	1940	−1.9	−2.6	−1.0	−4.3		−25.0	−13.1	−9.0	−7.4	−6.8	−6.4	−5.0	−4.6	
	1950	−0.6	−0.8	0.8	0.0	4.6		0.7	0.3	−0.6	−1.6	−2.1	−1.2	−1.3	
	1960	−0.2	−0.4	1.0	0.5	3.1	1.6		−0.1	−1.3	−2.4	−2.8	−1.5	−1.6	
	1970	−0.1	−0.1	1.0	0.6	2.4	1.3	1.0		−2.5	−3.5	−3.7	−1.9	−1.9	
	1980	0.2	0.2	1.2	0.9	2.3	1.6	1.6	2.1		−4.5	−4.3	−1.7	−1.8	
	1990	0.3	0.3	1.2	1.0	2.0	1.4	1.4	1.6	1.0		−4.1	−0.3	−0.9	
	2000	0.0	−0.1	0.6	0.4	1.2	0.5	0.3	0.0	−1.0	−3.0		3.7	0.6	
	2010	0.3	0.2	0.9	0.7	1.5	1.0	0.9	0.8	0.4	0.1	3.3		−2.0	
	2022	−0.1	−0.1	0.5	0.3	0.8	0.3	0.1	0.0	−0.5	−1.0	−0.1	−2.8		

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Japan



The FutureBrand Index ranks Japan as the world's number one country brand. Futures have a long history in financial markets and, by 1730, Osaka started trading rice futures. The city was to become the leading derivatives exchange in Japan (and the world's largest futures market in 1990 and 1991), while the Tokyo Stock Exchange, founded in 1878, was to become the leading market for spot trading. From 1900 to 1939, Japan was the world's second-best equity performer. But World War II was disastrous and Japanese stocks lost 96% of their real value.

From 1949 to 1959, Japan's "economic miracle" began and equities gave a real return of 1,565% over this period. With one or two setbacks, equities kept rising for another 30 years. By the start of the 1990s, the Japanese equity market was the largest in the world, with a 45% weighting in the world index compared to 29% for the USA. Real estate values were also riding high: a 1993 article in the Journal of Economic Perspectives reported that, in late 1991, the land under the Emperor's Palace in Tokyo was worth about the same as all the land in California.

Then the bubble burst. From 1990 to 2020, Japan was the worst-performing stock market of all the Yearbook countries. At the start of 2021, its capital value remained below that attained by the end of the 1980s. Its weighting in the world index fell from 41% to 8%. Meanwhile, Japan has suffered a prolonged period of stagnation, banking crises and deflation. Hopefully, this will not form the blueprint for other countries. Despite the fallout after the asset bubble burst, Japan remains a major economic power. It has the world's second-largest equity market and its third-biggest bond market. It is a world leader in technology, automobiles, electronics, machinery and robotics, and this is reflected in the composition of its equity market. Industrials make up 25% of the FTSE World Japan Index, while consumer discretionary accounts for 23%. The leading companies are Toyota Motor (5%) and Sony Corp (4%).

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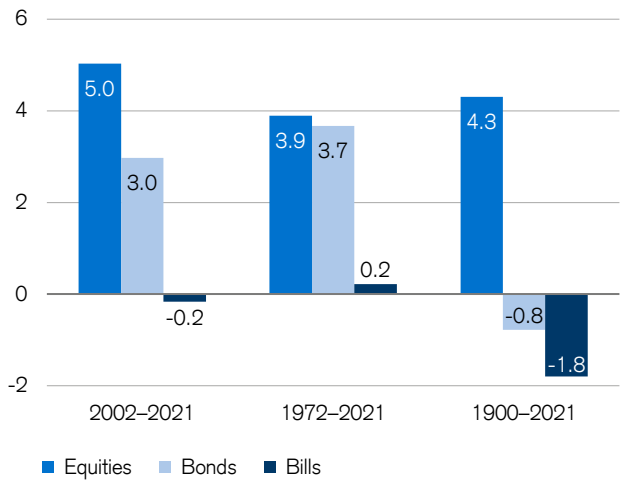
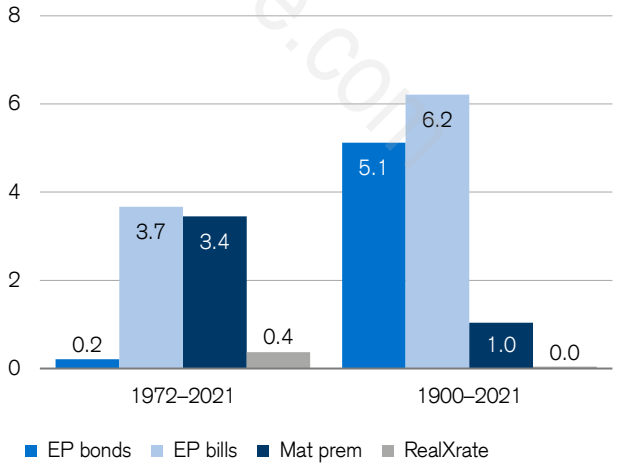
Figure 99: Annualized real returns and risk premiums (%) for Japan, 1900–2021



Note: The three asset classes are equities, long-term government bonds, and Treasury bills. All returns include reinvested income, are adjusted for inflation, and are expressed as geometric mean returns.



Note: EP bonds and EP bills denote the equity premium relative to bonds and to bills; Mat prem denotes the maturity premium for bonds relative to bills; RealXRate denotes the inflation-adjusted change in the exchange rate against the US dollar.

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Figure 100: Real returns on Japanese asset classes, 1900–2021

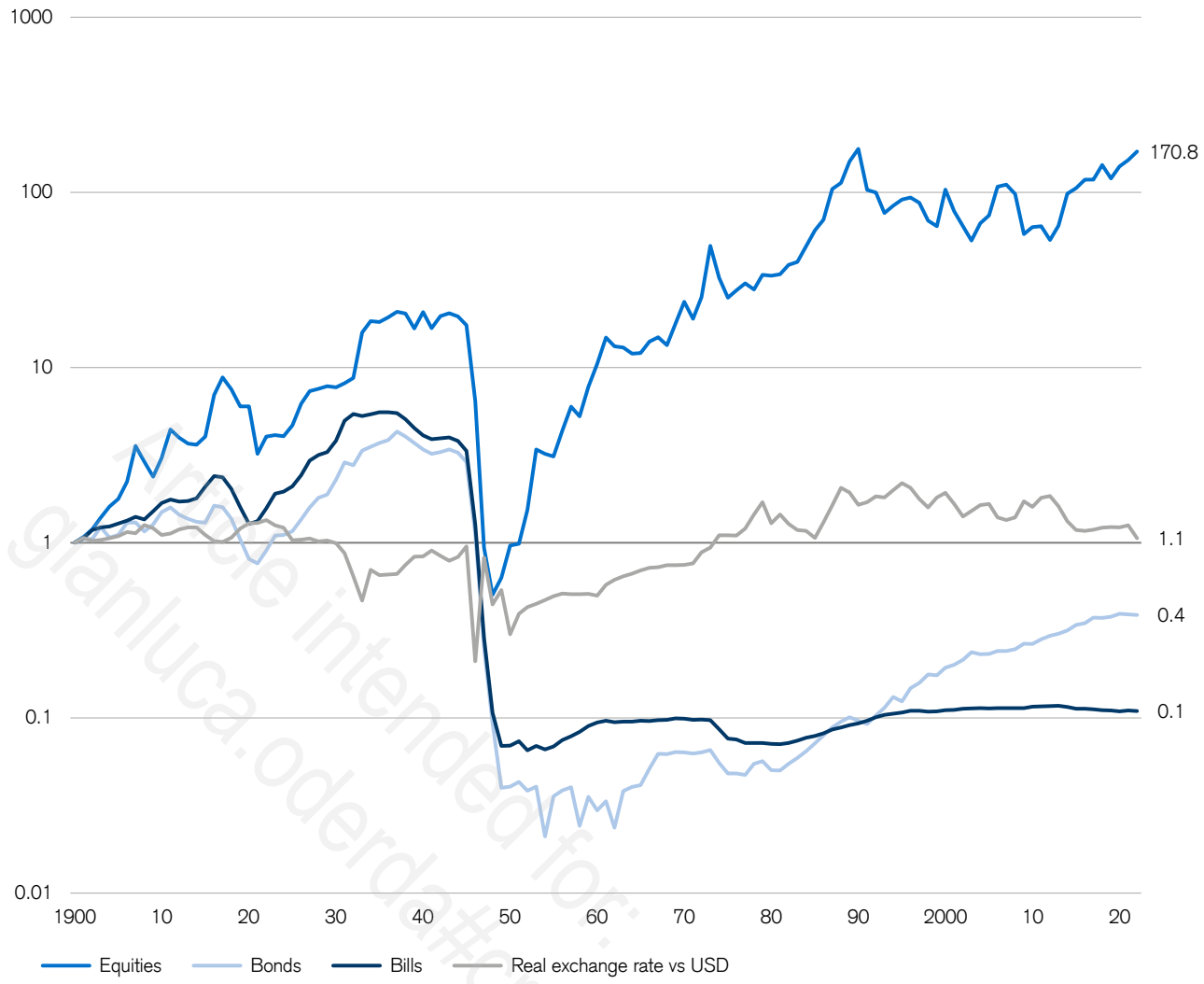

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Table 45: Returns on Japanese asset classes, 1900–2021

		Mean returns % p.a.					Annual returns %				10-year returns % p.a.				Current
Return	Asset	GM	AM	SE	SD	SC	Lowest		Highest		Lowest		Highest		year rank
Nominal	Equities	11.0	14.2	2.6	28.5	0.13	–44.0	1920	121.1	1952	–6.8	1998	44.9	1956	50
	Bonds	5.6	6.5	1.2	13.8	–0.34	–42.4	1953	72.8	1954	–5.1	1953	16.5	1971	99
	Bills	4.5	4.5	0.2	2.7	0.96	–0.2	2017	9.1	1901	0.0	2020	7.6	1928	117
	Inflation	6.4	9.5	3.6	39.9	0.70	–18.7	1930	361.1	1946	–6.1	1930	57.4	1948	80
Real	Equities	4.3	8.7	2.6	29.0	0.18	–85.5	1946	121.1	1952	–30.9	1947	31.1	1960	47
	Bonds	–0.8	1.7	1.7	19.2	0.23	–77.5	1946	69.8	1954	–39.6	1953	14.2	1930	85
	Bills	–1.8	–0.3	1.2	13.3	0.77	–77.5	1946	29.8	1930	–34.1	1948	14.1	1930	90
	Exchange rate	0.0	2.8	2.7	30.0	–0.36	–77.9	1945	290.3	1946	–10.8	1945	9.3	1955	114
Premiums	Equities vs bills	6.2	9.3	2.4	27.0	0.11	–48.3	1920	108.6	1952	–9.8	1998	37.0	1956	43
	Equities vs bonds	5.1	9.0	2.9	31.8	0.21	–45.1	2008	193.0	1948	–13.1	1998	44.8	1957	41
	Bonds vs bills	1.0	1.9	1.2	13.0	–0.32	–45.6	1953	63.0	1954	–10.4	1957	10.0	1971	76

GM=geometric mean; AM=arithmetic mean, SE=standard error of mean; SD=standard deviation; SC=serial correlation; 10-year returns to end of given year.
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Table 46: Japanese real returns, inflation and premiums, 1900–2021

	1 Jan	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000	2010	2022	
Real equity total returns	**1900**		7.4	10.6	4.1	4.6	6.5	10.3	8.8	8.5	8.7	6.5	5.1	5.1	**Equity premium vs bonds**
	1910	11.8		13.8	2.5	3.7	6.3	10.9	9.1	8.6	8.9	6.4	4.9	4.9	
	1920	9.4	7.0		–7.6	–1.0	4.0	10.1	8.1	7.8	8.2	5.5	3.9	4.1	
	1930	7.0	4.8	2.5		6.1	10.3	16.8	12.5	11.1	11.1	7.5	5.5	5.4	
	1940	7.9	6.6	6.4	10.4		14.6	22.5	14.7	12.4	12.1	7.8	5.4	5.4	
	1950	–0.1	–2.8	–5.9	–9.9	–26.4		31.0	14.8	11.7	11.5	6.4	3.9	4.1	
	1960	4.0	2.5	1.4	1.0	–3.3	27.0		0.6	3.2	5.6	1.0	–0.8	0.4	
	1970	4.6	3.5	2.8	2.9	0.5	17.4	8.5		5.9	8.3	1.2	–1.1	0.3	
	1980	4.5	3.5	2.9	3.0	1.2	12.5	5.9	3.5		10.7	–1.1	–3.3	–1.0	
	1990	5.9	5.2	5.0	5.4	4.4	13.9	9.9	10.6	18.2		–11.6	–9.7	–4.4	
	2000	4.7	4.0	3.6	3.8	2.7	9.8	5.9	5.0	5.8	–5.2		–7.7	–0.9	
	2010	3.8	3.1	2.7	2.7	1.6	7.2	3.7	2.5	2.2	–5.0	–4.8		5.2	
	2022	4.3	3.7	3.3	3.4	2.6	7.5	4.6	3.9	4.0	–0.1	2.3	8.6		
Real equity capital gains	**1900**		6.1	8.0	2.4	4.1	5.4	8.2	8.1	8.0	8.8	7.1	5.9	6.2	**Equity premium vs bills**
	1910	–0.1		10.0	0.5	3.5	5.2	8.6	8.5	8.3	9.1	7.2	5.9	6.2	
	1920	0.1	0.3		–8.1	0.4	3.7	8.2	8.2	8.0	9.0	6.8	5.4	5.9	
	1930	–1.6	–2.4	–5.1		9.6	10.1	14.3	12.7	11.5	12.1	9.2	7.3	7.5	
	1940	–0.2	–0.2	–0.5	4.3		10.7	16.7	13.7	12.0	12.6	9.1	6.9	7.2	
	1950	–7.6	–9.3	–12.4	–15.8	–32.0		23.1	15.3	12.5	13.1	8.8	6.3	6.8	
	1960	–3.8	–4.5	–5.7	–5.8	–10.5	17.7		8.0	7.5	9.9	5.5	3.2	4.4	
	1970	–2.7	–3.1	–3.8	–3.4	–5.9	10.7	4.2		6.9	10.9	4.6	2.1	3.7	
	1980	–2.2	–2.5	–3.0	–2.6	–4.2	7.4	2.5	0.9		15.0	3.5	0.5	2.9	
	1990	–0.3	–0.3	–0.4	0.4	–0.4	9.6	7.1	8.6	16.8		–6.9	–6.1	–0.6	
	2000	–0.9	–1.0	–1.1	–0.5	–1.3	6.3	3.6	3.5	4.8	–6.0		–5.2	2.4	
	2010	–1.3	–1.5	–1.7	–1.2	–2.0	4.2	1.7	1.0	1.1	–6.0	–5.9		9.2	
	2022	–0.6	–0.7	–0.8	–0.3	–0.8	4.5	2.5	2.2	2.5	–1.5	0.5	6.3		
Real bonds	**1900**		–1.2	–2.3	–1.7	–0.5	–1.1	–1.9	–0.6	–0.4	0.0	0.6	0.8	1.0	**Bond maturity premium**
	1910	4.1		–3.4	–1.9	–0.2	–1.0	–2.0	–0.5	–0.3	0.2	0.8	0.9	1.2	
	1920	–1.1	–6.0		–0.5	1.4	–0.3	–1.7	0.0	0.2	0.7	1.3	1.4	1.7	
	1930	2.8	2.2	11.0		3.3	–0.1	–2.1	0.2	0.3	0.9	1.5	1.7	1.9	
	1940	3.1	2.8	7.5	4.0		–3.5	–4.7	–0.9	–0.4	0.4	1.2	1.5	1.8	
	1950	–6.2	–8.6	–9.5	–18.3	–35.8		–6.0	0.5	0.7	1.5	2.2	2.3	2.5	
	1960	–5.7	–7.5	–7.9	–13.5	–21.1	–3.1		7.4	4.1	4.1	4.4	4.0	4.0	
	1970	–3.9	–5.1	–5.0	–8.6	–12.4	2.3	7.9		1.0	2.4	3.4	3.2	3.3	
	1980	–3.7	–4.7	–4.5	–7.4	–10.0	0.7	2.7	–2.3		3.9	4.6	4.0	3.9	
	1990	–2.6	–3.4	–3.0	–5.1	–6.9	2.2	4.0	2.1	6.7		5.3	4.0	3.9	
	2000	–1.6	–2.2	–1.8	–3.5	–4.7	3.2	4.8	3.8	7.0	7.2		2.7	3.3	
	2010	–1.2	–1.7	–1.2	–2.7	–3.6	3.2	4.5	3.6	5.7	5.2	3.2		3.7	
	2022	–0.8	–1.2	–0.7	–1.9	–2.6	3.2	4.2	3.5	5.0	4.4	3.2	3.2		
Real bills	**1900**		2.0	5.5	2.3	2.6	11.6	10.2	9.5	9.4	8.6	7.8	7.1	6.4	**Inflation**
	1910	5.3		9.1	2.5	2.8	14.1	11.9	10.8	10.6	9.5	8.5	7.6	6.8	
	1920	1.3	–2.7		–3.7	–0.2	15.9	12.6	11.2	10.8	9.5	8.4	7.4	6.6	
	1930	4.6	4.2	11.6		3.4	27.1	18.7	15.2	13.9	11.9	10.3	8.9	7.8	
	1940	3.6	3.0	6.0	0.7		56.2	27.1	19.5	16.7	13.7	11.5	9.7	8.3	
	1950	–5.2	–7.7	–9.3	–18.2	–33.5		3.4	4.5	5.9	5.0	4.2	3.5	2.9	
	1960	–3.9	–5.6	–6.3	–11.6	–17.2	3.1		5.5	7.2	5.5	4.4	3.5	2.9	
	1970	–3.3	–4.6	–5.0	–8.7	–11.7	1.8	0.5		8.9	5.6	4.1	3.0	2.4	
	1980	–3.3	–4.4	–4.7	–7.7	–9.6	0.1	–1.4	–3.3		2.3	1.7	1.0	0.9	
	1990	–2.6	–3.6	–3.7	–6.0	–7.3	0.7	0.0	–0.3	2.7		1.1	0.4	0.4	
	2000	–2.2	–3.0	–3.0	–4.9	–5.8	0.9	0.4	0.4	2.2	1.8		–0.3	0.1	
	2010	–1.9	–2.6	–2.6	–4.3	–5.0	0.9	0.4	0.4	1.6	1.1	0.5		0.5	
	2022	–1.8	–2.4	–2.4	–3.8	–4.3	0.6	0.2	0.2	1.0	0.5	–0.1	–0.5		
Real exchange rate vs USD	**1900**		0.1	–0.1	0.0	–1.8	–10.7	–8.4	–7.1	–5.8	–4.6	–3.8	–3.4	–3.3	**Exchange rate vs USD**
	1910	1.0		–0.3	0.0	–2.4	–13.2	–10.0	–8.3	–6.6	–5.2	–4.3	–3.8	–3.5	
	1920	1.3	1.5		0.2	–3.4	–17.2	–12.3	–9.8	–7.6	–5.9	–4.8	–4.1	–3.9	
	1930	0.0	–0.5	–2.6		–6.9	–24.7	–16.2	–12.1	–9.1	–6.9	–5.4	–4.7	–4.3	
	1940	–0.4	–0.9	–2.2	–1.7		–39.1	–20.4	–13.8	–9.6	–6.8	–5.2	–4.3	–4.0	
	1950	–2.4	–3.2	–4.8	–5.8	–9.8		4.0	2.6	3.1	3.6	3.6	3.1	2.3	
	1960	–1.2	–1.6	–2.3	–2.3	–2.5	5.2		1.2	2.6	3.5	3.5	3.0	2.0	
	1970	–0.4	–0.7	–1.1	–0.7	–0.4	4.7	4.1		4.1	4.7	4.3	3.4	2.2	
	1980	0.3	0.2	0.0	0.5	1.1	5.0	4.9	5.6		5.3	4.3	3.2	1.8	
	1990	0.6	0.5	0.3	0.8	1.4	4.4	4.1	4.0	2.5		3.5	2.2	0.7	
	2000	0.7	0.6	0.5	1.0	1.4	3.8	3.4	3.2	2.0	1.6		1.0	–0.5	
	2010	0.4	0.4	0.2	0.6	0.9	2.8	2.4	1.9	0.7	–0.1	–1.8		–1.8	
	2022	0.0	0.0	–0.2	0.1	0.3	1.8	1.2	0.7	–0.5	–1.4	–2.7	–3.4		

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Malaysia



Situated on the Malay Peninsula and the northern part of the island of Borneo, Malaysia lies between Singapore and Indonesia to its south and Thailand to its north. Formerly known as the "Federation of Malaya" after gaining independence from the United Kingdom in 1957, the name "Malaysia" was adopted in 1963 when a new federation was formed merging Malaya, North Borneo, Sarawak and Singapore (which left the federation two years later).

Once known for its agriculture, forestry and fishing, mineral resources and mining still account for a significant share of the country's GDP. However, manufacturing is now the largest contributor to economic growth, particularly the electrical and electronics industry. The country is also expanding in the sectors of science, tourism, commerce and medical tourism.

Among its global trading partners, China, Singapore and Japan are the largest, and it is also an important trading partner for the USA. It ranks 62nd (between the Bahamas and the Seychelles) in the UN Human Development Index. The Petronas Towers in Kuala Lumpur remain the tallest twin towers in the world.

The Stock Exchange of Malaysia was formed in 1964 and it is now the world's 28th largest equity market, with financials accounting for 34% of the market capitalization of the FTSE World Malaysia index. Public Bank (12% of the index), Malayan Banking (10%) and CIMB Group (7%) are the leading companies.

Our data for Malaysia starts in 1970.

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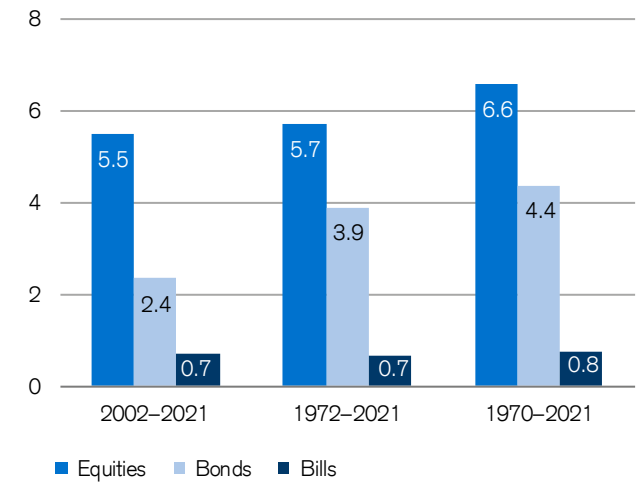
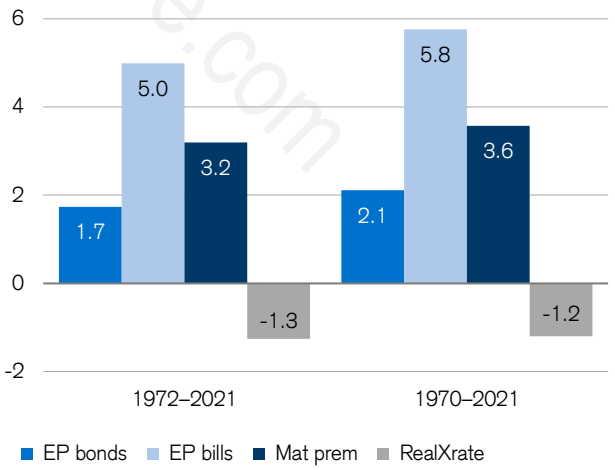
Figure 101: Annualized real returns and risk premiums (%) for Malaysia, 1970–2021



Note: The three asset classes are equities, long-term government bonds, and Treasury bills. All returns include reinvested income, are adjusted for inflation, and are expressed as geometric mean returns.



Note: EP bonds and EP bills denote the equity premium relative to bonds and to bills; Mat prem denotes the maturity premium for bonds relative to bills; RealXRate denotes the inflation-adjusted change in the exchange rate against the US dollar.

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Figure 102: Real returns on Malaysian asset classes, 1970–2021

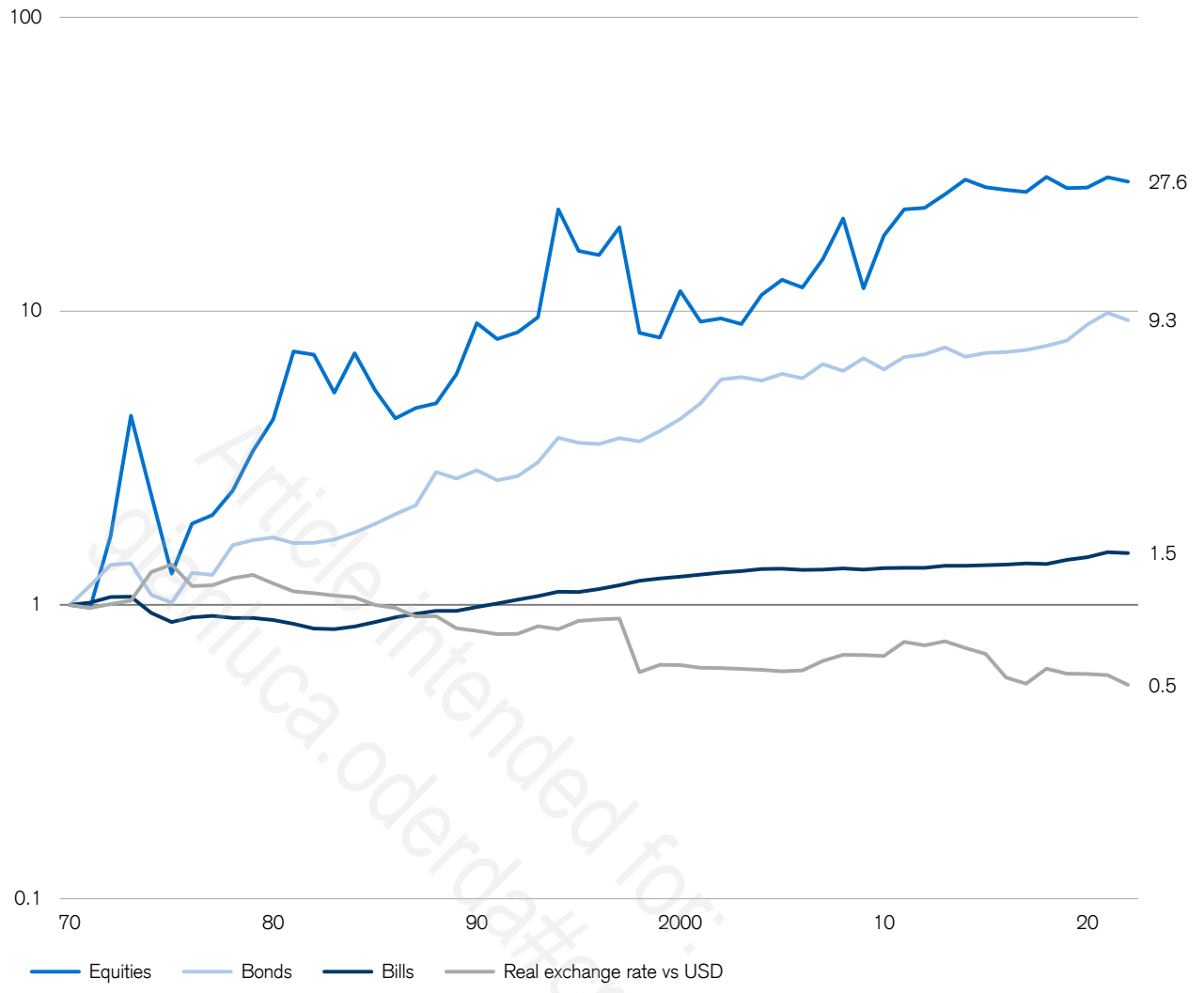

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Table 47: Returns on Malaysian asset classes, 1970–2021

		Mean returns % p.a.					Annual returns %				10-year returns % p.a.				Current
Return	**Asset**	**GM**	**AM**	**SE**	**SD**	**SC**	**Lowest**		**Highest**		**Lowest**		**Highest**		**year rank**
Nominal	Equities	10.1	15.9	5.5	39.6	–0.07	–55.1	1997	166.5	1972	–4.0	2003	29.5	1980	43
	Bonds	7.8	8.2	1.3	9.1	–0.14	–8.0	1973	33.0	1977	3.6	2018	11.3	2001	49
	Bills	4.1	4.1	0.2	1.5	0.78	2.1	2009	8.0	1992	2.8	2010	6.3	1998	53
	Inflation	3.3	3.3	0.4	3.0	0.44	–1.4	2020	17.9	1973	1.8	2020	7.0	1982	24
Real	Equities	6.6	12.4	5.4	38.6	–0.09	–56.3	1997	157.1	1972	–6.5	2003	22.2	1980	39
	Bonds	4.4	4.8	1.4	9.7	–0.07	–22.0	1973	29.7	1987	1.1	2016	7.9	2001	49
	Bills	0.8	0.8	0.4	2.8	0.42	–12.0	1973	4.6	1971	–2.5	1982	2.7	1993	46
	Exchange rate	–1.2	–0.9	1.1	8.0	0.00	–34.2	1997	24.9	1973	–4.3	1997	2.2	2012	50
Premiums	Equities vs bills	5.8	11.3	5.2	37.7	–0.07	–57.8	1997	156.5	1972	–8.1	2003	24.3	1980	37
	Equities vs bonds	2.1	7.3	5.0	36.0	–0.09	–55.2	1997	154.4	1972	–10.6	2003	18.2	1980	24
	Bonds vs bills	3.6	3.9	1.2	8.6	–0.16	–11.3	1973	28.6	1977	0.0	1997	6.7	1979	47

GM=geometric mean; AM=arithmetic mean, SE=standard error of mean; SD=standard deviation; SC=serial correlation; 10-year returns to end of given year.
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Table 48: Malaysian real returns, inflation and premiums, 1970–2021

	1 Jan	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000	2010	2022	
Real equity total returns	**1900**														**Equity premium vs bonds**
	1910														
	1920														
	1930														
	1940														
	1950														
	1960														
	1970									9.7	5.9	3.4	2.7	2.1	
	1980								15.7		2.3	0.4	0.4	0.4	
	1990								11.7	7.8		–1.5	–0.5	–0.2	
	2000								8.5	5.2	2.5		0.5	0.4	
	2010								7.5	4.9	3.5	4.4		0.3	
	2022								6.6	4.5	3.5	4.0	3.6		
Real equity capital gains	**1900**														**Equity premium vs bills**
	1910														
	1920														
	1930														
	1940														
	1950														
	1960														
	1970									17.0	11.8	7.7	6.7	5.8	
	1980								12.4		6.7	3.4	3.5	3.3	
	1990								8.9	5.5		0.1	1.9	2.2	
	2000								6.0	3.0	0.5		3.8	3.1	
	2010								4.9	2.4	0.9	1.3		2.6	
	2022								3.8	1.9	0.8	0.9	0.5		
Real bonds	**1900**														**Bond maturity premium**
	1910														
	1920														
	1930														
	1940														
	1950														
	1960														
	1970									6.7	5.5	4.2	4.0	3.6	
	1980								5.4		4.3	3.0	3.1	2.9	
	1990								5.4	5.4		1.7	2.5	2.4	
	2000								5.0	4.8	4.1		3.3	2.7	
	2010								4.7	4.5	4.0	3.9		2.3	
	2022								4.4	4.1	3.7	3.6	3.3		
Real bills	**1900**														**Inflation**
	1910														
	1920														
	1930														
	1940														
	1950														
	1960														
	1970									5.5	4.5	4.2	3.7	3.3	
	1980								–1.2		3.4	3.6	3.1	2.8	
	1990								–0.1	1.0		3.7	2.9	2.6	
	2000								0.7	1.7	2.4		2.2	2.0	
	2010								0.7	1.4	1.5	0.7		1.9	
	2022								0.8	1.2	1.3	0.8	0.9		
Real exchange rate vs USD	**1900**														**Exchange rate vs USD**
	1910														
	1920														
	1930														
	1940														
	1950														
	1960														
	1970									3.5	0.7	–0.7	–0.3	–0.6	
	1980								1.7		–2.1	–2.7	–1.5	–1.5	
	1990								–1.0	–3.7		–3.4	–1.2	–1.4	
	2000								–1.6	–3.1	–2.6		1.1	–0.4	
	2010								–1.0	–1.9	–1.0	0.7		–1.6	
	2022								–1.2	–1.9	–1.3	–0.7	–1.9		

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Mexico



Once known as "New Spain" after the Spanish conquest of the Aztecs in 1521, Mexico is situated in southern North America and is the third-largest country in Latin America after Brazil and Argentina. Mexico's free market economy has important trade links to the rest of Latin America, the USA and Canada. Trade with the USA and Canada has tripled since Mexico joined the North American Free Trade Agreement (NAFTA).

Boasting a wealth of mineral resources and a large industrial base, the country has a history of economic upswings and downswings. Today, the economy depends largely on services such as government, trade, tourism and finance, and around 80% of the population lives in urban areas. However, extremes of wealth and poverty mean that Mexico ranks 77th (between Bosnia-Herzegovina and Thailand) in the latest UN Human Development Index.

Established in 1886 as the Mexican Mercantile Exchange, the Mexican Stock Exchange (Bolsa Mexicana de Valores) adopted its current name in 1975 and is presently the second-largest stock exchange in Latin America in terms of market capitalization of listed companies (after Brazil).

It is now the world's 27th largest equity market, with telecommunications and consumer staples accounting for 39% of the market capitalization of the FTSE World Mexico Index. America Movil (18% of the index), Wal-Mart de Mexico (11%) and Grupo Banorte (11%) are the leading companies.

Our data for Mexico starts in 1969, except for bonds which begin in 1995.

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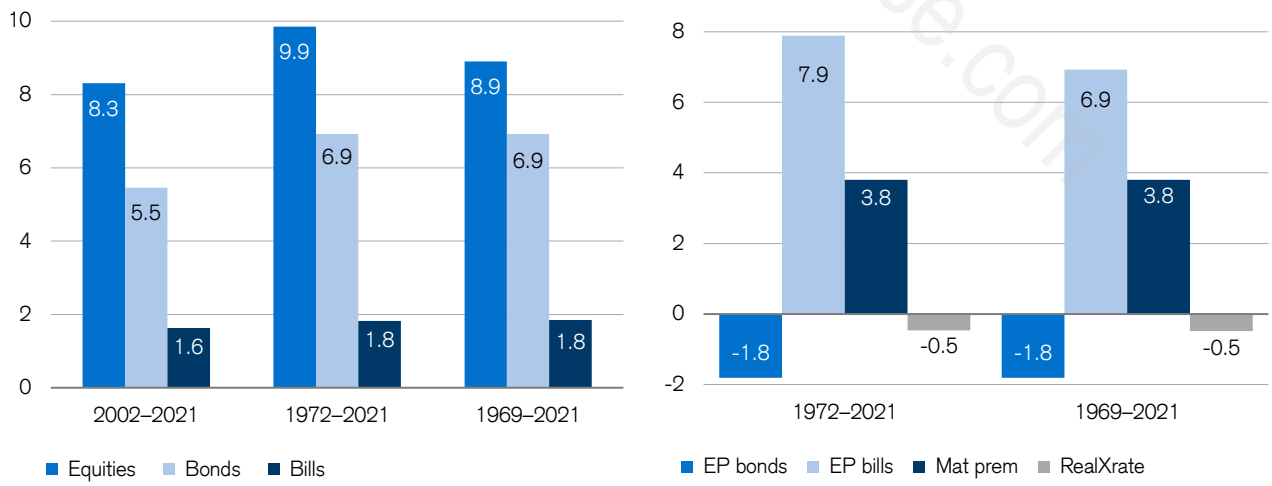
Figure 103: Annualized real returns and risk premiums (%) for Mexico, 1969–2021 (bonds from 1995)



Note: The three asset classes are equities, long-term government bonds, and Treasury bills. All returns include reinvested income, are adjusted for inflation, and are expressed as geometric mean returns.

Note: EP bonds and EP bills denote the equity premium relative to bonds and to bills; Mat prem denotes the maturity premium for bonds relative to bills; RealXRate denotes the inflation-adjusted change in the exchange rate against the US dollar.

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Figure 104: Real returns on Mexican asset classes, 1969–2021 (bonds from 1995)

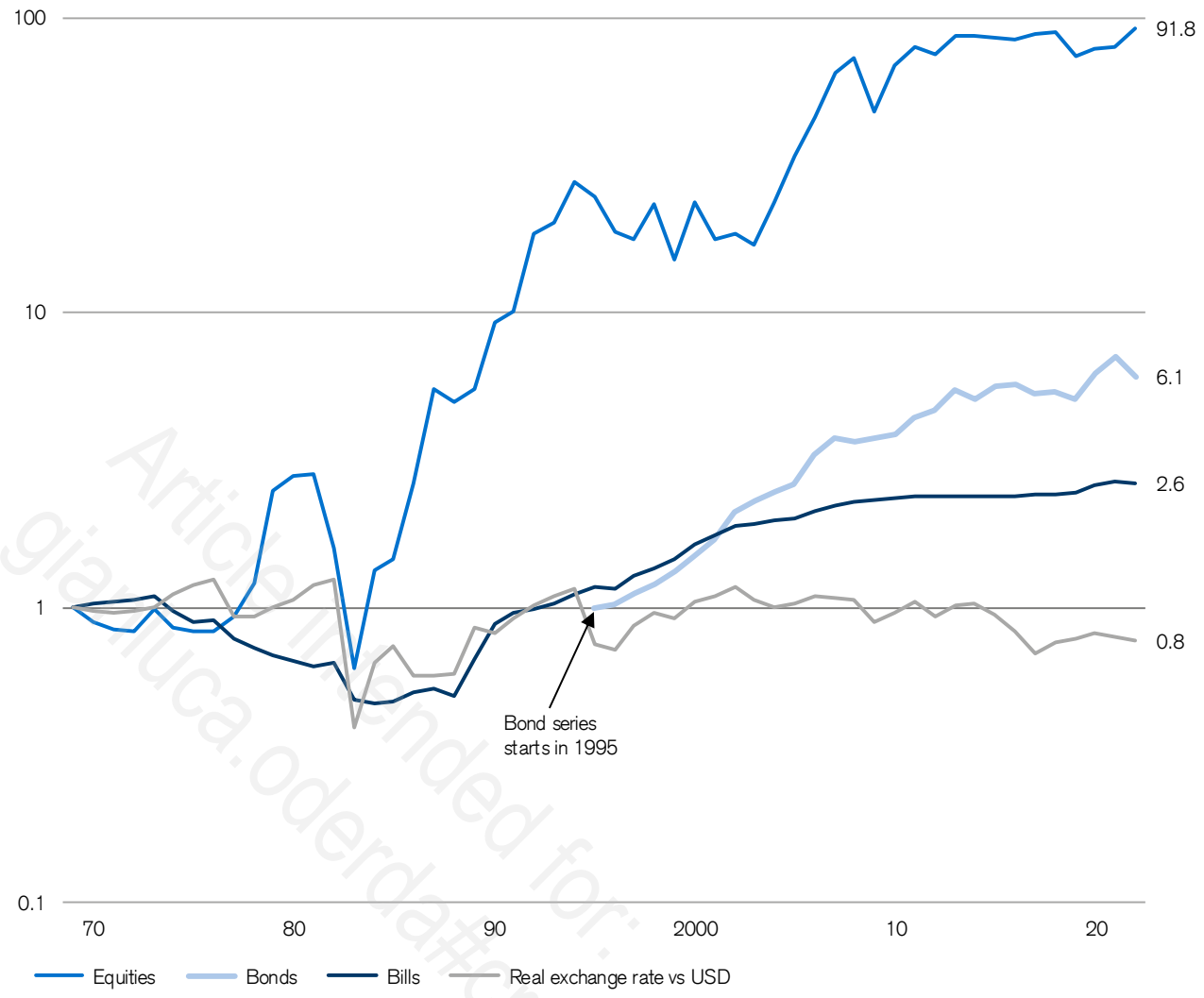

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Table 49: Returns on Mexican asset classes, 1969–2021 (bonds from 1995)

		Mean returns % p.a.					Annual returns %				10-year returns % p.a.				Current
Return	Asset	GM	AM	SE	SD	SC	Lowest		Highest		Lowest		Highest		year rank
Nominal	Equities	29.6	40.7	9.6	69.8	0.38	–29.5	2008	331.5	1986	3.8	2020	119.1	1992	28
	Bonds	15.4	16.3	2.8	14.3	0.46	–7.9	2021	55.6	1995	7.2	2018	26.4	2004	29
	Bills	21.2	24.0	4.2	30.3	0.89	3.0	2015	146.5	1987	4.8	2018	72.4	1990	47
	Inflation	19.0	21.8	4.2	30.7	0.72	2.1	2015	159.2	1987	3.8	2020	65.3	1988	29
Real	Equities	8.9	14.4	5.1	36.9	0.00	–60.8	1982	115.8	1983	–4.5	1982	41.6	1992	20
	Bonds	6.9	7.3	1.9	9.7	0.02	–14.2	2021	24.3	2005	3.0	2018	13.0	2006	29
	Bills	1.8	2.2	1.2	8.6	0.44	–24.8	1982	32.9	1988	–7.7	1982	10.5	1997	44
	Exchange rate	–0.5	1.4	2.4	17.6	–0.24	–68.4	1982	64.9	1983	–8.9	1982	10.8	1992	39
Premiums	Equities vs bills	6.9	11.9	4.9	35.9	0.04	–47.9	1982	122.3	1983	–7.7	2002	31.4	1992	20
	Equities vs bonds	–1.8	0.8	4.4	23.1	–0.28	–41.4	1998	39.6	2009	–6.3	2004	8.0	2012	5
	Bonds vs bills	3.8	4.1	1.6	8.2	–0.12	–13.0	2021	17.6	2019	2.3	2018	6.9	2006	29

GM=geometric mean; AM=arithmetic mean, SE=standard error of mean; SD=standard deviation; SC=serial correlation; 10-year returns to end of given year.
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Table 50: Mexican real returns, inflation and premiums, 1969–2021 (bonds from 1995)

	1 Jan	1900	1910	1920	1930	1940	1950	1969	1970	1980	1990	2000	2010	2022	
Real equity total returns	**1900**														**Equity premium vs bonds**
	1910														
	1920														
	1930														
	1940														
	1950														
	1969														
	1970							–10.8							
	1980							9.8	12.1						
	1990							11.2	12.4	12.7		–8.4	–2.1	–1.8	
	2000							10.7	11.5	11.3	9.8		1.2	–0.2	
	2010							10.9	11.5	11.3	10.6	11.3		–1.4	
	2022							8.9	9.3	8.7	7.4	6.4	2.4		
Real equity capital gains	**1900**														**Equity premium vs bills**
	1910														
	1920														
	1930														
	1940														
	1950														
	1969								–13.8	13.9	11.9	9.0	8.6	6.9	
	1970							–12.6		17.2	13.3	9.8	9.2	7.4	
	1980							4.8	6.7		9.6	6.3	6.7	5.2	
	1990							5.6	6.6	6.4		3.1	5.2	3.8	
	2000							6.3	7.0	7.1	7.8		7.3	4.2	
	2010							7.0	7.5	7.8	8.5	9.2		1.6	
	2022							5.4	5.8	5.6	5.4	4.3	0.3		
Real bonds	**1900**														**Bond maturity premium**
	1910														
	1920														
	1930														
	1940														
	1950														
	1969														
	1970														
	1980														
	1990											1.4	4.5	3.8	
	2000										8.3		6.1	4.4	
	2010										9.5	10.0		3.0	
	2022										6.9	6.6	3.8		
Real bills	**1900**														**Inflation**
	1910														
	1920														
	1930														
	1940														
	1950														
	1969								3.1	13.9	35.9	30.4	23.7	19.0	
	1970							3.4		15.0	37.8	31.5	24.3	19.3	
	1980							–3.6	–4.3		65.2	40.6	27.5	20.4	
	1990							–0.6	–0.8	2.8		19.6	12.0	9.0	
	2000							1.6	1.6	4.6	6.5		4.9	4.5	
	2010							2.1	2.1	4.3	5.1	3.7		4.2	
	2022							1.8	1.8	3.3	3.5	2.1	0.8		
Real exchange rate vs USD	**1900**														**Exchange rate vs USD**
	1910														
	1920														
	1930														
	1940														
	1950														
	1969								0.0	–5.3	–22.6	–19.3	–15.6	–13.0	
	1970							–2.9		–5.8	–23.6	–19.8	–16.0	–13.3	
	1980							0.5	0.9		–38.0	–26.0	–19.1	–15.0	
	1990							–0.9	–0.8	–2.5		–11.8	–7.6	–6.1	
	2000							0.2	0.3	0.0	2.4		–3.2	–3.4	
	2010							–0.1	0.0	–0.3	0.8	–0.9		–3.7	
	2022							–0.5	–0.4	–0.7	–0.2	–1.4	–1.8		

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Netherlands



The Netherlands is a low-lying land, half of which is one meter or less above sea level and much of which has been reclaimed from the sea and lakes. The Dutch port of Rotterdam is the largest port in Europe. Constitutionally, the Netherlands has been a monarchy since 1815, and a parliamentary democracy since 1848. Dutch politics and governance are often driven by an effort to achieve consensus on important issues. The country has a market-based mixed economy.

Although some forms of stock trading occurred in Roman times and 14th century Toulouse mill companies' securities were traded, transferable securities appeared in the 17th century. The Amsterdam market, which started in 1611, was the world's main center of stock trading in the 17th and 18th centuries. A book written in 1688 by a Spaniard living in Amsterdam (appropriately entitled Confusion de Confusiones) describes the amazingly diverse tactics used by investors. Even though only one stock was traded – the Dutch East India Company – they had bulls, bears, panics, bubbles and other features of modern exchanges.

The Amsterdam Exchange continues to prosper as part of Euronext. Since 1900, Dutch equities have generated a mid-ranking real return of 5.2% per year. The Netherlands has traditionally been a low-inflation country and, since 1900, has enjoyed the lowest inflation rate among the European Union countries and the second lowest (after Switzerland) of all the countries in the Yearbook.

The Netherlands is heavily exposed to technology (48% of the capitalization of the FTSE World Netherlands index), followed by consumer staples (12%), industrials (11%) and financials (10%). Although Unilever and Shell now have their primary listings in London, the Amsterdam exchange still hosts more than its share of major multinationals, including ASML Holding (35%), Ayden (9%), Prosus (8%) and ING Group (6%).

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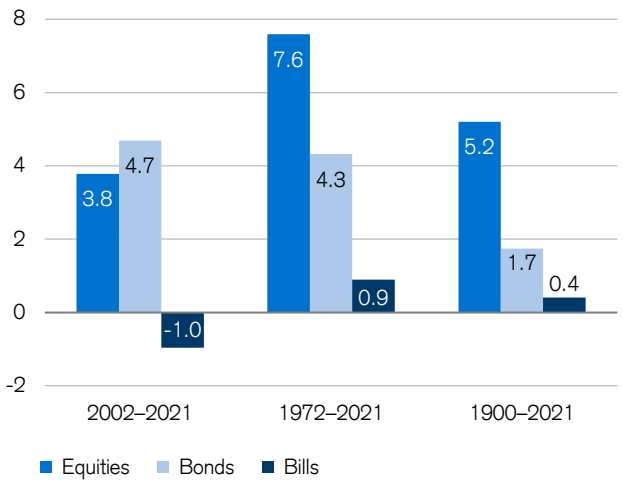
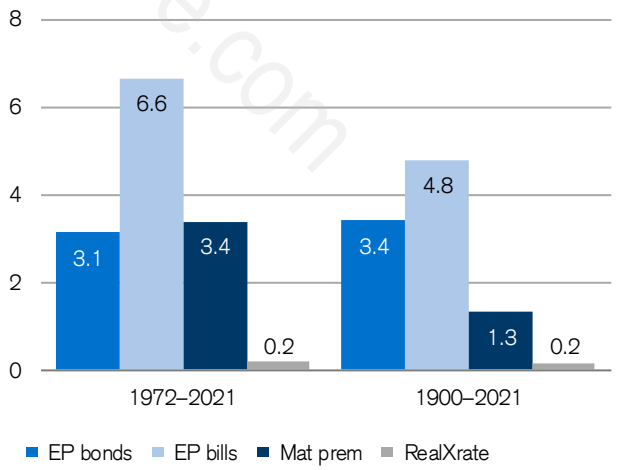
Figure 105: Annualized real returns and risk premiums (%) for The Netherlands, 1900–2021



Note: The three asset classes are equities, long-term government bonds, and Treasury bills. All returns include reinvested income, are adjusted for inflation, and are expressed as geometric mean returns.



Note: EP bonds and EP bills denote the equity premium relative to bonds and to bills; Mat prem denotes the maturity premium for bonds relative to bills; RealXRate denotes the inflation-adjusted change in the exchange rate against the US dollar.

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Figure 106: Real returns on Dutch asset classes, 1900–2021

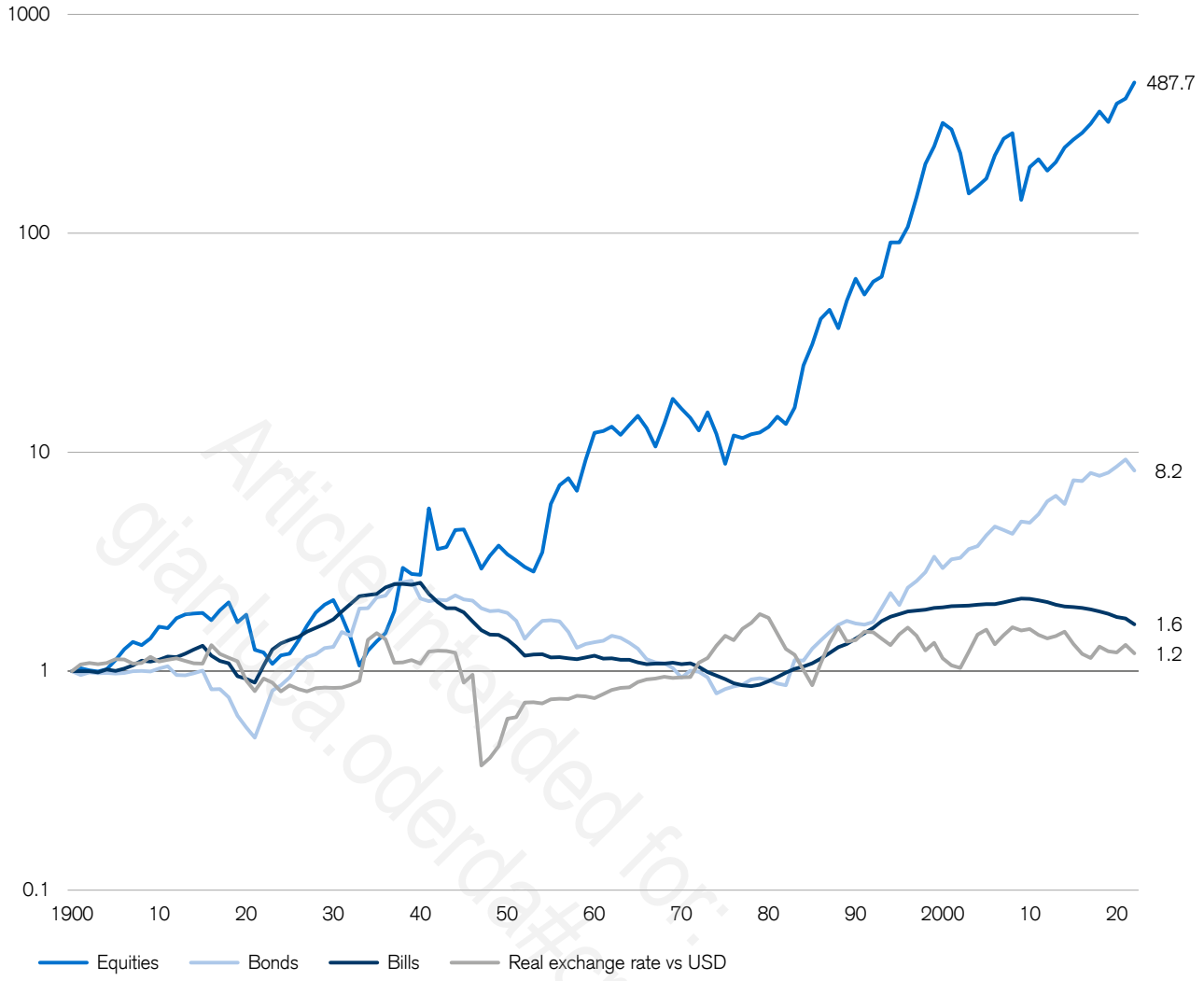

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Table 51: Returns on Dutch asset classes, 1900–2021

		Mean returns % p.a.					Annual returns %				10-year returns % p.a.				Current
Return	Asset	GM	AM	SE	SD	SC	Lowest		Highest		Lowest		Highest		year rank
Nominal	Equities	8.2	10.3	2.0	22.4	0.01	–49.5	2008	130.1	1940	–3.4	2008	21.8	2000	21
	Bonds	4.6	4.9	0.7	8.3	–0.09	–18.5	1939	36.1	1982	–0.9	1920	10.1	1984	113
	Bills	3.3	3.3	0.2	2.5	0.89	–0.8	2017	12.2	1981	–0.3	2020	7.7	1987	120
	Inflation	2.8	2.9	0.4	4.6	0.55	–13.4	1921	18.7	1918	–3.9	1930	7.7	1949	26
Real	Equities	5.2	7.2	1.9	21.0	0.04	–50.4	2008	101.6	1940	–5.5	2008	19.0	2000	29
	Bonds	1.7	2.2	0.9	9.8	0.11	–18.1	1915	32.8	1932	–7.2	1920	11.7	1930	114
	Bills	0.4	0.5	0.4	4.8	0.62	–12.7	1918	19.6	1921	–5.8	1949	7.8	1930	113
	Exchange rate	0.2	1.0	1.1	12.2	0.08	–61.5	1946	53.9	1933	–10.2	1946	7.2	1956	105
Premiums	Equities vs bills	4.8	6.9	2.0	22.0	0.01	–51.4	2008	126.7	1940	–6.4	2008	16.2	1961	18
	Equities vs bonds	3.4	5.7	2.0	21.9	–0.05	–56.4	2008	107.6	1940	–9.0	2009	17.2	1959	8
	Bonds vs bills	1.3	1.6	0.7	8.1	–0.07	–18.9	1939	29.2	2014	–4.6	1920	8.1	2019	100

GM=geometric mean; AM=arithmetic mean, SE=standard error of mean; SD=standard deviation; SC=serial correlation; 10-year returns to end of given year.
Source: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

Table 52: Dutch real returns, inflation and premiums, 1900–2021

	1 Jan	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000	2010	2022	
Real equity total returns	**1900**		4.5	6.1	1.7	0.6	1.2	3.7	4.1	3.4	4.1	4.8	3.5	3.4	**Equity premium vs bonds**
	1910	4.8		7.8	0.3	–0.6	0.4	3.6	4.1	3.2	4.1	4.8	3.4	3.3	
	1920	3.0	1.3		–6.7	–4.6	–1.9	2.6	3.3	2.5	3.5	4.5	2.9	2.9	
	1930	2.5	1.4	1.5		–2.4	0.6	5.9	6.0	4.4	5.4	6.2	4.1	4.0	
	1940	2.6	1.8	2.1	2.7		3.8	10.3	9.0	6.2	7.0	7.7	5.1	4.8	
	1950	2.5	1.9	2.1	2.4	2.2		17.2	11.7	7.0	7.8	8.5	5.3	4.9	
	1960	4.3	4.2	4.9	6.0	7.8	13.6		6.4	2.3	4.8	6.4	3.1	3.1	
	1970	4.0	3.9	4.4	5.2	6.0	8.0	2.5		–1.7	4.1	6.4	2.3	2.4	
	1980	3.3	3.0	3.3	3.7	4.0	4.6	0.3	–1.9		10.2	10.6	3.7	3.4	
	1990	4.7	4.7	5.2	5.8	6.4	7.5	5.5	7.1	16.9		11.1	0.6	1.4	
	2000	5.9	6.1	6.7	7.4	8.2	9.5	8.5	10.5	17.3	17.8		–9.0	–2.7	
	2010	4.9	5.0	5.4	5.9	6.3	7.0	5.7	6.6	9.5	6.0	–4.5		2.9	
	2022	5.2	5.2	5.6	6.1	6.5	7.1	6.1	6.8	9.0	6.7	1.9	7.7		
Real equity capital gains	**1900**		3.5	3.4	0.7	0.2	1.8	4.0	3.9	3.4	4.3	5.2	4.2	4.8	**Equity premium vs bills**
	1910	–0.2		3.4	–0.7	–0.9	1.4	4.1	4.0	3.4	4.4	5.4	4.3	4.9	
	1920	–2.0	–3.7		–4.6	–2.9	0.7	4.3	4.1	3.4	4.5	5.7	4.4	5.0	
	1930	–3.0	–4.3	–4.9		–1.2	3.5	7.4	6.4	5.1	6.2	7.2	5.6	6.2	
	1940	–2.7	–3.5	–3.4	–1.9		8.5	12.0	9.1	6.7	7.7	8.7	6.6	7.1	
	1950	–2.7	–3.3	–3.2	–2.3	–2.7		15.6	9.4	6.1	7.5	8.8	6.3	6.9	
	1960	–0.9	–1.1	–0.4	1.2	2.7	8.5		3.5	1.7	4.9	7.1	4.5	5.6	
	1970	–1.1	–1.2	–0.7	0.4	1.2	3.2	–1.9		–0.1	5.6	8.3	4.7	6.0	
	1980	–1.9	–2.1	–1.9	–1.2	–1.1	–0.5	–4.8	–7.6		11.8	12.9	6.4	7.5	
	1990	–0.6	–0.6	–0.2	0.7	1.2	2.2	0.1	1.2	10.8		14.0	3.9	6.2	
	2000	0.8	0.9	1.5	2.4	3.2	4.4	3.4	5.2	12.2	13.7		–5.4	2.8	
	2010	0.0	0.0	0.4	1.1	1.6	2.3	1.1	1.8	5.2	2.5	–7.6		10.1	
	2022	0.4	0.5	0.9	1.5	2.0	2.6	1.7	2.4	5.0	3.2	–1.2	4.4		
Real bonds	**1900**		–0.9	–2.5	–1.0	–0.4	0.6	0.2	–0.2	0.0	0.2	0.4	0.7	1.3	**Bond maturity premium**
	1910	0.3		–4.1	–1.0	–0.2	0.9	0.5	–0.1	0.2	0.3	0.6	0.9	1.5	
	1920	–2.9	–6.0		2.2	1.7	2.7	1.6	0.7	0.9	1.0	1.2	1.5	2.1	
	1930	0.9	1.1	8.8		1.3	2.9	1.4	0.4	0.6	0.8	1.0	1.4	2.1	
	1940	1.9	2.5	7.0	5.2		4.5	1.5	0.1	0.5	0.7	1.0	1.4	2.2	
	1950	1.2	1.5	4.1	1.8	–1.5		–1.4	–2.1	–0.9	–0.3	0.3	0.9	1.9	
	1960	0.5	0.6	2.3	0.2	–2.3	–3.0		–2.8	–0.6	0.1	0.7	1.3	2.4	
	1970	–0.1	–0.2	1.1	–0.8	–2.7	–3.3	–3.7		1.6	1.5	1.9	2.4	3.4	
	1980	–0.1	–0.2	0.8	–0.7	–2.1	–2.3	–1.9	–0.2		1.5	2.0	2.6	3.9	
	1990	0.6	0.6	1.6	0.4	–0.5	–0.3	0.7	2.9	6.1		2.6	3.2	4.7	
	2000	1.1	1.2	2.1	1.2	0.5	1.0	2.0	3.9	6.0	6.0		3.9	5.6	
	2010	1.4	1.5	2.4	1.6	1.1	1.6	2.5	4.2	5.7	5.4	4.9		7.0	
	2022	1.7	1.9	2.7	2.0	1.7	2.1	3.0	4.3	5.4	5.1	4.8	4.7		
Real bills	**1900**		1.9	3.9	1.7	0.7	2.0	2.3	2.6	3.1	3.1	3.0	2.9	2.8	**Inflation**
	1910	1.2		5.9	1.6	0.3	2.1	2.4	2.7	3.3	3.2	3.1	3.0	2.9	
	1920	–0.4	–2.0		–2.5	–2.4	0.9	1.5	2.1	2.9	2.9	2.8	2.7	2.6	
	1930	1.8	2.1	6.5		–2.3	2.6	2.9	3.2	4.0	3.8	3.6	3.4	3.2	
	1940	2.4	2.7	5.2	3.9		7.7	5.5	5.1	5.6	5.1	4.6	4.2	3.9	
	1950	0.7	0.5	1.4	–1.1	–5.8		3.5	3.9	5.0	4.4	4.0	3.7	3.4	
	1960	0.3	0.1	0.6	–1.3	–3.8	–1.7		4.4	5.7	4.7	4.1	3.7	3.4	
	1970	0.1	–0.1	0.3	–1.2	–2.8	–1.3	–0.9		7.2	4.9	4.1	3.6	3.2	
	1980	–0.1	–0.3	0.0	–1.3	–2.6	–1.4	–1.3	–1.8		2.7	2.6	2.4	2.3	
	1990	0.4	0.3	0.6	–0.3	–1.2	0.0	0.6	1.4	4.6		2.4	2.2	2.1	
	2000	0.7	0.6	0.9	0.2	–0.4	0.7	1.3	2.0	4.0	3.3		2.0	2.0	
	2010	0.7	0.6	0.9	0.3	–0.2	0.7	1.2	1.7	2.9	2.1	0.9		2.0	
	2022	0.4	0.3	0.6	–0.1	–0.5	0.2	0.5	0.8	1.4	0.5	–0.8	–2.2		
Real exchange rate vs USD	**1900**		0.1	–0.3	0.1	0.7	–1.0	–0.7	–0.5	0.4	0.3	0.1	0.5	0.2	**Exchange rate vs USD**
	1910	1.0		–0.8	0.0	0.9	–1.3	–0.8	–0.6	0.4	0.3	0.1	0.5	0.2	
	1920	–0.5	–2.0		0.8	1.8	–1.4	–0.8	–0.6	0.6	0.5	0.3	0.6	0.3	
	1930	–0.6	–1.4	–0.8		2.8	–2.5	–1.4	–0.9	0.5	0.4	0.2	0.6	0.3	
	1940	0.2	–0.1	0.9	2.6		–7.6	–3.4	–2.2	0.0	0.0	–0.3	0.3	0.0	
	1950	–1.0	–1.5	–1.3	–1.6	–5.6		1.0	0.7	2.6	2.0	1.3	1.7	1.1	
	1960	–0.5	–0.8	–0.5	–0.4	–1.8	2.2		0.4	3.5	2.3	1.4	1.8	1.1	
	1970	–0.1	–0.3	0.1	0.3	–0.5	2.2	2.2		6.7	3.3	1.7	2.2	1.2	
	1980	0.7	0.7	1.1	1.5	1.2	3.6	4.3	6.5		0.0	–0.7	0.7	–0.1	
	1990	0.4	0.3	0.6	0.8	0.5	2.1	2.0	2.0	–2.3		–1.4	1.1	–0.1	
	2000	0.1	0.0	0.3	0.4	0.1	1.3	1.0	0.7	–2.1	–1.9		3.7	0.6	
	2010	0.4	0.3	0.6	0.8	0.5	1.6	1.5	1.3	–0.4	0.6	3.1		–2.0	
	2022	0.2	0.1	0.3	0.4	0.1	1.0	0.8	0.5	–0.9	–0.4	0.2	–2.1		

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New Zealand



Since 1999, New Zealand has been promoting itself to the world as “100% pure” and Forbes calls this marketing drive one of the world's top ten travel campaigns. But the country also prides itself on honesty, openness, good governance, and freedom to run businesses. The Wall Street Journal ranks New Zealand as the best place in the world for business freedom.

The British colony of New Zealand became an independent dominion in 1907. Traditionally, New Zealand's economy was built upon a few primary products, notably wool, meat and dairy products. It was dependent on concessionary access to UK markets until the UK’s accession to the European Union.

Over the last three decades, New Zealand has evolved into a more industrialized, free market economy. It competes globally as an export-led nation through efficient ports, airline services, and submarine fiber-optic communications.

The New Zealand Exchange traces its roots to the Gold Rush of the 1870s. In 1974, the regional stock markets merged to form the New Zealand Stock Exchange. In 2003, the Exchange demutualized and officially became the New Zealand Exchange Limited.

The largest firms traded on the exchange are F&P Healthcare (22% of the FTSE World New Zealand Index), Auckland International Airport (11%), Spark NZ (10%) and Mainfreight (9%).

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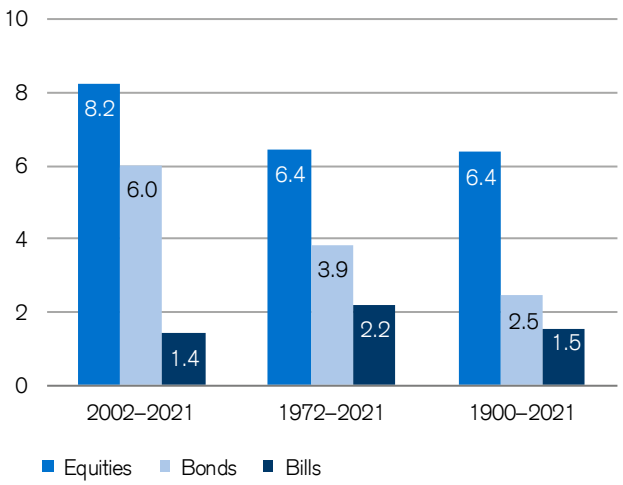
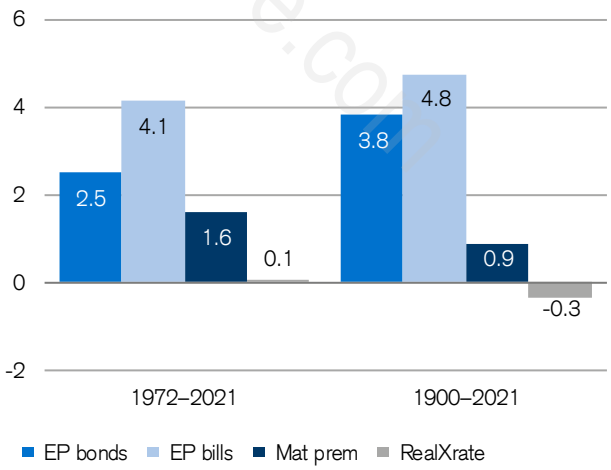
Figure 107: Annualized real returns and risk premiums (%) for New Zealand, 1900–2021



Note: The three asset classes are equities, long-term government bonds, and Treasury bills. All returns include reinvested income, are adjusted for inflation, and are expressed as geometric mean returns.



Note: EP bonds and EP bills denote the equity premium relative to bonds and to bills; Mat prem denotes the maturity premium for bonds relative to bills; RealXRate denotes the inflation-adjusted change in the exchange rate against the US dollar.

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Figure 108: Real returns on New Zealand asset classes, 1900–2021

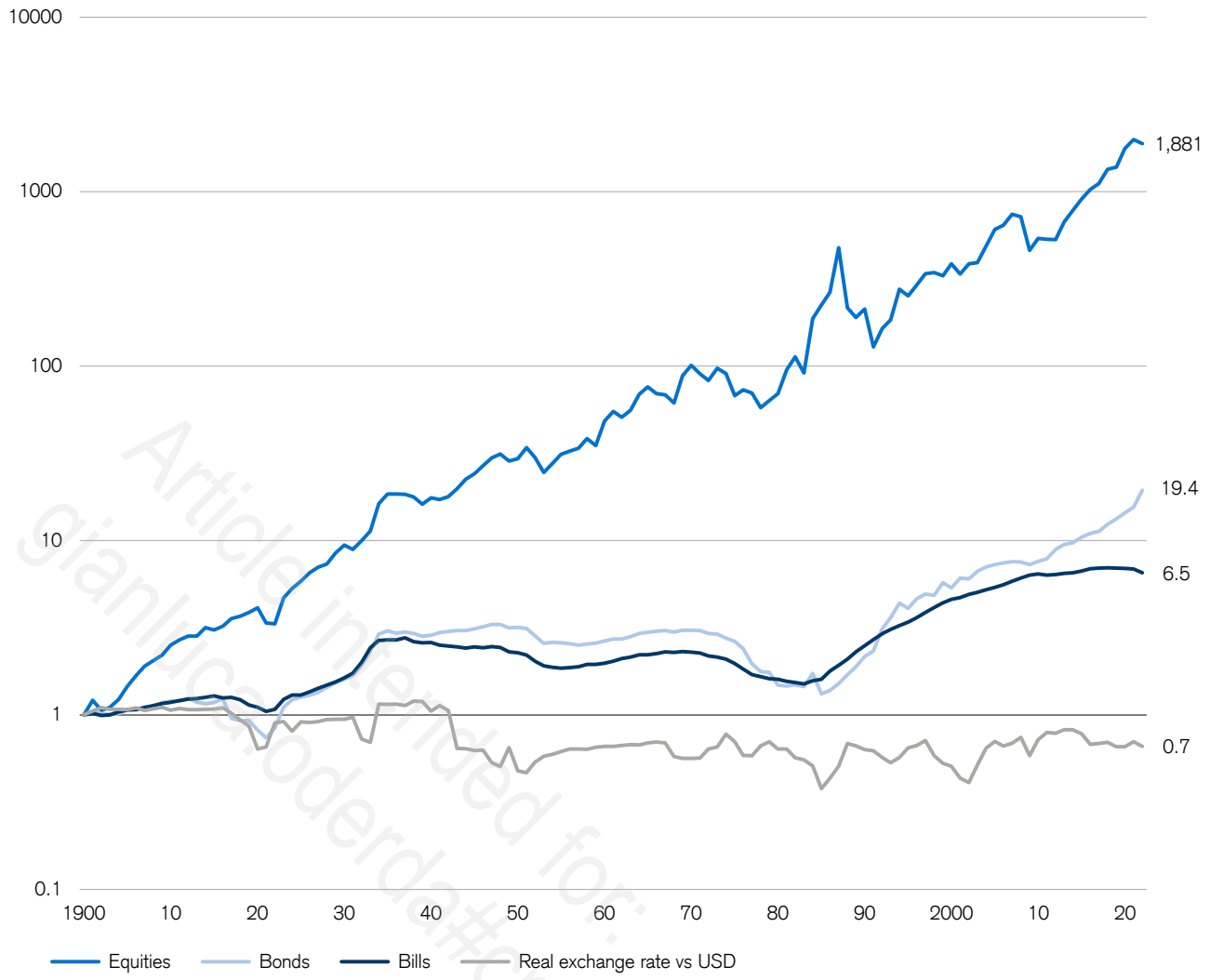

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Table 53: Returns on New Zealand asset classes, 1900–2021

		Mean returns % p.a.					Annual returns %				10-year returns % p.a.				Current
Return	Asset	GM	AM	SE	SD	SC	Lowest		Highest		Lowest		Highest		year rank
Nominal	Equities	10.2	11.8	1.8	19.9	–0.08	–48.6	1987	119.4	1983	0.8	1996	34.9	1986	96
	Bonds	6.1	6.4	0.7	8.2	0.12	–19.2	1984	37.4	1991	0.6	1916	18.8	1994	2
	Bills	5.2	5.2	0.4	4.2	0.86	0.6	2020	26.0	1985	1.5	1951	15.7	1990	122
	Inflation	3.6	3.7	0.4	4.5	0.74	–12.0	1932	14.7	1980	–2.4	1933	12.2	1982	31
Real	Equities	6.4	8.0	1.7	19.1	–0.11	–54.7	1987	105.3	1983	–3.7	1979	21.1	1986	99
	Bonds	2.5	2.8	0.8	8.9	0.32	–23.7	1984	34.1	1991	–7.1	1980	12.8	1995	4
	Bills	1.5	1.6	0.4	4.5	0.74	–8.1	1951	21.1	1932	–3.6	1980	7.9	1994	114
	Exchange rate	–0.3	0.4	1.2	12.8	0.04	–39.6	1942	65.7	1933	–8.5	1950	6.7	2011	96
Premiums	Equities vs bills	4.8	6.3	1.6	17.8	–0.12	–58.3	1987	97.3	1983	–9.9	1996	19.6	1986	87
	Equities vs bonds	3.8	5.3	1.6	17.5	0.00	–59.7	1987	72.7	1983	–14.1	1996	24.3	1986	119
	Bonds vs bills	0.9	1.1	0.6	7.1	0.03	–25.2	1984	31.9	2021	–5.1	1985	6.2	2020	1

GM=geometric mean; AM=arithmetic mean, SE=standard error of mean; SD=standard deviation; SC=serial correlation; 10-year returns to end of given year.
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Table 54: New Zealand real returns, inflation and premiums, 1900–2021

	1 Jan	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000	2010	2022	
Real equity total returns	**1900**		7.7	8.4	6.1	4.6	4.5	5.0	5.1	4.9	5.2	4.4	4.0	3.8	**Equity premium vs bonds**
	1910	9.7		9.1	5.3	3.6	3.8	4.4	4.7	4.5	4.9	4.0	3.6	3.5	
	1920	7.3	5.0		1.6	1.0	2.1	3.3	3.8	3.8	4.3	3.4	3.0	2.9	
	1930	7.8	6.8	8.6		0.4	2.3	3.9	4.4	4.2	4.8	3.6	3.2	3.1	
	1940	7.4	6.7	7.5	6.4		4.2	5.6	5.8	5.2	5.7	4.2	3.6	3.4	
	1950	7.0	6.3	6.8	5.9	5.3		7.1	6.6	5.6	6.1	4.2	3.5	3.3	
	1960	6.7	6.1	6.4	5.6	5.2	5.1		6.1	4.8	5.8	3.5	2.7	2.7	
	1970	6.8	6.3	6.6	6.1	6.0	6.4	7.6		3.5	5.6	2.6	1.9	2.1	
	1980	5.4	4.9	4.8	4.1	3.5	2.9	1.8	–3.7		7.7	2.2	1.4	1.7	
	1990	6.1	5.7	5.8	5.3	5.1	5.1	5.0	3.8	11.8		–3.0	–1.6	0.0	
	2000	6.1	5.7	5.8	5.4	5.3	5.3	5.3	4.6	8.9	6.1		–0.2	1.3	
	2010	5.9	5.5	5.6	5.2	5.0	5.0	4.9	4.3	7.1	4.8	3.4		2.6	
	2022	6.4	6.1	6.2	5.9	5.9	5.9	6.1	5.8	8.2	7.1	7.5	11.0		
Real equity capital gains	**1900**		7.9	6.8	6.0	4.9	5.2	5.5	5.6	4.8	5.1	4.5	4.1	4.8	**Equity premium vs bills**
	1910	4.8		5.7	5.1	3.9	4.6	5.0	5.2	4.4	4.7	4.2	3.7	4.5	
	1920	1.9	–0.9		4.5	3.0	4.2	4.8	5.1	4.2	4.6	4.0	3.5	4.4	
	1930	2.6	1.5	3.8		1.5	4.1	4.9	5.2	4.1	4.6	3.9	3.4	4.3	
	1940	2.2	1.4	2.5	1.2		6.7	6.7	6.5	4.8	5.2	4.3	3.7	4.7	
	1950	2.0	1.3	2.0	1.2	1.2		6.6	6.3	4.1	4.8	3.8	3.2	4.4	
	1960	1.8	1.2	1.7	1.0	0.9	0.7		6.0	2.9	4.2	3.1	2.5	4.1	
	1970	1.9	1.4	1.9	1.4	1.5	1.7	2.7		–0.2	3.3	2.2	1.6	3.7	
	1980	0.4	–0.2	–0.1	–0.9	–1.4	–2.3	–3.8	–9.8		7.0	3.3	2.2	4.6	
	1990	1.0	0.5	0.7	0.2	0.0	–0.3	–0.7	–2.4	5.7		–0.2	–0.1	3.9	
	2000	0.8	0.4	0.5	0.1	–0.1	–0.4	–0.6	–1.7	2.6	–0.4		0.0	5.8	
	2010	0.5	0.0	0.2	–0.3	–0.5	–0.8	–1.1	–2.0	0.7	–1.7	–2.9		10.8	
	2022	1.1	0.7	0.9	0.6	0.5	0.4	0.4	–0.1	2.4	1.4	2.2	6.6		
Real bonds	**1900**		0.2	–1.5	–0.1	0.2	0.7	0.5	0.4	–0.1	–0.2	0.1	0.2	0.9	**Bond maturity premium**
	1910	1.8		–3.1	–0.2	0.3	0.8	0.6	0.5	–0.1	–0.2	0.1	0.2	1.0	
	1920	–1.0	–3.7		2.9	2.0	2.1	1.5	1.2	0.4	0.2	0.6	0.5	1.4	
	1930	1.6	1.5	6.9		1.1	1.8	1.0	0.8	–0.1	–0.2	0.2	0.2	1.2	
	1940	2.7	2.9	6.4	6.0		2.4	1.0	0.7	–0.4	–0.5	0.1	0.1	1.2	
	1950	2.3	2.5	4.6	3.5	1.1		–0.4	–0.2	–1.4	–1.2	–0.4	–0.3	1.1	
	1960	1.6	1.6	3.0	1.7	–0.4	–1.8		0.0	–1.8	–1.4	–0.4	–0.3	1.3	
	1970	1.6	1.6	2.7	1.6	0.2	–0.2	1.4		–3.6	–2.1	–0.5	–0.3	1.6	
	1980	0.5	0.3	1.0	–0.2	–1.6	–2.5	–2.9	–7.0		–0.6	1.1	0.8	2.8	
	1990	0.9	0.7	1.4	0.5	–0.6	–1.0	–0.7	–1.7	3.9		2.9	1.6	3.9	
	2000	1.7	1.7	2.4	1.7	1.0	1.0	1.8	1.9	6.6	9.4		0.2	4.4	
	2010	1.9	1.9	2.5	2.0	1.4	1.5	2.1	2.3	5.6	6.5	3.6		8.0	
	2022	2.5	2.5	3.2	2.7	2.4	2.5	3.3	3.6	6.3	7.1	6.0	8.2		
Real bills	**1900**		1.5	3.0	2.1	1.4	1.7	2.2	2.3	3.3	4.1	3.8	3.7	3.6	**Inflation**
	1910	1.7		4.5	2.4	1.4	1.8	2.4	2.5	3.5	4.4	4.1	4.0	3.8	
	1920	0.5	–0.6		0.4	–0.1	0.9	1.8	2.1	3.4	4.4	4.1	3.9	3.7	
	1930	1.6	1.6	4.0		–0.7	1.2	2.3	2.5	4.0	5.0	4.6	4.4	4.0	
	1940	2.4	2.7	4.4	4.8		3.0	3.8	3.6	5.2	6.2	5.5	5.1	4.6	
	1950	1.7	1.7	2.4	1.7	–1.3		4.6	3.9	5.9	7.0	6.0	5.4	4.9	
	1960	1.1	1.0	1.5	0.6	–1.4	–1.4		3.1	6.6	7.8	6.4	5.6	4.9	
	1970	1.2	1.1	1.5	0.8	–0.4	0.0	1.5		10.1	10.3	7.5	6.2	5.2	
	1980	0.6	0.4	0.6	0.0	–1.2	–1.2	–1.0	–3.5		10.4	6.1	5.0	4.1	
	1990	1.0	0.9	1.2	0.7	–0.1	0.2	0.8	0.4	4.5		2.0	2.4	2.2	
	2000	1.5	1.5	1.8	1.5	1.0	1.4	2.1	2.4	5.4	6.3		2.7	2.3	
	2010	1.7	1.7	2.0	1.7	1.3	1.7	2.4	2.6	4.7	4.8	3.4		1.9	
	2022	1.5	1.5	1.8	1.5	1.1	1.5	1.9	2.0	3.4	3.1	1.6	0.1		
Real exchange rate vs USD	**1900**		0.1	–1.2	0.0	0.0	–1.2	–0.8	–1.0	–1.0	–1.5	–1.5	–1.0	–1.0	**Exchange rate vs USD**
	1910	0.6		–2.6	0.0	–0.1	–1.5	–1.0	–1.2	–1.2	–1.7	–1.6	–1.1	–1.1	
	1920	–2.2	–5.0		2.7	1.2	–1.1	–0.6	–0.9	–1.0	–1.6	–1.5	–1.0	–0.9	
	1930	–0.2	–0.6	4.0		–0.3	–3.0	–1.7	–1.8	–1.7	–2.2	–2.1	–1.4	–1.3	
	1940	0.1	0.0	2.5	1.1		–5.5	–2.3	–2.3	–2.0	–2.6	–2.4	–1.6	–1.4	
	1950	–1.5	–2.0	–1.0	–3.4	–7.6		0.9	–0.6	–0.8	–1.9	–1.8	–0.9	–0.9	
	1960	–0.7	–1.0	0.1	–1.2	–2.3	3.3		–2.1	–1.7	–2.8	–2.4	–1.3	–1.1	
	1970	–0.8	–1.1	–0.2	–1.3	–2.1	0.8	–1.5		–1.3	–3.1	–2.5	–1.1	–0.9	
	1980	–0.6	–0.7	0.0	–0.8	–1.2	1.0	–0.2	1.2		–4.9	–3.1	–1.0	–0.9	
	1990	–0.5	–0.6	0.0	–0.7	–1.0	0.7	–0.1	0.6	–0.1		–1.3	1.0	0.4	
	2000	–0.7	–0.8	–0.3	–0.9	–1.2	0.1	–0.6	–0.3	–1.1	–2.2		3.4	1.2	
	2010	–0.3	–0.4	0.1	–0.3	–0.5	0.7	0.2	0.6	0.4	0.7	3.6		–0.5	
	2022	–0.3	–0.4	0.0	–0.4	–0.6	0.5	0.0	0.3	0.1	0.1	1.2	–0.7		

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Norway



Norway is a small country but blessed with large natural resources. It is the only country that is self-sufficient in electricity production (through hydropower) and it is one of the world's largest exporters of oil. Norway is the second-largest exporter of fish.

The population in 2021 of 5.4 million enjoys the largest GDP per capita in the world, apart from a few city-states. Norwegians live under a constitutional monarchy outside the European Union. The United Nations, through its Human Development Index, ranks Norway the best country in the world for life expectancy, education and overall standard of living.

The Oslo Stock Exchange was founded as Christiania Bors in 1819 for auctioning ships, commodities, and currencies. Later, this extended to trading in stocks and shares. The exchange now forms part of the Euronext Group.

In the 1990s, the country established the Norwegian Government Pension Fund Global to invest surplus oil wealth. This has grown to become the world's largest sovereign wealth fund, with a market value at the end of 2021 of USD 1.35 trillion. The fund invests in equities and debt; on average, it owns 1.4% of the equity of every listed company in the world. It also owns 0.7% of the global bond market.

The largest Oslo Stock Exchange stocks are Equinor (19% of the FTSE World Norway Index), DNB Bank (18%), Norsk Hydro (8%) and Mowi (8%).

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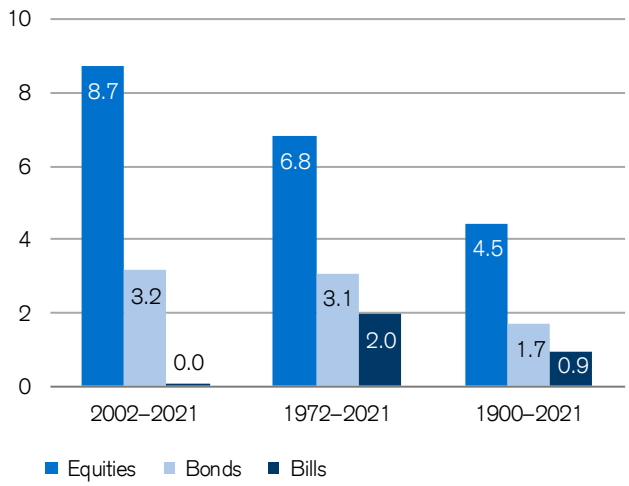
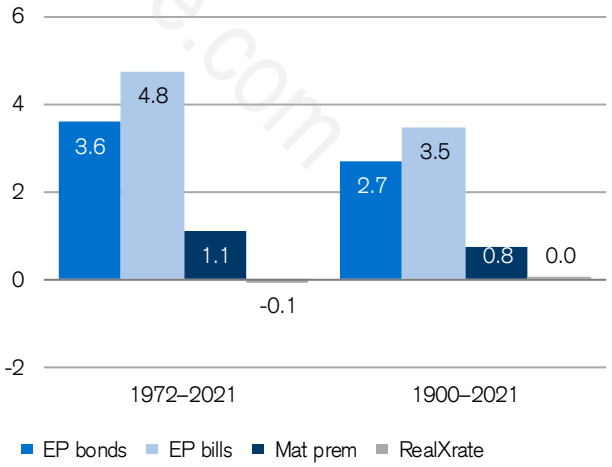
Figure 109: Annualized real returns and risk premiums (%) for Norway, 1900–2021



Note: The three asset classes are equities, long-term government bonds, and Treasury bills. All returns include reinvested income, are adjusted for inflation, and are expressed as geometric mean returns.



Note: EP bonds and EP bills denote the equity premium relative to bonds and to bills; Mat prem denotes the maturity premium for bonds relative to bills; RealXRate denotes the inflation-adjusted change in the exchange rate against the US dollar.

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Figure 110: Real returns on Norwegian asset classes, 1900–2021

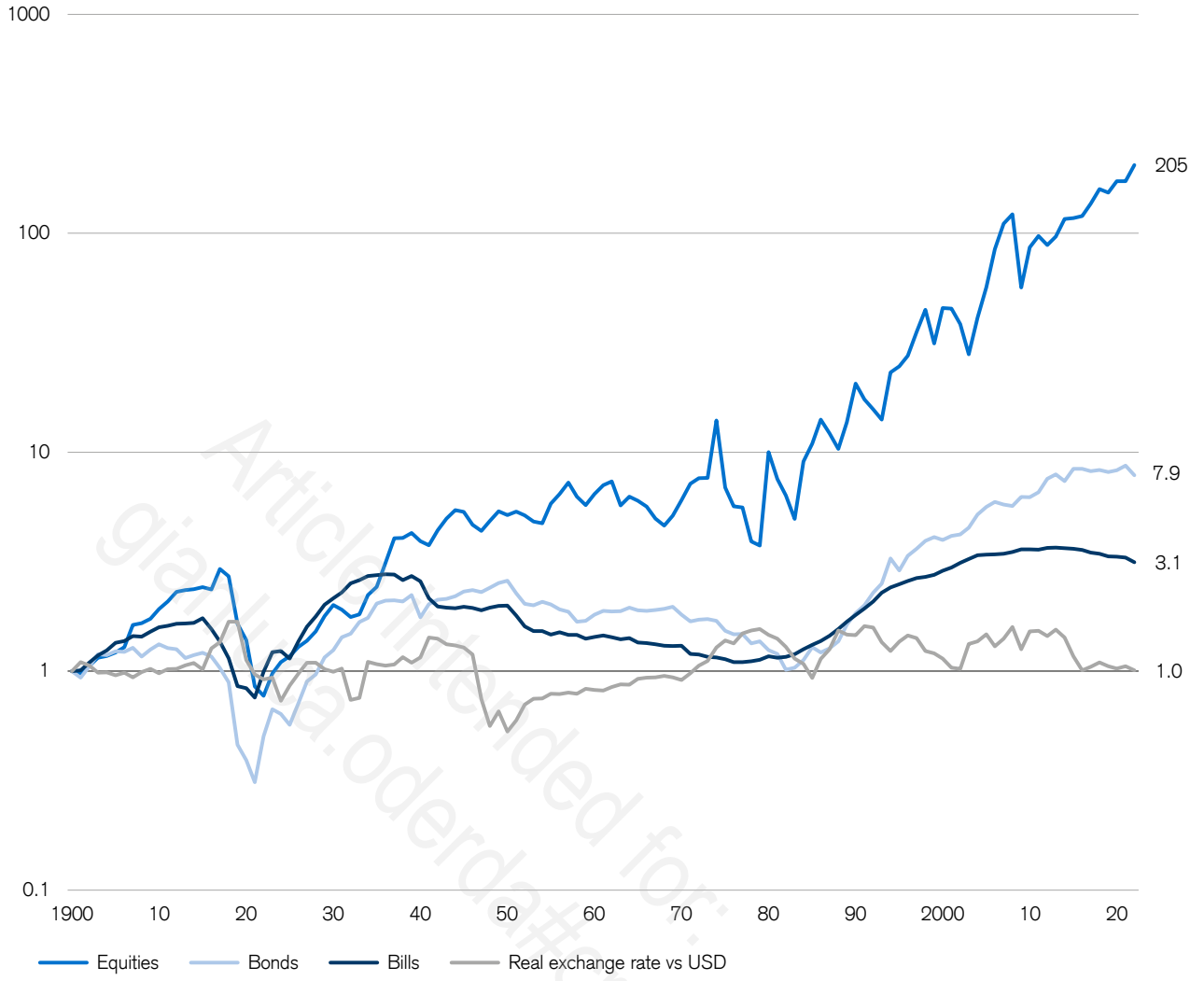

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Table 55: Returns on Norwegian asset classes, 1900–2021

		Mean returns % p.a.					Annual returns %				10-year returns % p.a.				Current
Return	**Asset**	**GM**	**AM**	**SE**	**SD**	**SC**	**Lowest**		**Highest**		**Lowest**		**Highest**		**year rank**
Nominal	Equities	8.2	11.0	2.5	27.2	–0.06	–52.6	2008	179.5	1979	–5.5	1927	23.2	1988	24
	Bonds	5.4	5.7	0.8	8.7	0.03	–27.1	1918	40.2	1940	–1.9	1920	16.7	1993	113
	Bills	4.6	4.6	0.3	3.5	0.95	0.3	2020	15.2	1987	1.1	2020	13.0	1990	122
	Inflation	3.6	3.8	0.6	7.0	0.49	–19.5	1921	40.3	1918	–6.6	1930	13.0	1920	36
Real	Equities	4.5	7.3	2.4	26.3	–0.08	–53.6	2008	166.9	1979	–10.4	1921	15.8	1997	26
	Bonds	1.7	2.4	1.1	11.8	0.24	–48.0	1918	62.1	1921	–13.2	1920	16.5	1930	109
	Bills	0.9	1.2	0.6	6.9	0.52	–25.4	1918	31.2	1921	–7.3	1920	11.7	1930	109
	Exchange rate	0.0	0.7	1.1	11.8	0.08	–37.4	1946	46.0	1933	–8.4	1950	6.6	1941	90
Premiums	Equities vs bills	3.5	6.2	2.3	25.4	–0.07	–55.0	2008	157.1	1979	–9.7	1927	13.8	1942	20
	Equities vs bonds	2.7	5.5	2.5	27.1	–0.12	–57.8	2008	192.1	1979	–8.0	1928	11.9	1988	11
	Bonds vs bills	0.8	1.1	0.7	8.1	–0.02	–30.4	1918	37.3	1940	–6.3	1920	6.6	1949	100

GM=geometric mean; AM=arithmetic mean, SE=standard error of mean; SD=standard deviation; SC=serial correlation; 10-year returns to end of given year.
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Table 56: Norwegian real returns, inflation and premiums, 1900–2021

	1 Jan	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000	2010	2022	
Real	**1900**		3.8	6.5	1.6	2.0	1.4	2.1	1.7	2.6	2.7	2.5	2.4	2.7	**Equity**
equity	**1910**	6.7		9.4	0.5	1.4	0.8	1.8	1.4	2.5	2.6	2.3	2.3	2.6	**premium**
total	**1920**	1.6	–3.2		–7.6	–2.3	–1.9	0.0	–0.1	1.4	1.7	1.5	1.5	2.0	**vs bonds**
returns	**1930**	2.3	0.2	3.8		3.3	1.1	2.7	1.8	3.3	3.3	2.8	2.7	3.1	
	1940	3.5	2.4	5.3	6.9		–1.1	2.4	1.4	3.3	3.3	2.8	2.6	3.0	
	1950	3.3	2.5	4.5	4.8	2.8		6.0	2.6	4.8	4.4	3.6	3.3	3.6	
	1960	3.2	2.5	3.9	4.0	2.5	2.3		–0.6	4.1	3.9	3.0	2.7	3.3	
	1970	2.6	1.9	3.0	2.8	1.5	0.8	–0.6		9.1	6.2	4.2	3.6	4.0	
	1980	2.9	2.4	3.3	3.3	2.4	2.2	2.2	5.2		3.4	1.8	1.8	2.9	
	1990	3.4	3.0	3.9	4.0	3.4	3.5	3.9	6.3	7.5		0.2	1.1	2.7	
	2000	3.9	3.6	4.5	4.6	4.2	4.5	5.0	7.0	7.9	8.2		1.9	3.8	
	2010	4.1	3.9	4.7	4.8	4.5	4.8	5.3	6.9	7.4	7.4	6.6		5.4	
	2022	4.5	4.3	5.0	5.2	4.9	5.2	5.7	7.0	7.5	7.4	7.1	7.5		
Real	**1900**		1.9	2.6	–0.2	1.1	1.9	2.5	2.2	2.7	2.7	2.8	2.9	3.5	**Equity**
equity	**1910**	1.5		3.2	–1.3	0.8	1.9	2.7	2.3	2.8	2.8	2.9	3.0	3.6	**premium**
capital	**1920**	–3.5	–8.3		–5.6	–0.4	1.5	2.5	2.1	2.8	2.8	2.9	3.0	3.7	**vs bills**
gains	**1930**	–3.1	–5.3	–2.2		5.1	5.2	5.4	4.1	4.5	4.3	4.1	4.1	4.7	
	1940	–1.9	–3.0	–0.2	1.9		5.4	5.6	3.8	4.4	4.1	4.0	4.0	4.7	
	1950	–1.6	–2.3	–0.3	0.7	–0.4		5.7	2.9	4.1	3.8	3.7	3.8	4.6	
	1960	–1.5	–2.0	–0.4	0.2	–0.7	–0.9		0.3	3.3	3.1	3.2	3.4	4.4	
	1970	–1.9	–2.4	–1.2	–1.0	–1.9	–2.6	–4.3		6.3	4.6	4.2	4.2	5.2	
	1980	–1.4	–1.9	–0.7	–0.4	–1.0	–1.2	–1.4	1.6		2.9	3.1	3.5	5.0	
	1990	–0.9	–1.2	–0.1	0.3	–0.1	0.0	0.3	2.7	3.9		3.3	3.8	5.6	
	2000	–0.2	–0.4	0.6	1.1	0.9	1.2	1.7	3.8	4.9	6.0		4.2	6.6	
	2010	0.1	0.0	0.9	1.3	1.3	1.5	2.0	3.7	4.4	4.6	3.2		8.7	
	2022	0.4	0.3	1.2	1.6	1.5	1.8	2.3	3.6	4.0	4.1	3.2	3.2		
Real	**1900**		–1.8	–3.7	–1.8	–0.9	0.5	0.4	0.5	0.1	0.0	0.3	0.5	0.8	**Bond**
bonds	**1910**	2.9		–5.6	–1.8	–0.7	1.1	0.8	0.8	0.3	0.2	0.6	0.7	1.0	**maturity**
	1920	–4.6	–11.5		2.1	1.9	3.5	2.5	2.2	1.4	1.1	1.4	1.5	1.7	**premium**
	1930	0.7	–0.3	12.3		1.7	4.1	2.6	2.2	1.2	0.9	1.2	1.4	1.6	
	1940	1.4	0.9	7.8	3.5		6.6	3.1	2.4	1.1	0.8	1.2	1.3	1.6	
	1950	1.9	1.7	6.5	3.7	3.9		–0.3	0.3	–0.7	–0.6	0.1	0.5	0.9	
	1960	1.0	0.6	3.9	1.3	0.1	–3.5		0.9	–0.8	–0.7	0.2	0.6	1.1	
	1970	0.9	0.5	3.1	0.9	0.1	–1.8	0.0		–2.6	–1.5	0.0	0.6	1.1	
	1980	0.3	–0.1	1.9	0.0	–0.9	–2.4	–1.8	–3.6		–0.5	1.3	1.6	2.0	
	1990	0.7	0.4	2.2	0.7	0.1	–0.9	0.1	0.1	3.9		3.1	2.7	2.8	
	2000	1.4	1.2	2.9	1.7	1.4	0.9	2.0	2.7	6.0	8.0		2.3	2.7	
	2010	1.7	1.6	3.1	2.0	1.8	1.5	2.5	3.1	5.5	6.3	4.6		3.1	
	2022	1.7	1.6	3.0	2.0	1.8	1.6	2.4	2.9	4.5	4.6	3.1	1.9		
Real	**1900**		0.6	5.9	2.2	1.9	2.3	2.8	2.9	3.6	4.1	3.9	3.7	3.6	**Inflation**
bills	**1910**	4.7		11.6	3.0	2.4	2.8	3.2	3.3	4.0	4.5	4.3	4.1	3.9	
	1920	–0.9	–6.2		–4.9	–1.9	0.0	1.2	1.7	2.8	3.6	3.4	3.3	3.1	
	1930	2.6	1.5	9.9		1.1	2.5	3.4	3.4	4.4	5.0	4.7	4.3	4.1	
	1940	2.4	1.6	5.8	1.8		4.0	4.5	4.2	5.3	5.8	5.3	4.8	4.4	
	1950	1.4	0.6	2.9	–0.4	–2.5		5.1	4.3	5.7	6.3	5.5	4.9	4.5	
	1960	0.6	–0.2	1.4	–1.3	–2.9	–3.2		3.6	6.0	6.7	5.6	4.9	4.4	
	1970	0.4	–0.3	0.9	–1.2	–2.2	–2.1	–0.9		8.5	8.3	6.3	5.2	4.5	
	1980	0.2	–0.4	0.6	–1.2	–2.0	–1.8	–1.0	–1.1		8.2	5.3	4.2	3.6	
	1990	0.7	0.2	1.1	–0.3	–0.7	–0.2	0.8	1.6	4.4		2.5	2.3	2.3	
	2000	1.1	0.7	1.6	0.4	0.2	0.7	1.8	2.7	4.6	4.8		2.1	2.2	
	2010	1.2	0.8	1.6	0.6	0.5	1.0	1.9	2.6	3.8	3.5	2.3		2.3	
	2022	0.9	0.6	1.3	0.4	0.2	0.6	1.3	1.7	2.4	1.8	0.4	–1.1		
Real	**1900**		0.2	–1.2	0.1	–0.3	–1.5	–1.0	–0.9	–0.3	–0.6	–0.7	–0.4	–0.7	**Exchange**
exchange	**1910**	–0.2		–2.6	0.1	–0.5	–2.0	–1.3	–1.0	–0.4	–0.7	–0.8	–0.4	–0.8	**rate**
rate	**1920**	0.6	1.4		2.9	0.6	–1.7	–0.9	–0.7	0.0	–0.4	–0.6	–0.2	–0.6	**vs USD**
vs USD	**1930**	0.0	0.1	–1.2		–1.6	–4.0	–2.1	–1.6	–0.6	–0.9	–1.1	–0.5	–0.9	
	1940	0.4	0.6	0.1	1.5		–6.3	–2.4	–1.6	–0.3	–0.8	–1.0	–0.4	–0.8	
	1950	–1.3	–1.5	–2.5	–3.1	–7.5		1.6	0.8	1.8	0.6	0.1	0.6	–0.1	
	1960	–0.3	–0.4	–0.8	–0.6	–1.7	4.5		0.0	1.9	0.3	–0.3	0.4	–0.3	
	1970	–0.1	–0.1	–0.4	–0.2	–0.8	2.8	1.0		3.8	0.4	–0.4	0.5	–0.4	
	1980	0.5	0.6	0.4	0.8	0.6	3.4	2.9	4.9		–2.9	–2.4	–0.5	–1.4	
	1990	0.4	0.5	0.4	0.6	0.5	2.6	1.9	2.4	0.0		–2.0	0.7	–0.9	
	2000	0.1	0.2	0.0	0.2	0.0	1.6	0.8	0.8	–1.2	–2.4		3.4	–0.4	
	2010	0.4	0.4	0.3	0.5	0.4	1.8	1.2	1.3	0.1	0.2	2.9		–3.5	
	2022	0.0	0.0	–0.1	0.0	–0.2	0.9	0.3	0.2	–0.9	–1.1	–0.6	–3.3		

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Portugal



In the 15th century, during the Age of Discovery, a rudimentary centralized market existed in Lisbon. It solved two problems: how to assemble the substantial funds necessary to finance fleets and voyages, and how to agree on the premiums for insurance contracts to cover the associated risks. In general, this was not a formally organized market, and transactions were conducted in the open air at a corner of a main street in downtown Lisbon. Nevertheless, that market offered opportunities to trade commodities, especially those brought from distant lands by this nation of mariners.

The Portuguese monarchy was deposed in 1910 and the country was then run by repressive governments for some six decades. Modern Portugal emerged in 1974 from the Carnation Revolution, a military coup that overthrew the former regime. The following year, Portugal granted independence to all its African colonies. The country joined the European Union in 1986 and was among the first batch of countries to adopt the euro.

In the second decade of the 21st century, the Global Financial Crisis and the European sovereign debt crisis conspired to push the economy into a severe recession, its worst since the 1970s. Austerity measures were implemented, and they exacerbated the country's record level of unemployment and encouraged emigration on a scale not seen since the 1960s. Economic growth resumed in 2015, and today the Portuguese economy is growing faster than the Eurozone average.

The Euronext Lisbon stock exchange trades a range of major Portuguese corporations. The FTSE World Portugal index comprises 66% in utilities, 19% in consumer staples and 15% in oil and gas. The biggest companies traded in Lisbon are EDP (66%), Jeronimo Martins (19%) and Galp Energia (15%).

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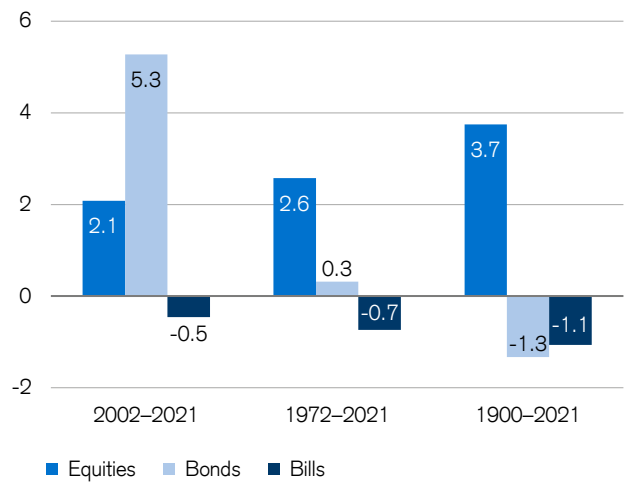
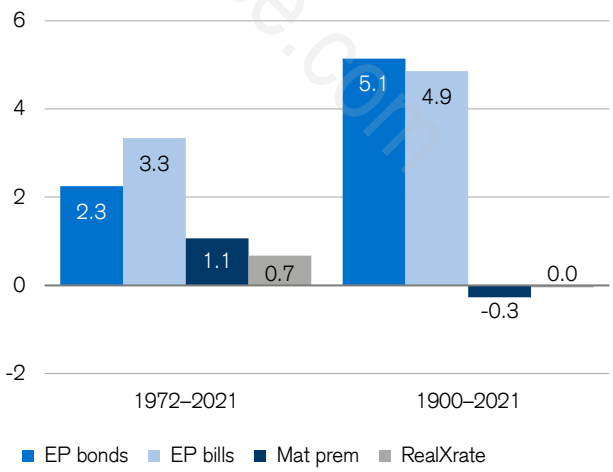
Figure 111: Annualized real returns and risk premiums (%) for Portugal, 1900–2021



Note: The three asset classes are equities, long-term government bonds, and Treasury bills. All returns include reinvested income, are adjusted for inflation, and are expressed as geometric mean returns.



Note: EP bonds and EP bills denote the equity premium relative to bonds and to bills; Mat prem denotes the maturity premium for bonds relative to bills; RealXRate denotes the inflation-adjusted change in the exchange rate against the US dollar.

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Figure 112: Real returns on Portuguese asset classes, 1900–2021

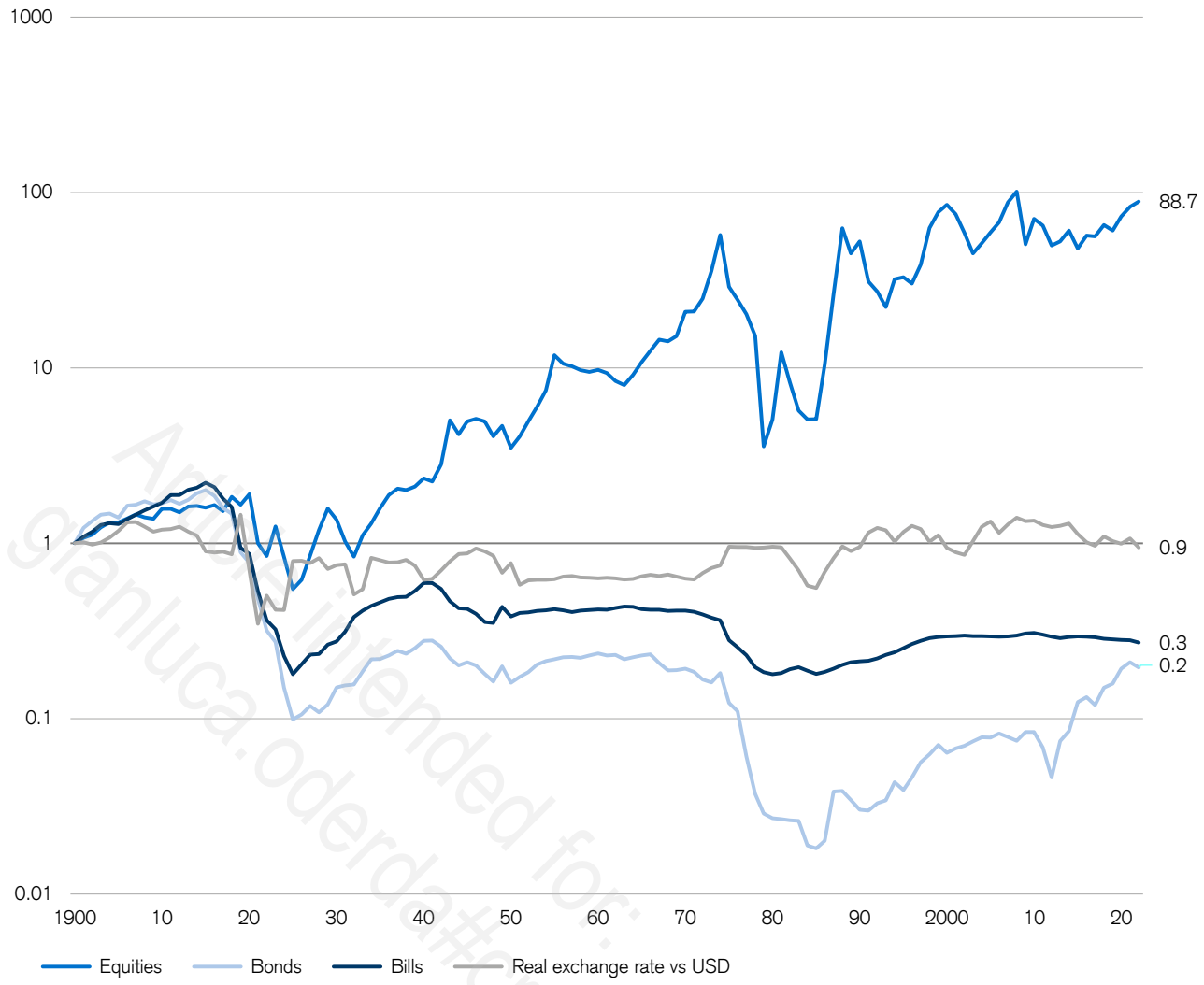

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Table 57: Returns on Portuguese asset classes, 1900–2021

		Mean returns % p.a.					Annual returns %				10-year returns % p.a.				Current
Return	Asset	GM	AM	SE	SD	SC	Lowest		Highest		Lowest		Highest		year rank
Nominal	Equities	11.1	16.1	3.5	38.2	0.31	–70.3	1978	186.7	1980	–3.2	2017	52.5	1988	59
	Bonds	5.6	6.6	1.4	15.8	0.16	–33.3	1976	113.1	1986	–3.7	1978	22.9	1993	105
	Bills	5.9	6.1	0.5	5.5	0.97	–0.6	2020	25.6	1982	0.1	2020	20.5	1987	122
	Inflation	7.1	7.9	1.3	14.4	0.55	–17.6	1948	80.9	1918	–2.1	1939	37.4	1924	63
Real	Equities	3.7	8.5	3.0	33.6	0.24	–76.6	1978	151.8	1986	–21.5	1983	28.8	1988	58
	Bonds	–1.3	0.3	1.6	18.0	0.28	–45.1	1923	90.6	1986	–26.0	1924	11.9	2020	89
	Bills	–1.1	–0.5	0.9	9.5	0.53	–41.6	1918	23.8	1948	–22.2	1924	9.9	1934	96
	Exchange rate	0.0	1.3	1.5	16.7	–0.09	–52.0	1919	90.7	1924	–11.7	1920	8.1	1930	105
Premiums	Equities vs bills	4.9	9.3	3.0	33.0	0.25	–75.1	1978	141.2	1986	–16.1	1983	27.2	1988	50
	Equities vs bonds	5.1	9.2	2.8	30.9	0.07	–69.8	1978	145.7	1980	–10.7	2017	26.6	1988	36
	Bonds vs bills	–0.3	0.6	1.3	14.4	0.12	–38.9	1976	82.6	1986	–14.8	1983	12.7	2020	86

GM=geometric mean; AM=arithmetic mean, SE=standard error of mean; SD=standard deviation; SC=serial correlation; 10-year returns to end of given year.
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Table 58: Portuguese real returns, inflation and premiums, 1900–2021

	1 Jan	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000	2010	2022	
Real equity total returns	**1900**		–0.7	4.6	7.6	5.5	6.4	6.4	6.9	6.8	8.6	7.5	6.3	5.1	**Equity premium vs bonds**
	1910	4.6		10.2	12.0	7.6	8.2	7.9	8.3	7.9	9.9	8.4	7.1	5.7	
	1920	3.3	1.9		13.9	6.4	7.6	7.3	7.9	7.5	9.8	8.2	6.7	5.2	
	1930	1.0	–0.7	–3.3		–0.7	4.5	5.2	6.4	6.3	9.2	7.4	5.8	4.3	
	1940	2.1	1.3	1.0	5.6		10.0	8.3	8.9	8.1	11.2	8.8	6.8	5.0	
	1950	2.5	2.0	2.0	4.8	4.1		6.6	8.3	7.4	11.6	8.6	6.3	4.3	
	1960	3.9	3.7	4.2	6.8	7.4	10.8		10.1	7.8	13.3	9.1	6.2	3.9	
	1970	4.4	4.4	4.9	7.1	7.6	9.4	7.9		5.6	14.9	8.7	5.3	2.8	
	1980	2.1	1.7	1.6	2.7	2.0	1.3	–3.2	–13.2		25.0	10.3	5.1	2.1	
	1990	4.5	4.5	4.9	6.3	6.4	7.0	5.8	4.7	26.3		–2.6	–3.6	–4.1	
	2000	4.5	4.5	4.9	6.1	6.2	6.6	5.6	4.8	15.2	5.0		–4.5	–4.8	
	2010	3.9	3.9	4.1	5.1	5.0	5.1	4.0	3.1	9.2	1.5	–1.8		–5.1	
	2022	3.7	3.7	3.8	4.6	4.5	4.6	3.6	2.8	7.0	1.6	0.2	1.9		
Real equity capital gains	**1900**		–0.8	4.0	5.5	3.5	4.5	5.4	5.8	4.3	6.3	5.8	5.1	4.9	**Equity premium vs bills**
	1910	–0.1		9.0	8.8	5.0	5.9	6.7	6.9	5.0	7.2	6.6	5.7	5.4	
	1920	–1.6	–3.2		8.5	3.0	4.9	6.1	6.5	4.4	7.0	6.3	5.3	5.0	
	1930	–4.2	–6.2	–9.2		–2.2	3.1	5.3	6.0	3.6	6.7	6.0	4.9	4.7	
	1940	–3.2	–4.2	–4.7	0.1		8.8	9.3	8.9	5.1	8.6	7.4	6.0	5.5	
	1950	–2.4	–3.0	–3.0	0.3	0.5		9.8	8.9	3.9	8.6	7.2	5.5	5.1	
	1960	–1.0	–1.2	–0.6	2.4	3.5	6.7		8.0	1.0	8.2	6.5	4.7	4.4	
	1970	–0.4	–0.5	0.1	2.5	3.4	4.8	3.0		–5.6	8.3	6.0	3.9	3.7	
	1980	–2.2	–2.6	–2.4	–1.0	–1.3	–1.9	–5.9	–14.1		24.2	12.3	7.2	6.0	
	1990	0.2	0.3	0.8	2.6	3.1	3.7	2.8	2.6	22.6		1.6	–0.4	0.9	
	2000	0.4	0.4	0.9	2.4	2.8	3.3	2.5	2.3	11.7	1.7		–2.3	0.6	
	2010	–0.1	–0.1	0.3	1.5	1.7	1.9	1.0	0.5	5.9	–1.5	–4.7		3.0	
	2022	–0.2	–0.3	0.0	1.1	1.2	1.3	0.5	0.0	3.7	–1.6	–3.1	–1.8		
Real bonds	**1900**		–0.1	–0.6	–2.0	–1.9	–1.7	–1.0	–1.1	–2.3	–2.1	–1.5	–1.2	–0.3	**Bond maturity premium**
	1910	5.4		–1.1	–2.9	–2.5	–2.1	–1.1	–1.3	–2.7	–2.4	–1.7	–1.3	–0.3	
	1920	–1.3	–7.5		–4.8	–3.2	–2.5	–1.1	–1.3	–2.9	–2.6	–1.8	–1.3	–0.2	
	1930	–6.1	–11.4	–15.1		–1.6	–1.3	0.1	–0.4	–2.5	–2.2	–1.3	–0.9	0.3	
	1940	–3.2	–5.9	–5.0	6.3		–1.1	0.9	0.0	–2.8	–2.3	–1.3	–0.8	0.5	
	1950	–3.6	–5.7	–5.1	0.3	–5.3		3.0	0.5	–3.3	–2.7	–1.3	–0.7	0.8	
	1960	–2.4	–3.9	–2.9	1.5	–0.8	3.9		–1.9	–6.4	–4.5	–2.4	–1.4	0.4	
	1970	–2.3	–3.6	–2.7	0.6	–1.2	0.9	–2.0		–10.6	–5.7	–2.5	–1.3	0.8	
	1980	–4.4	–5.7	–5.4	–3.4	–5.7	–5.8	–10.3	–17.8		–0.6	1.8	2.0	3.8	
	1990	–3.8	–4.9	–4.5	–2.6	–4.3	–4.1	–6.6	–8.8	1.1		4.3	3.3	5.2	
	2000	–2.7	–3.6	–3.1	–1.2	–2.4	–1.8	–3.2	–3.6	4.4	7.8		2.3	5.6	
	2010	–2.2	–3.0	–2.4	–0.7	–1.7	–1.1	–2.0	–2.1	3.8	5.2	2.8		8.5	
	2022	–1.3	–1.9	–1.3	0.3	–0.4	0.3	–0.3	0.0	4.8	6.0	5.2	7.3		
Real bills	**1900**		0.3	6.6	11.3	7.8	7.7	6.6	6.0	7.5	8.5	8.3	7.7	7.1	**Inflation**
	1910	5.5		13.2	17.3	10.5	9.7	7.9	7.0	8.5	9.6	9.2	8.5	7.7	
	1920	–0.7	–6.5		21.6	9.1	8.5	6.6	5.8	7.8	9.1	8.7	8.0	7.2	
	1930	–4.2	–8.7	–10.9		–2.1	2.6	2.1	2.2	5.2	7.1	7.0	6.4	5.7	
	1940	–1.3	–3.4	–1.9	8.0		7.4	4.2	3.6	7.1	9.1	8.5	7.7	6.7	
	1950	–1.9	–3.7	–2.7	1.7	–4.3		1.1	1.7	7.0	9.5	8.8	7.7	6.6	
	1960	–1.4	–2.8	–1.8	1.4	–1.7	0.9		2.4	10.1	12.5	10.8	9.1	7.5	
	1970	–1.3	–2.3	–1.5	1.0	–1.2	0.4	–0.1		18.4	17.8	13.7	10.8	8.5	
	1980	–2.1	–3.2	–2.6	–0.9	–3.0	–2.5	–4.2	–8.0		17.3	11.4	8.4	6.3	
	1990	–1.7	–2.6	–2.0	–0.4	–2.0	–1.5	–2.2	–3.3	1.7		5.9	4.2	3.0	
	2000	–1.2	–1.9	–1.3	0.1	–1.2	–0.5	–0.9	–1.1	2.5	3.3		2.5	1.8	
	2010	–1.1	–1.7	–1.1	0.1	–0.9	–0.4	–0.6	–0.7	1.8	1.9	0.5		1.2	
	2022	–1.1	–1.6	–1.1	0.0	–1.0	–0.5	–0.7	–0.8	1.0	0.8	–0.4	–1.1		
Real exchange rate vs USD	**1900**		2.5	–4.1	–8.9	–7.2	–5.8	–5.0	–4.3	–4.4	–5.1	–4.9	–4.1	–3.9	**Exchange rate vs USD**
	1910	1.8		–10.3	–14.2	–10.3	–7.7	–6.4	–5.4	–5.4	–6.0	–5.7	–4.8	–4.5	
	1920	–1.8	–5.2		–17.9	–10.3	–6.9	–5.4	–4.3	–4.5	–5.4	–5.1	–4.2	–3.9	
	1930	–1.0	–2.3	0.7		–1.9	–0.8	–0.9	–0.6	–1.6	–3.1	–3.1	–2.3	–2.2	
	1940	–1.2	–2.2	–0.6	–1.9		0.2	–0.3	–0.2	–1.5	–3.4	–3.3	–2.3	–2.3	
	1950	–0.5	–1.1	0.3	0.1	2.2		–0.9	–0.4	–2.1	–4.3	–4.0	–2.8	–2.6	
	1960	–0.8	–1.3	–0.3	–0.6	0.1	–2.0		0.1	–2.7	–5.4	–4.7	–3.1	–2.9	
	1970	–0.7	–1.1	–0.2	–0.4	0.0	–1.0	0.0		–5.5	–8.0	–6.3	–3.9	–3.5	
	1980	–0.1	–0.3	0.5	0.5	1.1	0.7	2.1	4.3		–10.4	–6.7	–3.4	–3.0	
	1990	–0.1	–0.3	0.4	0.4	0.9	0.5	1.4	2.1	0.0		–2.9	0.3	–0.5	
	2000	–0.1	–0.3	0.4	0.3	0.7	0.4	1.0	1.4	–0.1	–0.1		3.7	0.6	
	2010	0.3	0.1	0.7	0.7	1.1	0.9	1.5	1.9	1.1	1.7	3.6		–2.0	
	2022	0.0	–0.2	0.3	0.3	0.5	0.3	0.7	0.8	0.0	0.0	0.0	–2.9		

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Russia



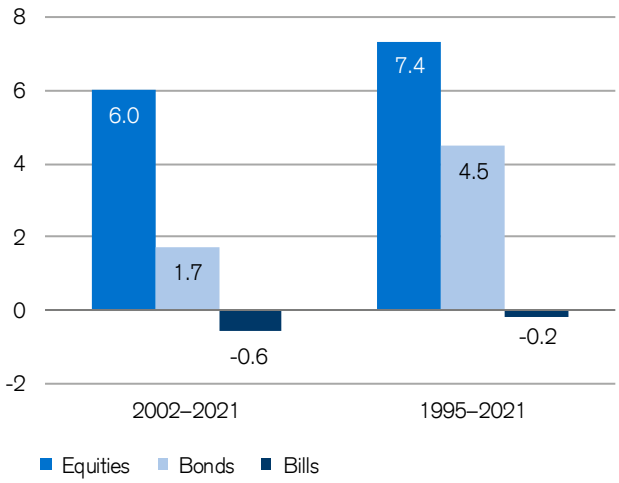
Russia is the world's largest country, covering more than one-eighth of the Earth's inhabited land area, spanning nine time zones, and located in both Europe and Asia. It is the world's leading oil producer and has the biggest natural gas and forestry reserves and the second-largest coal reserves. After the 1917 revolution, Russia ceased to be a market economy. We can identify three periods since then. First, the Russian Empire up to 1917. Second, the long interlude following Soviet expropriation of private assets and the repudiation of Russia's government debt. Third, the Russian Federation, following the dissolution of the Soviet Union in 1991. The 1917 revolution resulted in complete losses for domestic stock- and bondholders. While Russian bonds held overseas were still traded in centers such as London and Paris long after 1917, no interest was paid. Although the Russian government eventually reached agreement with the UK (1986) and France (1996) to pay a small amount of compensation, investors in aggregate still lost more than 99% in present value terms.

Russia, like China, does not therefore have a continuous investment history because of the long interval of Soviet communism that lasted for more than 70 years following the October 1917 Revolution. In the early 1990s, following the dissolution of the Soviet Union, informal markets in shares started to emerge and in 1995, the first centralized exchange opened.

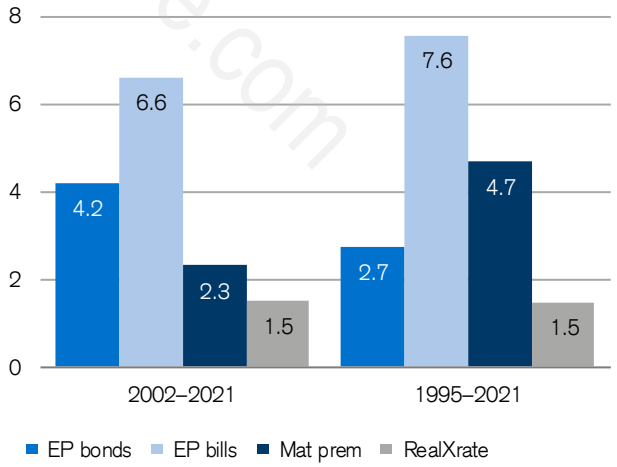
In 1998, Russia experienced a severe financial crisis, with government debt default, currency devaluation, hyperinflation and an economic meltdown. However, there was a surprisingly swift recovery and, in the decade after the 1998 crisis, the economy averaged 7% annual growth. By the beginning of 2022, over half (57%) of the Russian stock market comprised oil and gas companies, the largest being Gazprom and LUKOIL. Adding in basic materials, resources represent almost three-quarters of Russia's market capitalization.

Anderson, Gianluca (Credit-Suisse.com)

Figure 113: Annualized real returns and risk premiums (%) for Russia, 1900–2021



Note: The three asset classes are equities, long-term government bonds, and Treasury bills. All returns include reinvested income, are adjusted for inflation, and are expressed as geometric mean returns.



Note: EP bonds and EP bills denote the equity premium relative to bonds and to bills; Mat prem denotes the maturity premium for bonds relative to bills; RealXRate denotes the inflation-adjusted change in the exchange rate against the US dollar.

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Figure 114: Real returns on Russian asset classes, 1900–2021

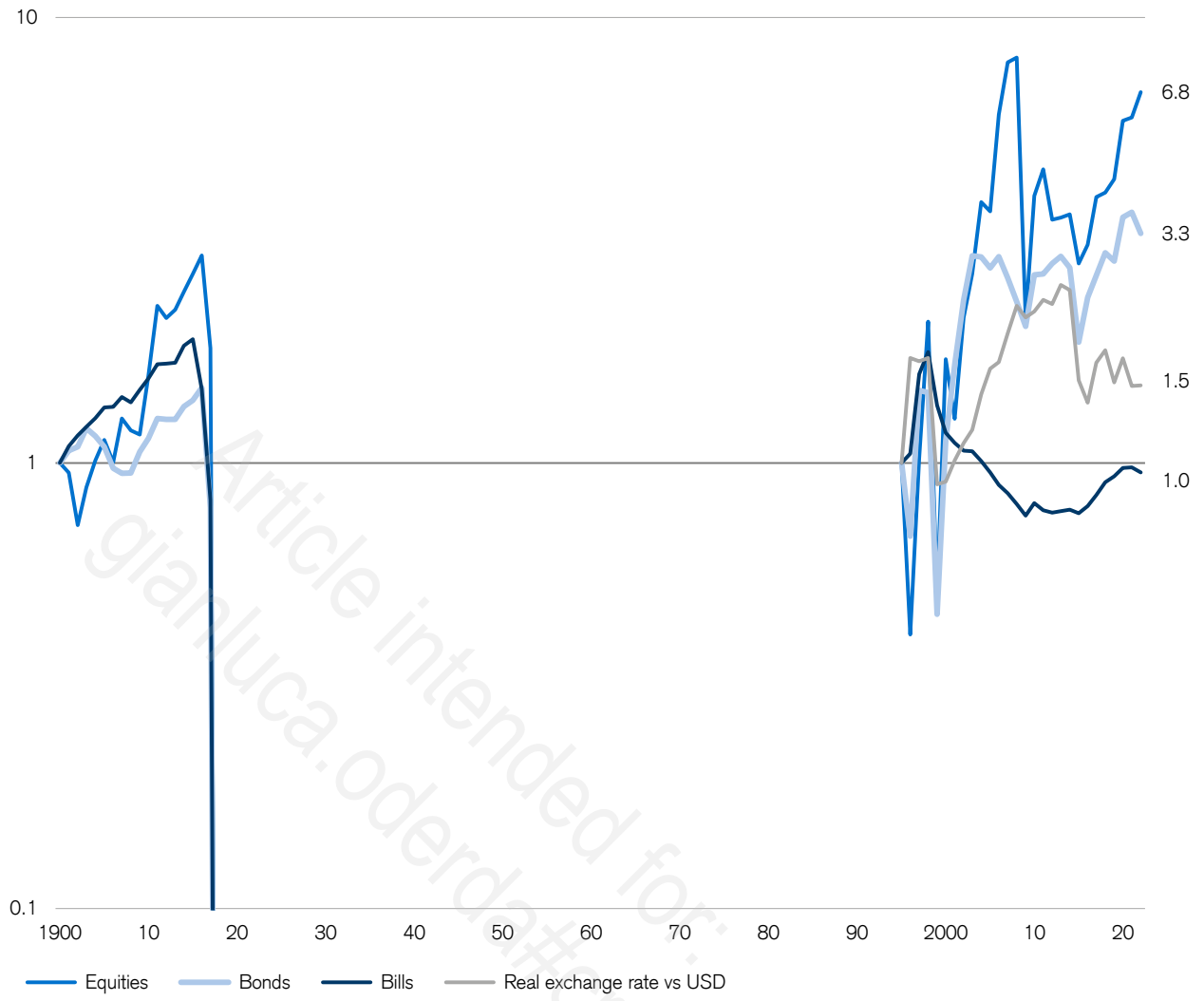

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Table 59: Returns on Russian asset classes, 1995–2021

		Mean returns % p.a.					Annual returns %				10-year returns % p.a.				Current
Return	Asset	GM	AM	SE	SD	SC	Lowest		Highest		Lowest		Highest		year rank
Nominal	Equities	24.8	42.9	16.2	84.4	–0.28	–70.6	2008	358.4	1999	0.9	2017	60.6	2005	18
	Bonds	21.5	29.6	10.7	55.7	0.07	–41.4	1998	235.0	1999	5.2	2014	46.1	2004	27
	Bills	16.1	18.5	5.7	29.6	0.89	3.9	2005	142.8	1995	6.5	2012	31.4	2004	22
	Inflation	16.3	18.4	5.3	27.5	0.28	2.5	2017	131.3	1995	6.3	2020	32.1	2004	20
Real	Equities	7.4	23.9	12.7	65.7	–0.41	–75.5	1998	235.9	1999	–6.7	2017	30.8	2005	14
	Bonds	4.5	11.2	8.0	41.5	–0.19	–68.2	1998	145.5	1999	–3.8	2014	16.0	2008	23
	Bills	–0.2	0.5	2.4	12.3	0.30	–24.0	1998	50.9	1996	–7.5	2007	2.2	2020	18
	Exchange rate	1.5	3.6	4.0	21.0	0.04	–47.9	1998	72.2	1995	–4.4	2020	9.2	2009	19
Premiums	Equities vs bills	7.6	22.7	13.0	67.5	–0.40	–72.5	2008	287.1	1999	–7.8	2017	33.0	2005	14
	Equities vs bonds	2.7	9.3	6.8	35.4	–0.27	–70.5	2008	105.0	1997	–9.1	2017	15.8	2006	8
	Bonds vs bills	4.7	10.5	8.1	41.9	–0.04	–58.1	1998	182.9	1999	–1.7	2014	22.9	2008	25

GM=geometric mean; AM=arithmetic mean, SE=standard error of mean; SD=standard deviation; SC=serial correlation; 10-year returns to end of given year.
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Singapore



Singapore is a modern city-state situated just north of the equator with few natural resources, but with the largest port in Southeast Asia, ideally placed between the Indian and Pacific oceans. A former British colony, Singapore became an independent republic in 1965 and ranks 10th in the latest UN Human Development Index.

About 80% of Singapore's population now resides in high-rise government-built flats and there are very few old buildings left – one of the few is Raffles Hotel, named after Sir Stamford Raffles who founded the port city of Singapore in 1819. Changi Airport is rated the world's best airport by the international air transport rating organization Skytrax.

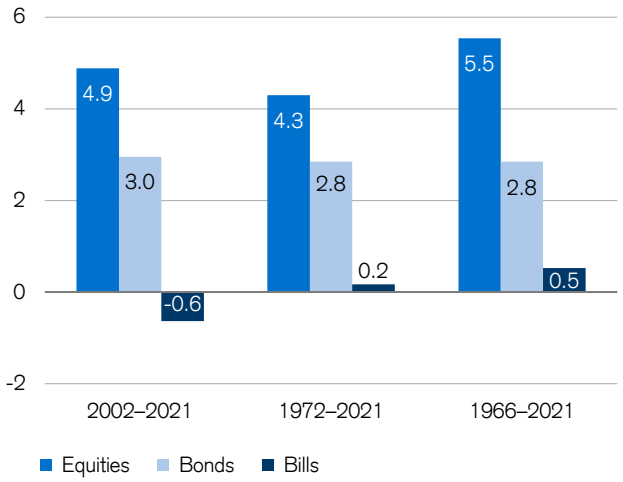
Although the Singapore Stockbrokers' Association dates back to 1930, the Stock Exchange of Singapore was not formed until 1973 following the separation from the combined Stock Exchange of Malaysia and Singapore.

The renamed Singapore Exchange is now the world's 24th largest equity market, with financials accounting for 49% of the market capitalization of the FTSE World Singapore Index. DBS Group Holdings (20% of the index), Oversea-Chinese Bank (14%) and United Overseas Bank (12%) are the three leading banks.

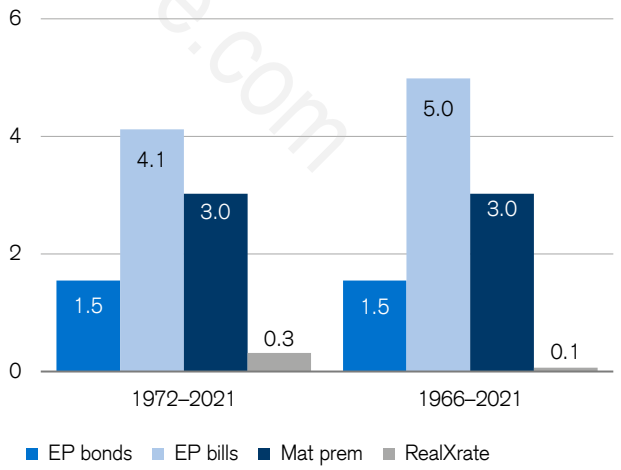
Our data for Singapore starts in 1966 except for bonds, which begin in 1988.

Auszug aus Datenbank für gianluca.scaringi@credit-suisse.com

Figure 115: Annualized real returns and risk premiums (%) for Singapore, 1966–2021 (bonds from 1988)



Note: The three asset classes are equities, long-term government bonds, and Treasury bills. All returns include reinvested income, are adjusted for inflation, and are expressed as geometric mean returns.



Note: EP bonds and EP bills denote the equity premium relative to bonds and to bills; Mat prem denotes the maturity premium for bonds relative to bills; RealXRate denotes the inflation-adjusted change in the exchange rate against the US dollar.

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Figure 116: Real returns on Singapore asset classes, 1966–2021 (bonds from 1988)

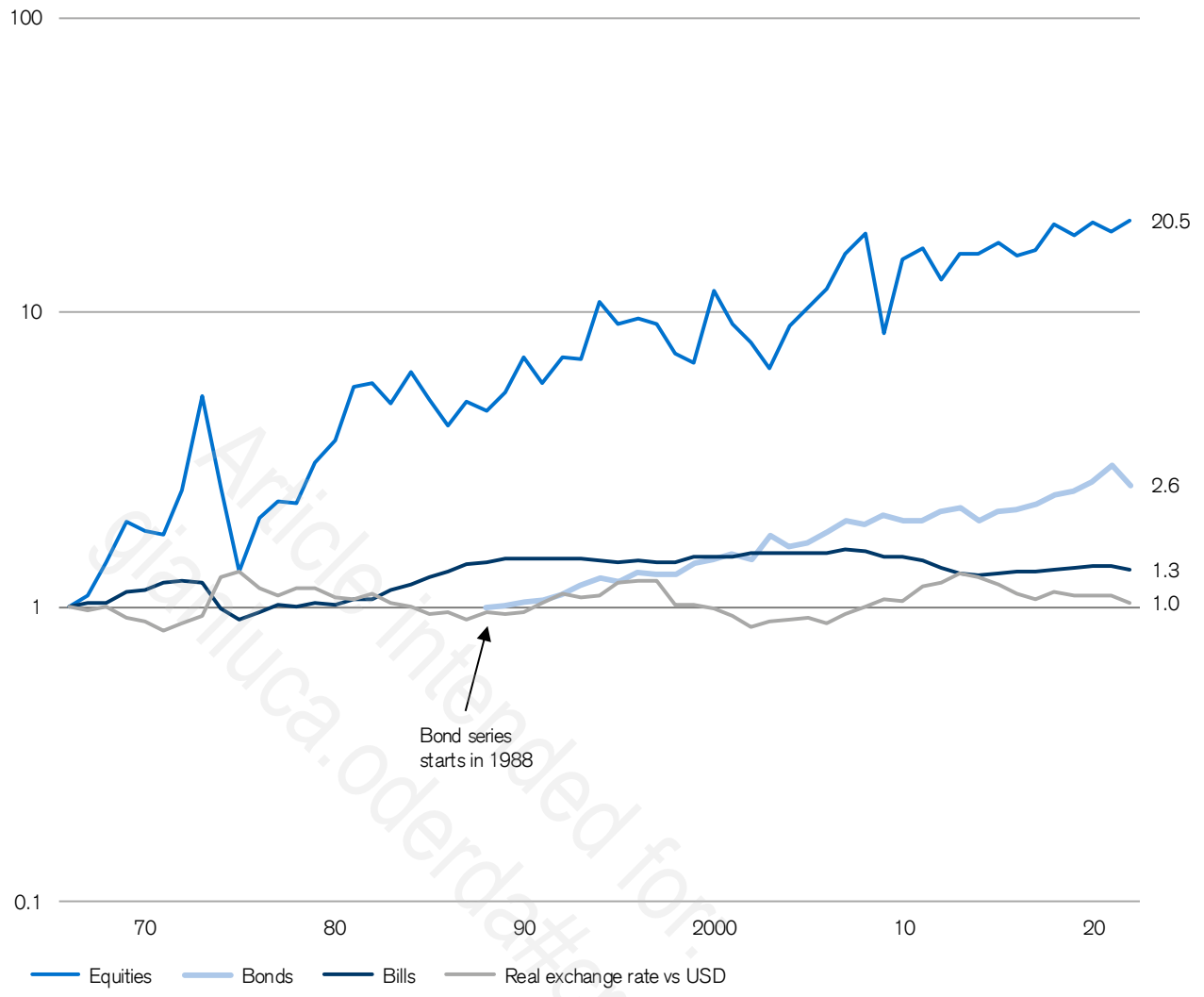

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Table 60: Returns on Singapore asset classes, 1966–2021 (bonds from 1988)

		Mean returns % p.a.					Annual returns %				10-year returns % p.a.				Current
Return	Asset	GM	AM	SE	SD	SC	Lowest		Highest		Lowest		Highest		year rank
Nominal	Equities	8.2	12.3	4.2	31.2	–0.18	–51.5	2008	121.1	1972	–1.0	2003	19.7	1980	29
	Bonds	4.6	4.8	1.2	6.8	–0.50	–11.1	2021	21.3	2002	3.5	2018	6.3	2011	36
	Bills	3.1	3.1	0.3	2.4	0.91	0.3	2013	11.2	1981	0.6	2017	6.7	1985	51
	Inflation	2.5	2.6	0.6	4.4	0.37	–2.7	1968	27.2	1973	0.7	2006	7.3	1981	14
Real	Equities	5.5	9.8	4.1	30.8	–0.22	–53.9	2008	108.8	1972	–1.9	2003	14.4	1984	28
	Bonds	2.8	3.1	1.2	6.8	–0.48	–14.4	2021	20.7	2002	1.4	2016	4.5	2020	36
	Bills	0.5	0.6	0.5	4.0	0.39	–18.4	1973	7.8	1968	–1.7	2013	3.7	1989	52
	Exchange rate	0.1	0.3	1.0	7.4	0.17	–16.7	1997	35.6	1973	–3.2	2005	3.9	2012	47
Premiums	Equities vs bills	5.0	8.9	4.0	30.1	–0.21	–51.9	2008	112.7	1972	–3.0	1990	13.8	1980	25
	Equities vs bonds	1.5	5.3	5.0	28.9	–0.41	–56.8	2008	86.0	2009	–4.5	2002	6.9	2012	6
	Bonds vs bills	3.0	3.2	1.2	6.7	–0.52	–11.7	2021	20.3	2002	2.0	2003	5.0	2011	36

GM=geometric mean; AM=arithmetic mean, SE=standard error of mean; SD=standard deviation; SC=serial correlation; 10-year returns to end of given year.
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Table 61: Singapore real returns, inflation and premiums, 1966–2021 (bonds from 1988)

	1 Jan	1900	1910	1920	1930	1940	1950	1966	1970	1980	1990	2000	2010	2022	
Real equity total returns	**1900**														**Equity premium vs bonds**
	1910														
	1920														
	1930														
	1940														
	1950														
	1966														
	1970							16.1							
	1980							9.7	7.3		19.9	4.7	2.3	1.5	
	1990							8.5	7.0	6.7		1.9	0.7	0.5	
	2000							7.5	6.4	6.0	5.3		–0.4	–0.1	
	2010							6.4	5.4	4.8	3.9	2.5		0.1	
	2022							5.5	4.8	4.2	3.4	2.5	2.5		
Real equity capital gains	**1900**														**Equity premium vs bills**
	1910														
	1920														
	1930														
	1940														
	1950														
	1966								12.4	9.5	6.7	6.3	5.4	5.0	
	1970							12.6		8.4	5.6	5.5	4.7	4.4	
	1980							6.8	4.6		2.9	4.1	3.5	3.5	
	1990							5.9	4.6	4.6		5.2	3.8	3.7	
	2000							5.3	4.3	4.2	3.7		2.5	3.0	
	2010							3.9	3.1	2.5	1.5	–0.6		3.4	
	2022							2.8	2.1	1.5	0.5	–0.9	–1.1		
Real bonds	**1900**														**Bond maturity premium**
	1910														
	1920														
	1930														
	1940														
	1950														
	1966														
	1970														
	1980										0.8	2.8	2.9	3.0	
	1990									2.4		3.2	3.1	3.2	
	2000									3.2	3.3		2.9	3.1	
	2010									3.1	3.2	3.0		3.3	
	2022									2.8	2.9	2.7	2.4		
Real bills	**1900**														**Inflation**
	1910														
	1920														
	1930														
	1940														
	1950														
	1966								1.5	4.6	3.7	3.1	2.7	2.5	
	1970							3.3		5.8	4.1	3.3	2.9	2.6	
	1980							0.2	–1.0		2.4	2.1	1.9	1.8	
	1990							1.6	1.3	3.7		1.8	1.6	1.7	
	2000							1.2	0.9	1.9	0.1		1.5	1.6	
	2010							0.9	0.7	1.3	0.1	0.0		1.7	
	2022							0.5	0.3	0.6	–0.3	–0.5	–0.9		
Real exchange rate vs USD	**1900**														**Exchange rate vs USD**
	1910														
	1920														
	1930														
	1940														
	1950														
	1966								–0.1	2.4	2.0	1.8	1.8	1.5	
	1970							–2.8		3.5	2.4	2.1	2.0	1.6	
	1980							0.6	2.0		1.4	1.4	1.5	1.1	
	1990							–0.2	0.4	–1.2		1.3	1.5	1.1	
	2000							0.0	0.3	–0.5	0.2		1.7	1.0	
	2010							0.1	0.4	–0.1	0.4	0.7		0.3	
	2022							0.1	0.3	–0.1	0.2	0.2	–0.1		

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South Africa



The discovery of diamonds at Kimberley in 1870 and the Witwatersrand gold rush of 1886 had a profound impact on South Africa's subsequent history. Gold and diamond production have declined from their peaks, and South Africa is now the eighth-biggest gold producer globally. Today, South Africa is the world's largest producer of chrome, manganese, platinum, vanadium and vermiculite. The country is also a major producer of coal, iron ore and other minerals such as ilmenite, palladium, rutile and zirconium.

The 1886 gold rush led to many mining and financing companies opening up. To cater to their needs, the Johannesburg Stock Exchange (JSE) opened in 1887. Over the years since 1900, the South African equity market has been one of the world's most successful, generating a real equity return of 7.2% per year, the highest real return in local currency terms among the Yearbook countries. In common currency terms, South African equities rank fourth, reflecting the long-run weakness of the South African rand.

South Africa held its first multi-racial elections in 1994 and the apartheid era was replaced by a government run by the African National Congress. The country is still struggling to resolve apartheid-era inequities related to education, health and housing. Still, South Africa is the second-largest economy in Africa (Nigeria is the largest) and it has a sophisticated financial system.

In 1900, South Africa would have been deemed an emerging market. According to index compilers, it has not yet emerged. Today it ranks as the seventh-largest emerging market, well below China, Taiwan (Chinese Taipei), India and South Korea. Gold, once key to South Africa's wealth, has declined in importance as the economy has diversified. Financials account for 29% of the market capitalization of the FTSE World South Africa Index, basic materials for 24% and technology for 12%. The largest JSE stocks are Naspers (12%), MTN Group and Firstrand (each 7%) and Impala Platinum (4%).

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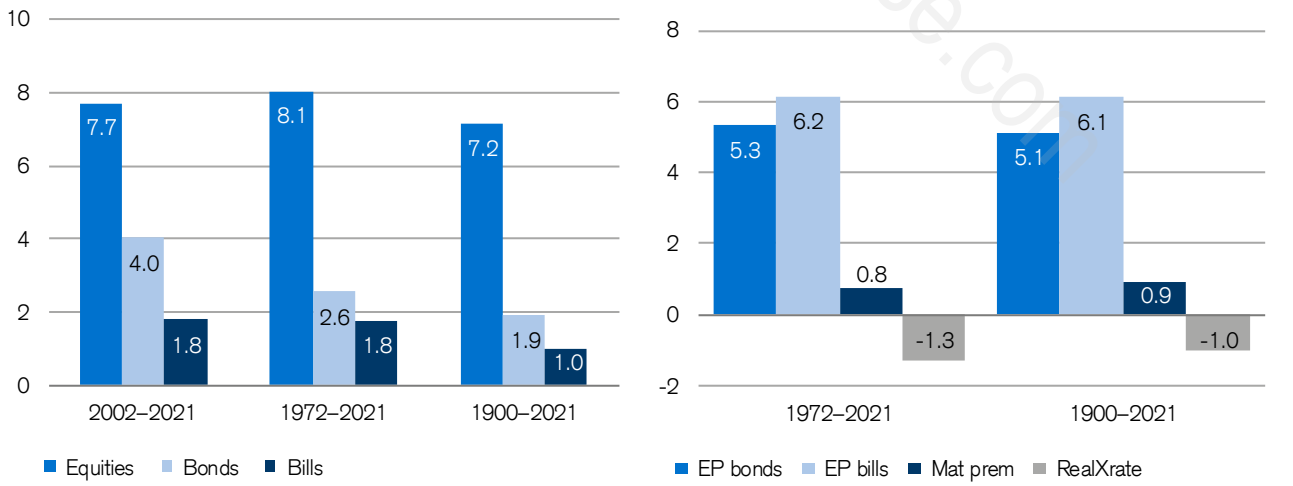
Figure 117: Annualized real returns and risk premiums (%) for South Africa, 1900–2021



Note: The three asset classes are equities, long-term government bonds, and Treasury bills. All returns include reinvested income, are adjusted for inflation, and are expressed as geometric mean returns.

Note: EP bonds and EP bills denote the equity premium relative to bonds and to bills; Mat prem denotes the maturity premium for bonds relative to bills; RealXRate denotes the inflation-adjusted change in the exchange rate against the US dollar.

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Figure 118: Real returns on South African asset classes, 1900–2021

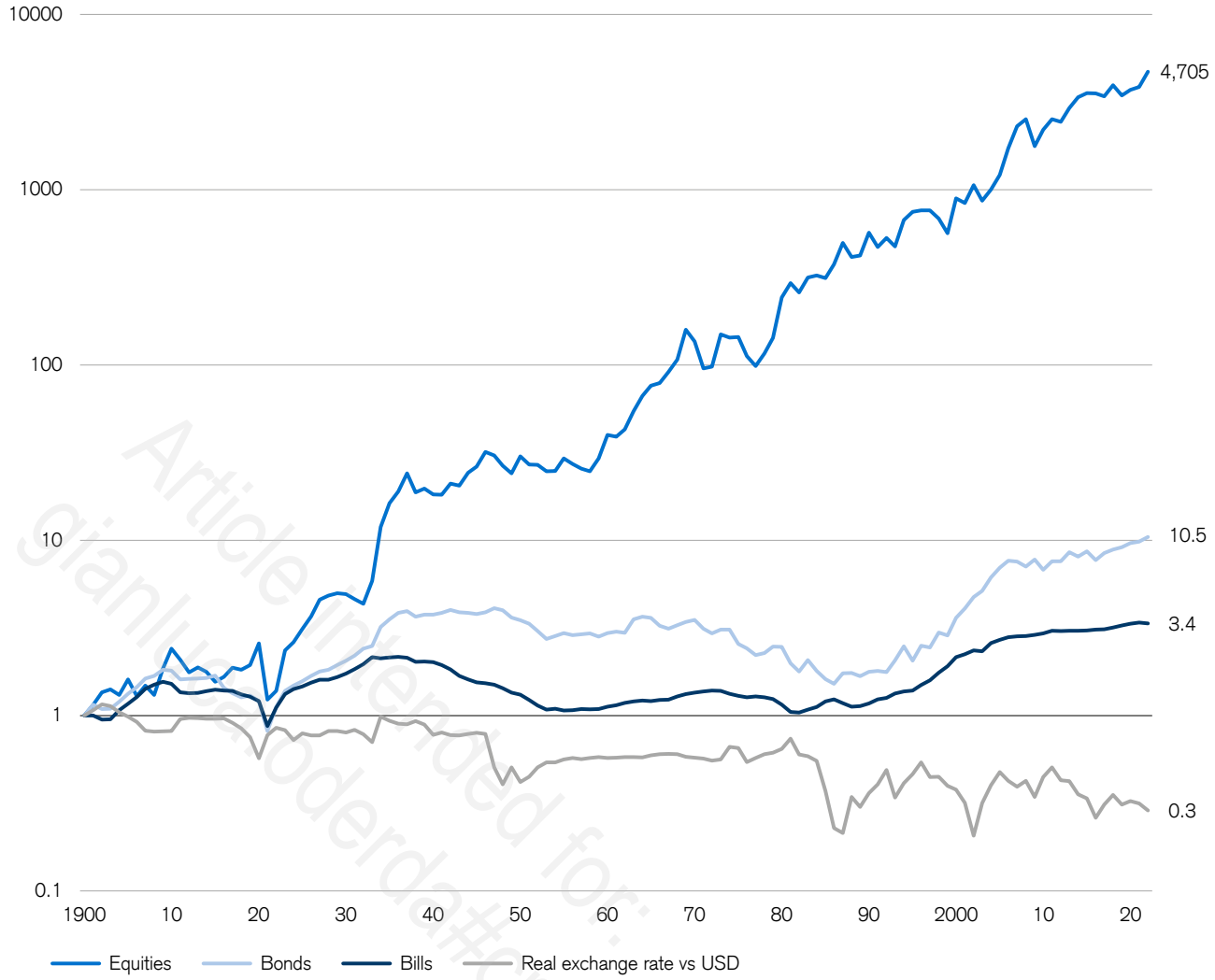

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Table 62: Returns on South African asset classes, 1900–2021

		Mean returns % p.a.					Annual returns %				10-year returns % p.a.				Current
Return	Asset	GM	AM	SE	SD	SC	Lowest		Highest		Lowest		Highest		year rank
Nominal	Equities	12.5	14.5	2.0	22.5	0.08	–29.6	1920	107.7	1933	0.7	1914	34.1	1986	25
	Bonds	7.0	7.4	0.9	9.4	0.13	–10.7	1915	35.9	1986	0.9	1956	19.8	2004	31
	Bills	6.0	6.1	0.5	5.4	0.93	0.0	1934	21.8	1985	0.0	1947	17.0	1991	64
	Inflation	4.9	5.2	0.6	7.2	0.42	–17.2	1921	47.5	1920	–4.2	1930	14.8	1991	47
Real	Equities	7.2	9.2	2.0	21.8	0.04	–52.2	1920	102.9	1933	–5.1	1920	18.4	1968	26
	Bonds	1.9	2.5	0.9	10.3	0.07	–32.6	1920	37.1	1921	–6.5	1920	13.0	2004	37
	Bills	1.0	1.2	0.5	5.9	0.37	–27.8	1920	27.3	1921	–4.6	1951	7.7	1930	91
	Exchange rate	–1.0	0.1	1.4	15.2	–0.04	–38.3	1985	60.5	1987	–9.4	1986	9.0	1995	97
Premiums	Equities vs bills	6.1	8.1	1.9	21.3	0.09	–33.9	1920	106.2	1933	–2.3	2003	18.6	1986	24
	Equities vs bonds	5.1	6.8	1.7	19.2	0.01	–36.1	2008	70.9	1979	–7.1	2004	20.4	1986	40
	Bonds vs bills	0.9	1.2	0.7	7.9	–0.06	–18.3	1994	30.4	1933	–4.3	1985	7.1	1942	25

GM=geometric mean; AM=arithmetic mean, SE=standard error of mean; SD=standard deviation; SC=serial correlation; 10-year returns to end of given year.
Source: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

Table 63: South African real returns, inflation and premiums, 1900–2021

	1 Jan	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000	2010	2022	
Real equity total returns	**1900**		3.0	3.9	3.0	4.0	4.4	4.4	5.4	5.9	6.6	5.7	5.4	5.1	**Equity premium vs bonds**
	1910	9.2		4.8	2.9	4.4	4.8	4.7	5.8	6.3	7.1	6.0	5.6	5.3	
	1920	4.9	0.7		1.2	4.2	4.8	4.7	6.0	6.6	7.4	6.1	5.7	5.4	
	1930	5.5	3.6	6.7		7.3	6.6	5.9	7.2	7.7	8.5	6.8	6.3	5.9	
	1940	7.5	7.0	10.3	14.0		5.9	5.3	7.2	7.8	8.7	6.8	6.2	5.7	
	1950	7.0	6.5	8.5	9.5	5.1		4.6	7.8	8.5	9.5	6.9	6.2	5.6	
	1960	6.3	5.8	7.1	7.2	4.0	2.9		11.2	10.4	11.1	7.5	6.6	5.8	
	1970	7.3	7.0	8.3	8.7	6.9	7.8	13.1		9.7	11.1	6.4	5.4	4.8	
	1980	7.1	6.8	7.9	8.1	6.7	7.2	9.4	5.9		12.5	4.7	4.0	3.7	
	1990	7.3	7.1	8.0	8.2	7.1	7.6	9.3	7.4	8.9		–2.6	0.0	1.1	
	2000	7.0	6.8	7.6	7.7	6.7	7.0	8.1	6.5	6.7	4.6		2.7	2.8	
	2010	7.2	7.1	7.8	7.9	7.1	7.4	8.3	7.2	7.6	7.0	9.4		2.8	
	2022	7.2	7.0	7.6	7.7	7.0	7.3	8.0	7.0	7.3	6.8	7.9	6.6		
Real equity capital gains	**1900**		4.7	3.9	3.5	5.7	6.5	6.1	6.8	6.9	7.1	6.2	6.2	6.1	**Equity premium vs bills**
	1910	3.3		3.0	2.9	6.0	6.9	6.4	7.2	7.2	7.4	6.4	6.3	6.2	
	1920	–2.2	–7.3		2.9	7.5	8.2	7.3	8.0	7.9	8.1	6.8	6.7	6.6	
	1930	–2.3	–5.0	–2.6		12.3	11.0	8.8	9.3	9.0	8.9	7.4	7.2	7.0	
	1940	–0.2	–1.3	1.8	6.4		9.7	7.1	8.4	8.2	8.3	6.6	6.5	6.3	
	1950	–0.1	–1.0	1.2	3.2	0.1		4.5	7.7	7.7	7.9	6.0	6.0	5.9	
	1960	–0.5	–1.2	0.3	1.3	–1.1	–2.3		11.0	9.3	9.1	6.3	6.3	6.1	
	1970	0.6	0.1	1.7	2.8	1.6	2.4	7.4		7.6	8.2	4.8	5.1	5.2	
	1980	0.5	0.1	1.4	2.2	1.2	1.5	3.5	–0.3		8.8	3.5	4.3	4.6	
	1990	0.8	0.4	1.6	2.3	1.5	1.9	3.3	1.3	3.0		–1.6	2.2	3.4	
	2000	0.8	0.6	1.6	2.2	1.6	1.8	2.9	1.5	2.3	1.7		6.1	5.7	
	2010	1.3	1.1	2.1	2.7	2.2	2.6	3.6	2.6	3.6	3.9	6.2		5.4	
	2022	1.5	1.4	2.3	2.8	2.4	2.7	3.5	2.8	3.5	3.7	4.6	3.3		
Real bonds	**1900**		1.7	0.0	0.6	1.6	2.0	1.6	1.4	0.9	0.5	0.5	0.8	0.9	**Bond maturity premium**
	1910	6.1		–1.7	0.0	1.5	2.0	1.6	1.3	0.8	0.3	0.4	0.7	0.9	
	1920	1.0	–3.9		1.7	3.2	3.3	2.4	1.9	1.3	0.6	0.6	0.9	1.1	
	1930	2.4	0.7	5.5		4.7	4.1	2.7	2.0	1.2	0.4	0.5	0.8	1.1	
	1940	3.4	2.5	5.8	6.2		3.6	1.7	1.1	0.3	–0.4	–0.2	0.3	0.6	
	1950	2.5	1.7	3.6	2.7	–0.8		–0.1	–0.1	–0.7	–1.4	–0.9	–0.2	0.2	
	1960	1.8	1.0	2.3	1.2	–1.2	–1.7		–0.1	–1.0	–1.8	–1.1	–0.3	0.3	
	1970	1.8	1.1	2.1	1.3	–0.2	0.0	1.7		–2.0	–2.7	–1.5	–0.3	0.4	
	1980	1.1	0.4	1.2	0.4	–1.1	–1.2	–0.9	–3.5		–3.4	–1.2	0.3	0.9	
	1990	0.6	0.0	0.5	–0.2	–1.5	–1.7	–1.7	–3.4	–3.2		1.0	2.1	2.3	
	2000	1.3	0.8	1.4	0.8	–0.1	0.1	0.5	0.1	1.9	7.4		3.3	2.9	
	2010	1.8	1.3	1.9	1.5	0.8	1.1	1.7	1.7	3.4	6.9	6.5		2.6	
	2022	1.9	1.6	2.1	1.8	1.3	1.5	2.1	2.1	3.5	5.7	4.9	3.7		
Real bills	**1900**		–1.2	2.4	1.6	1.1	1.7	2.1	2.1	3.1	4.3	4.8	4.9	4.9	**Inflation**
	1910	4.3		6.1	3.0	1.8	2.4	2.7	2.7	3.7	5.0	5.5	5.6	5.5	
	1920	1.0	–2.2		–0.1	–0.3	1.2	1.9	2.0	3.3	4.9	5.4	5.5	5.4	
	1930	1.9	0.7	3.7		–0.5	1.9	2.5	2.5	4.0	5.7	6.2	6.2	6.1	
	1940	1.8	1.0	2.6	1.5		4.4	4.1	3.6	5.2	7.0	7.4	7.2	6.9	
	1950	0.5	–0.4	0.3	–1.4	–4.2		3.8	3.1	5.5	7.7	8.0	7.7	7.2	
	1960	0.2	–0.6	–0.2	–1.4	–2.9	–1.6		2.5	6.3	9.0	9.1	8.5	7.8	
	1970	0.4	–0.2	0.2	–0.6	–1.3	0.1	1.9		10.2	12.4	11.4	10.0	8.9	
	1980	0.2	–0.4	–0.1	–0.8	–1.4	–0.4	0.2	–1.5		14.7	11.9	10.0	8.5	
	1990	0.2	–0.3	0.0	–0.7	–1.1	–0.3	0.1	–0.7	0.1		9.3	7.7	6.7	
	2000	0.8	0.4	0.7	0.3	0.1	1.0	1.6	1.6	3.2	6.3		6.1	5.5	
	2010	1.0	0.7	1.0	0.7	0.5	1.4	1.9	2.0	3.2	4.7	3.2		5.0	
	2022	1.0	0.7	1.0	0.7	0.6	1.3	1.8	1.8	2.6	3.3	2.0	1.0		
Real exchange rate vs USD	**1900**		0.1	–1.2	0.0	–0.5	–1.4	–0.9	–0.8	–0.9	–2.4	–2.7	–2.6	–2.9	**Exchange rate vs USD**
	1910	–2.0		–2.6	0.0	–0.6	–1.8	–1.1	–0.9	–1.0	–2.7	–3.0	–2.8	–3.2	
	1920	–2.8	–3.5		2.6	0.3	–1.5	–0.7	–0.6	–0.7	–2.7	–3.0	–2.9	–3.3	
	1930	–0.7	–0.1	3.5		–1.9	–3.5	–1.8	–1.4	–1.4	–3.5	–3.8	–3.5	–3.9	
	1940	–0.6	–0.2	1.6	–0.3		–5.1	–1.8	–1.2	–1.3	–3.8	–4.1	–3.8	–4.1	
	1950	–1.7	–1.7	–1.0	–3.2	–6.0		1.7	0.8	0.1	–3.5	–3.9	–3.5	–4.0	
	1960	–0.9	–0.7	0.0	–1.1	–1.5	3.2		0.0	–0.7	–5.2	–5.2	–4.6	–4.9	
	1970	–0.8	–0.6	0.0	–0.8	–1.0	1.6	0.0		–1.5	–7.7	–6.9	–5.7	–5.8	
	1980	–0.5	–0.3	0.2	–0.4	–0.5	1.5	0.6	1.2		–13.5	–9.5	–7.0	–6.8	
	1990	–1.1	–1.0	–0.7	–1.3	–1.5	–0.4	–1.5	–2.3	–5.6		–5.4	–3.6	–4.6	
	2000	–1.0	–0.9	–0.5	–1.1	–1.2	–0.2	–1.0	–1.4	–2.6	0.5		–1.8	–4.2	
	2010	–0.7	–0.6	–0.3	–0.7	–0.8	0.1	–0.5	–0.6	–1.2	1.1	1.7		–6.2	
	2022	–1.0	–0.9	–0.7	–1.1	–1.2	–0.5	–1.1	–1.3	–1.9	–0.7	–1.2	–3.6		

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South Korea



South Korea has seen remarkable economic growth since the early 1960s driven by the development of export-oriented industries and an educated workforce. Targeted industries began with textiles and light manufacturing, followed by iron, steel and chemicals, and the current focus on high-technology products.

It is a member of many international organizations (e.g. United Nations, G-20, Association of Southeast Asian Nations Regional Forum and World Trade Organization). It has also hosted major international events such as the 1988 Summer Olympics, the 2002 FIFA World Cup and the 2018 Winter Olympics. Korean popular music, or "K-pop," became an international phenomenon in the 21st century and one of South Korea's most visible cultural exports.

Severe economic difficulties in the late 1990s resulted in an International Monetary Fund (IMF) bailout. The depopulation of vast rural areas means that roughly half the population now lives in the country's seven largest cities. South Korea ranks 23rd (equal with Israel) in the latest UN Human Development Index.

The Korea Stock Exchange was established in 1956 and it is now the world's twelfth-largest equity market, with technology accounting for 53% of the market capitalization of the FTSE World Korea Index. Samsung Electronics (35% of the index) is the largest company.

Our data for South Korea starts in 1963.

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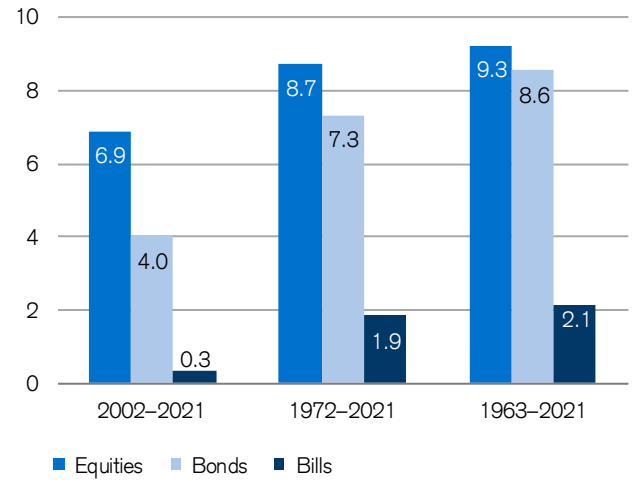
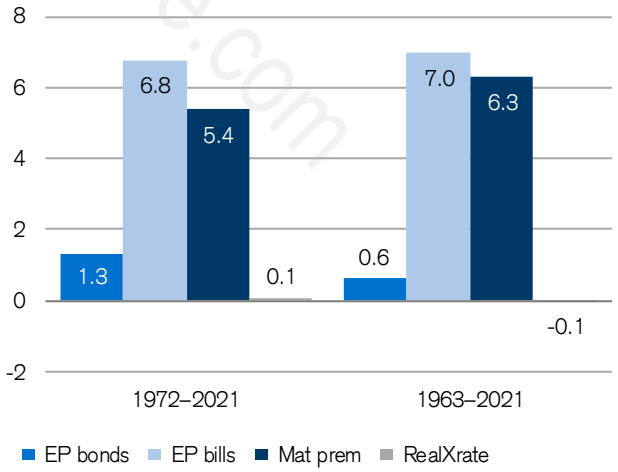
Figure 119: Annualized real returns and risk premiums (%) for South Korea, 1963–2021





Note: The three asset classes are equities, long-term government bonds, and Treasury bills. All returns include reinvested income, are adjusted for inflation, and are expressed as geometric mean returns.

Note: EP bonds and EP bills denote the equity premium relative to bonds and to bills; Mat prem denotes the maturity premium for bonds relative to bills; RealXRate denotes the inflation-adjusted change in the exchange rate against the US dollar.

Source: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

Figure 120: Real returns on South Korean asset classes, 1963–2021

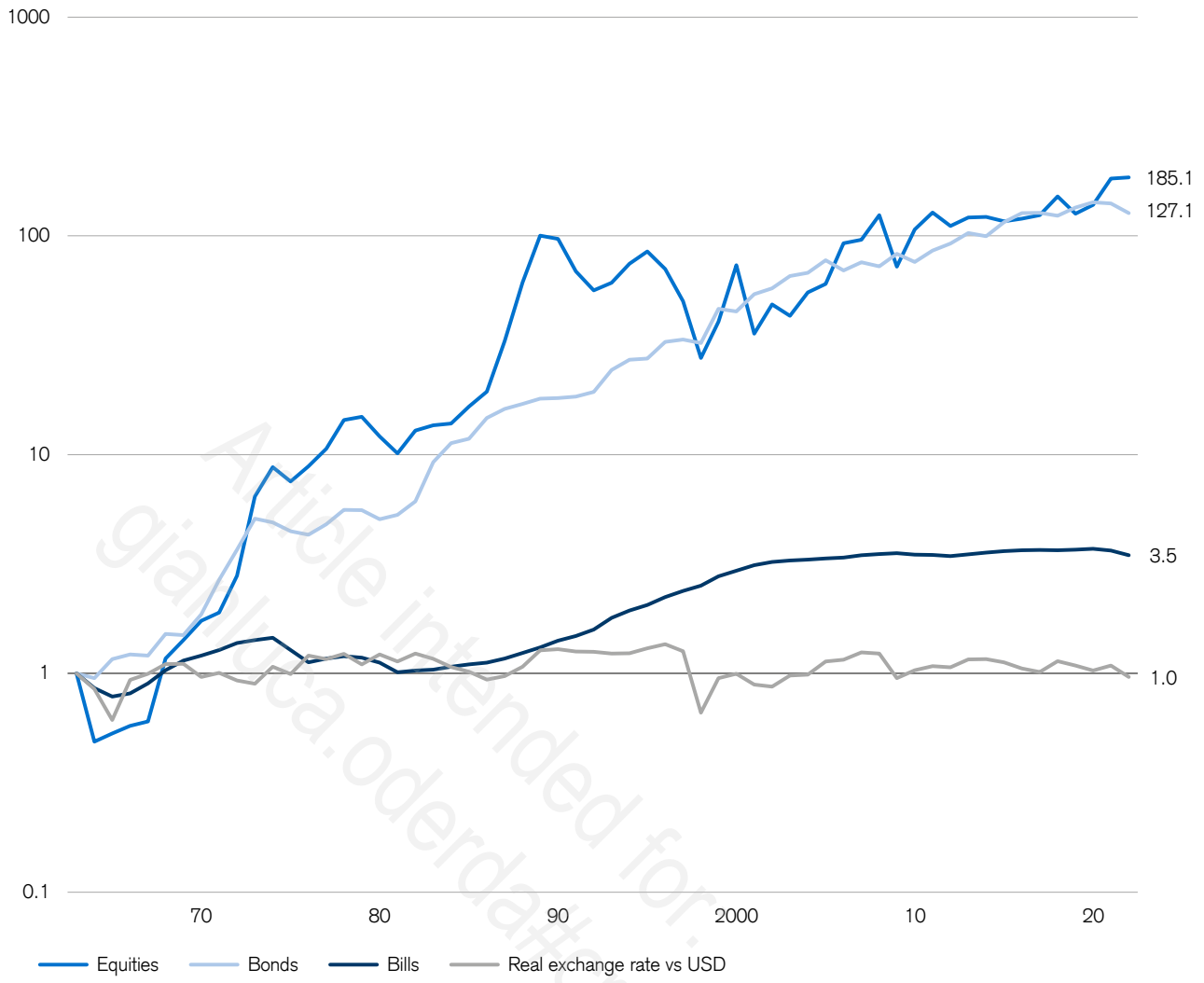


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Table 64: Returns on South Korean asset classes, 1963–2021

		Mean returns % p.a.					Annual returns %				10-year returns % p.a.				Current
Return	**Asset**	**GM**	**AM**	**SE**	**SD**	**SC**	**Lowest**		**Highest**		**Lowest**		**Highest**		**year rank**
Nominal	Equities	17.3	22.7	4.8	37.1	0.18	–50.0	2000	151.8	1972	–3.2	1998	52.0	1976	46
	Bonds	16.6	17.6	2.2	16.5	0.28	–7.9	2005	64.6	1970	6.5	2020	34.4	1972	60
	Bills	9.7	9.9	0.9	7.0	0.88	–1.3	2020	28.0	1966	1.9	2020	18.4	1974	61
	Inflation	7.4	7.6	1.0	7.6	0.73	0.5	2020	32.2	1980	1.4	2020	17.2	1981	37
Real	Equities	9.3	14.4	4.5	34.9	0.14	–51.4	2000	130.7	1972	–8.7	1998	33.5	1973	43
	Bonds	8.6	9.4	1.8	14.1	0.13	–10.2	2005	51.1	1982	3.9	2013	17.8	1973	60
	Bills	2.1	2.3	0.8	5.8	0.67	–14.2	1963	14.7	1967	–3.1	1982	7.8	1998	55
	Exchange rate	–0.1	1.0	1.9	14.4	–0.26	–47.6	1997	52.4	1965	–4.7	1997	6.4	2007	56
Premiums	Equities vs bills	7.0	11.6	4.2	32.4	0.11	–54.2	2000	123.7	1972	–15.3	1998	29.8	1976	33
	Equities vs bonds	0.6	5.5	4.2	32.1	0.01	–59.4	2000	86.4	1999	–16.9	1998	16.0	1976	21
	Bonds vs bills	6.3	7.0	1.7	12.7	0.09	–11.1	2005	49.6	1982	–0.7	1997	13.7	1978	52

GM=geometric mean; AM=arithmetic mean, SE=standard error of mean; SD=standard deviation; SC=serial correlation; 10-year returns to end of given year.
Source: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

Table 65: South Korean real returns, inflation and premiums, 1963–2021

	1 Jan	1900	1910	1920	1930	1940	1950	1963	1970	1980	1990	2000	2010	2022	
Real equity total returns	**1900**														**Equity premium vs bonds**
	1910														
	1920														
	1930														
	1940														
	1950														
	1963								–1.0	5.3	6.4	1.3	0.7	0.6	
	1970							8.2		9.9	9.1	1.9	1.0	0.9	
	1980							15.8	21.4		8.4	–1.9	–1.8	–1.2	
	1990							18.5	22.3	23.1		–11.2	–6.5	–4.0	
	2000							12.3	13.3	9.4	–2.7		–1.4	–0.5	
	2010							10.4	10.8	7.5	0.5	3.8		0.3	
	2022							9.3	9.4	6.7	2.0	4.3	4.7		
Real equity capital gains	**1900**														**Equity premium vs bills**
	1910														
	1920														
	1930														
	1940														
	1950														
	1963								5.3	15.0	16.9	9.1	7.5	7.0	
	1970							–7.2		22.3	21.3	10.0	7.9	7.2	
	1980							0.1	5.6		20.3	4.3	3.5	3.9	
	1990							5.1	9.8	14.1		–9.6	–4.0	–0.8	
	2000							2.5	4.9	4.6	–4.1		2.0	3.5	
	2010							2.4	4.1	3.7	–1.2	1.9		4.8	
	2022							2.5	3.9	3.5	0.4	2.5	3.1		
Real bonds	**1900**														**Bond maturity premium**
	1910														
	1920														
	1930														
	1940														
	1950														
	1963								6.4	9.3	9.9	7.7	6.8	6.3	
	1970							9.3		11.4	11.2	8.0	6.8	6.3	
	1980							10.0	10.5		11.0	6.3	5.4	5.1	
	1990							11.3	12.1	13.6		1.8	2.7	3.3	
	2000							10.9	11.2	11.6	9.6		3.5	4.0	
	2010							9.7	9.7	9.4	7.4	5.3		4.5	
	2022							8.6	8.5	8.0	6.3	4.8	4.4		
Real bills	**1900**														**Inflation**
	1910														
	1920														
	1930														
	1940														
	1950														
	1963								15.7	15.3	12.3	10.5	8.9	7.4	
	1970							2.7		15.0	11.2	9.3	7.7	6.3	
	1980							0.7	–0.7		7.5	6.5	5.4	4.3	
	1990							1.3	0.8	2.3		5.6	4.3	3.4	
	2000							3.0	3.0	4.9	7.6		3.1	2.4	
	2010							2.7	2.7	3.9	4.6	1.7		1.7	
	2022							2.1	2.0	2.7	2.8	0.7	–0.1		
Real exchange rate vs USD	**1900**														**Exchange rate vs USD**
	1910														
	1920														
	1930														
	1940														
	1950														
	1963								–11.3	–7.3	–5.3	–5.2	–4.2	–3.4	
	1970							–0.5		–4.4	–3.0	–3.7	–2.8	–2.2	
	1980							1.2	2.4		–1.7	–3.3	–2.3	–1.7	
	1990							0.9	1.5	0.5		–5.0	–2.6	–1.7	
	2000							0.0	0.1	–1.0	–2.5		–0.2	–0.2	
	2010							0.1	0.2	–0.6	–1.1	0.4		–0.2	
	2022							–0.1	0.0	–0.6	–0.9	–0.2	–0.6		

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Spain



Spanish is the most widely spoken international language after English and has the fourth-largest number of native speakers after Chinese, Hindi and English. Partly for this reason, Spain has a visibility and influence that extends far beyond its Southern European borders and carries weight throughout Latin America.

While the 1960s and 1980s saw Spanish real equity returns enjoying a bull market and ranked second in the world, the 1930s and 1970s witnessed the very worst returns among the countries we follow. Over the entire 122 years covered by the Yearbook, Spain's long-term equity premium (measured relative to bonds) was 1.6%, which is lower than for any other country that we cover over our full period. Although Spain stayed on the sidelines during the two world wars, Spanish stocks lost much of their real value over the period of the Civil War during 1936–39, while the return to democracy in the 1970s coincided with the quadrupling of oil prices, heightened by Spain's dependence on imports for 70% of the country's energy needs.

Spain joined the European Union in 1986. It was hit hard by the Global Financial Crisis and faced a major budget deficit. The country's banks were exposed to the collapse of the depressed real estate and construction industries. The austerity measures that were set in place led to one of the highest unemployment rates in Europe. However, from 2014, Spain returned to growth. The Madrid Stock Exchange was founded in 1831 and is now the eighteenth largest in the world, helped by strong economic growth since the 1980s. The major Spanish companies retain a strong presence in Latin America combined with increasing strength in banking and infrastructure across Europe. The largest stocks are Iberdrola (17% of the FTSE World Spain Index), Banco Santander (14%), BBVA (10%), Cellnex Telecom (9%), and Inditex (8%).

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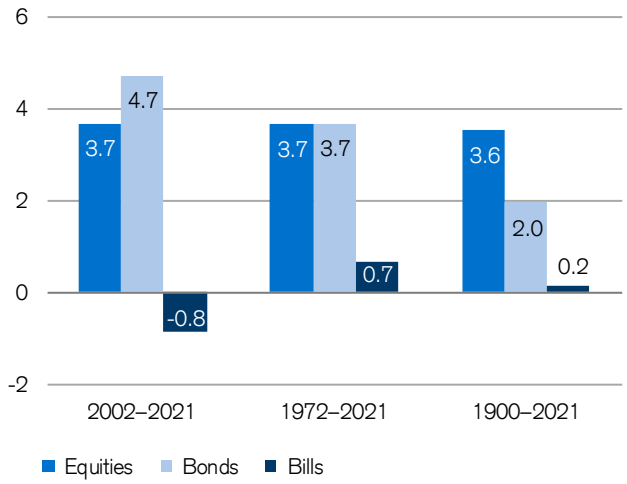
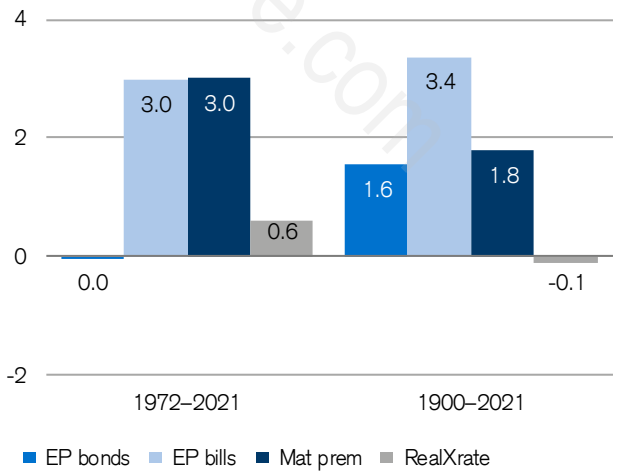
Figure 121: Annualized real returns and risk premiums (%) for Spain, 1900–2021



Note: The three asset classes are equities, long-term government bonds, and Treasury bills. All returns include reinvested income, are adjusted for inflation, and are expressed as geometric mean returns.



Note: EP bonds and EP bills denote the equity premium relative to bonds and to bills; Mat prem denotes the maturity premium for bonds relative to bills; RealXRate denotes the inflation-adjusted change in the exchange rate against the US dollar.

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Figure 122: Real returns on Spanish asset classes, 1900–2021

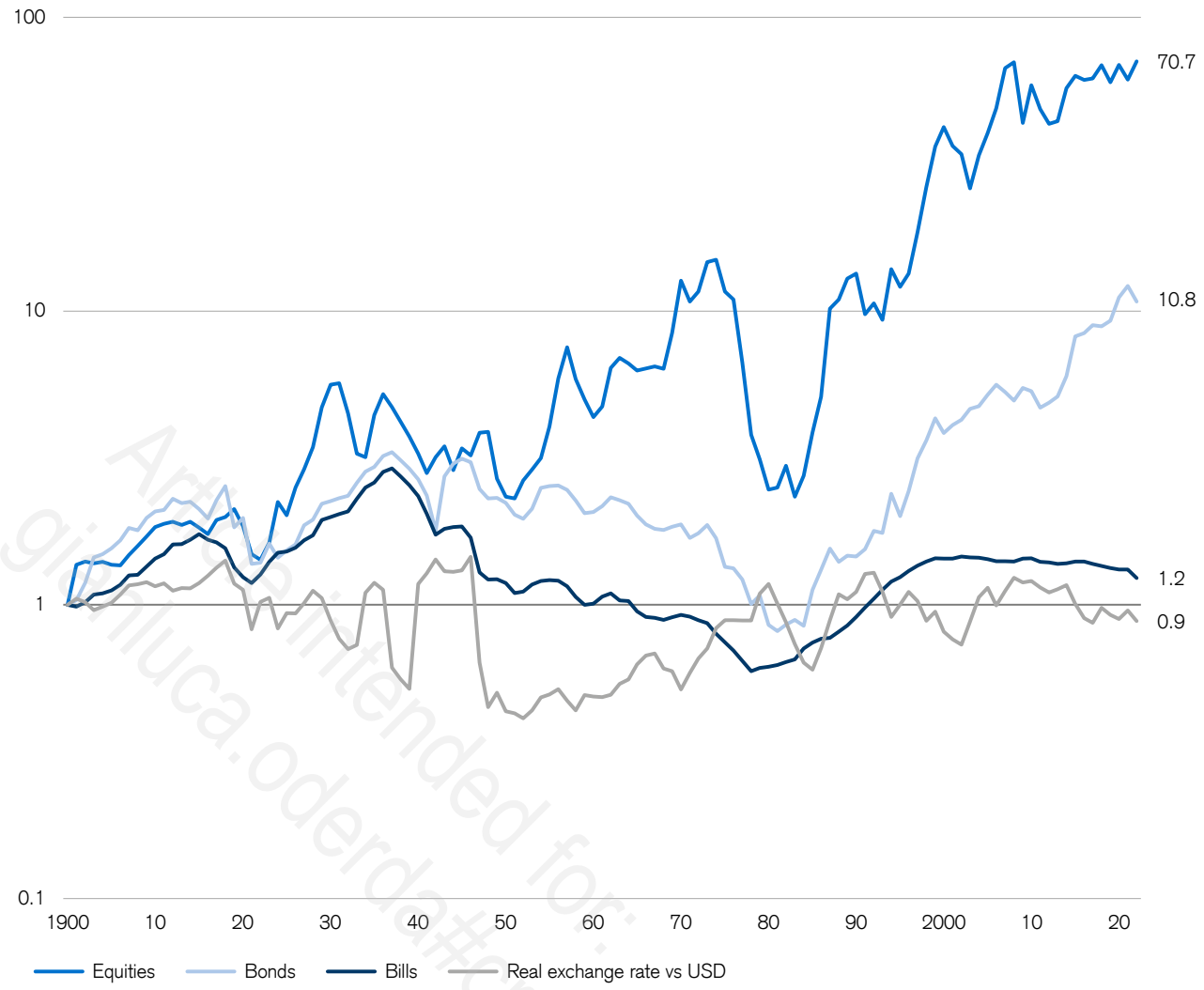

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Table 66: Returns on Spanish asset classes, 1900–2021

		Mean returns % p.a.					Annual returns %				10-year returns % p.a.				Current
Return	Asset	GM	AM	SE	SD	SC	Lowest		Highest		Lowest		Highest		year rank
Nominal	Equities	9.2	11.3	2.0	22.4	0.20	–36.9	2008	115.9	1986	–2.8	1982	30.1	1989	34
	Bonds	7.5	8.0	1.0	11.1	–0.03	–23.7	1920	52.4	1942	1.3	1927	18.1	1993	113
	Bills	5.6	5.7	0.4	4.2	0.94	–0.5	2018	21.7	1983	0.2	2020	16.1	1985	122
	Inflation	5.4	5.6	0.6	6.8	0.64	–6.7	1928	36.5	1946	–0.5	1935	16.8	1982	41
Real	Equities	3.6	5.7	2.0	21.6	0.26	–43.3	1977	99.4	1986	–16.8	1982	18.5	1989	36
	Bonds	2.0	2.7	1.1	12.6	0.07	–30.2	1920	53.2	1942	–7.6	1979	11.4	1998	112
	Bills	0.2	0.3	0.5	5.6	0.60	–23.8	1946	12.6	1928	–7.8	1946	6.1	1935	108
	Exchange rate	–0.1	1.2	1.6	17.6	0.11	–56.4	1946	127.6	1939	–11.7	1951	8.6	1979	97
Premiums	Equities vs bills	3.4	5.4	1.9	21.2	0.20	–39.3	2008	98.1	1986	–14.6	1983	13.9	1989	25
	Equities vs bonds	1.6	3.5	1.9	20.4	0.06	–43.7	2008	69.1	1986	–10.4	1982	12.4	1969	14
	Bonds vs bills	1.8	2.3	0.9	10.4	–0.04	–27.0	1920	46.5	1942	–5.5	1983	10.7	2020	102

GM=geometric mean; AM=arithmetic mean, SE=standard error of mean; SD=standard deviation; SC=serial correlation; 10-year returns to end of given year.
Source: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

Table 67: Spanish real returns, inflation and premiums, 1900–2021

	1 Jan	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000	2010	2022	
Real equity total returns	**1900**		−1.2	−0.3	3.1	0.5	0.1	1.2	2.8	1.3	2.5	2.4	2.2	1.6	**Equity premium vs bonds**
	1910	6.3		0.6	5.3	1.1	0.4	1.7	3.4	1.7	3.0	2.8	2.6	1.8	
	1920	3.1	0.1		10.3	1.3	0.4	2.0	4.0	1.9	3.3	3.1	2.8	1.9	
	1930	5.9	5.7	11.7		−6.9	−4.2	−0.6	2.5	0.3	2.2	2.1	1.9	1.1	
	1940	3.0	1.9	2.9	−5.2		−1.5	2.7	5.9	2.2	4.1	3.7	3.2	2.1	
	1950	1.7	0.6	0.8	−4.3	−3.3		7.2	9.8	3.4	5.6	4.8	4.0	2.6	
	1960	2.5	1.7	2.2	−0.8	1.4	6.4		12.4	1.6	5.0	4.2	3.4	1.9	
	1970	3.7	3.3	3.9	2.1	4.6	8.8	11.3		−8.1	1.5	1.6	1.2	−0.1	
	1980	1.1	0.4	0.5	−1.6	−0.7	0.2	−2.8	−15.1		12.3	6.9	4.6	2.0	
	1990	2.9	2.5	2.9	1.5	2.9	4.5	3.8	0.3	18.5		1.8	0.9	−1.0	
	2000	3.8	3.5	4.0	2.9	4.4	6.0	5.8	4.1	15.3	12.2		0.0	−2.3	
	2010	3.8	3.5	3.9	3.0	4.2	5.5	5.3	3.9	11.1	7.7	3.3		−4.2	
	2022	3.6	3.3	3.6	2.8	3.8	4.9	4.6	3.4	8.3	5.3	2.4	1.6		
Real equity capital gains	**1900**		2.5	2.0	3.5	0.8	1.4	2.5	3.8	1.7	3.0	3.4	3.4	3.4	**Equity premium vs bills**
	1910	2.2		1.6	4.0	0.3	1.1	2.5	4.0	1.6	3.1	3.5	3.5	3.5	
	1920	−0.9	−4.0		6.6	−0.3	0.9	2.7	4.5	1.7	3.3	3.8	3.7	3.6	
	1930	1.6	1.3	6.8		−6.8	−1.8	1.4	4.0	0.7	2.8	3.4	3.4	3.3	
	1940	−1.5	−2.6	−2.0	−10.0		3.5	5.8	7.9	2.7	4.8	5.2	4.9	4.6	
	1950	−2.3	−3.4	−3.2	−7.8	−5.6		8.2	10.2	2.4	5.2	5.6	5.2	4.8	
	1960	−1.5	−2.2	−1.8	−4.5	−1.6	2.6		12.3	−0.4	4.2	4.9	4.6	4.3	
	1970	−0.3	−0.7	0.0	−1.6	1.3	4.9	7.4		−11.6	0.4	2.6	2.8	2.8	
	1980	−2.7	−3.4	−3.3	−5.2	−4.0	−3.5	−6.4	−18.4		13.9	10.5	8.0	6.5	
	1990	−1.3	−1.7	−1.4	−2.7	−1.1	0.0	−0.9	−4.7	11.2		7.1	5.2	4.3	
	2000	−0.3	−0.6	−0.2	−1.1	0.4	1.7	1.4	−0.5	9.9	8.6		3.3	3.1	
	2010	−0.4	−0.6	−0.3	−1.1	0.2	1.2	1.0	−0.6	6.2	3.8	−0.8		2.9	
	2022	−0.8	−1.0	−0.8	−1.5	−0.5	0.3	−0.1	−1.5	3.1	0.6	−2.8	−4.4		
Real bonds	**1900**		3.8	2.3	0.4	0.3	1.3	1.2	1.0	0.4	0.5	1.0	1.2	1.8	**Bond maturity premium**
	1910	7.6		1.0	−1.2	−0.8	0.6	0.7	0.6	−0.1	0.1	0.7	0.9	1.6	
	1920	3.5	−0.5		−3.3	−1.6	0.5	0.6	0.5	−0.2	0.0	0.7	0.9	1.7	
	1930	2.7	0.4	1.3		0.1	2.5	2.0	1.5	0.4	0.6	1.2	1.5	2.2	
	1940	2.5	0.8	1.5	1.7		5.1	3.0	1.9	0.5	0.7	1.4	1.7	2.5	
	1950	1.6	0.2	0.4	−0.1	−1.8		0.9	0.4	−1.0	−0.4	0.7	1.1	2.2	
	1960	1.2	0.0	0.1	−0.3	−1.3	−0.7		−0.1	−1.9	−0.8	0.7	1.2	2.4	
	1970	0.9	−0.2	−0.1	−0.5	−1.2	−0.8	−1.0		−3.8	−1.2	0.9	1.5	2.8	
	1980	−0.2	−1.3	−1.4	−1.9	−2.8	−3.1	−4.3	−7.6		1.5	3.3	3.3	4.5	
	1990	0.4	−0.4	−0.4	−0.7	−1.2	−1.0	−1.2	−1.2	5.5		5.2	4.3	5.4	
	2000	1.4	0.7	0.8	0.8	0.6	1.1	1.6	2.4	7.8	10.1		3.3	5.5	
	2010	1.5	0.9	1.1	1.1	1.0	1.5	1.9	2.6	6.3	6.7	3.3		7.4	
	2022	2.0	1.5	1.7	1.7	1.7	2.2	2.7	3.4	6.2	6.4	4.8	6.0		
Real bills	**1900**		0.5	3.3	2.3	2.7	4.4	4.6	4.8	6.0	6.4	6.2	5.9	5.4	**Inflation**
	1910	3.7		6.1	3.2	3.4	5.4	5.5	5.5	6.8	7.2	6.8	6.4	5.9	
	1920	1.1	−1.5		0.4	2.1	5.1	5.3	5.4	6.9	7.3	6.9	6.4	5.9	
	1930	2.3	1.6	4.8		3.8	7.6	7.0	6.7	8.2	8.5	7.9	7.2	6.5	
	1940	2.2	1.6	3.2	1.7		11.4	8.6	7.7	9.4	9.5	8.5	7.7	6.8	
	1950	0.3	−0.5	−0.2	−2.5	−6.6		5.9	5.8	8.7	9.0	8.0	7.1	6.2	
	1960	0.0	−0.7	−0.5	−2.2	−4.1	−1.6		5.8	10.1	10.0	8.5	7.4	6.2	
	1970	−0.1	−0.7	−0.6	−1.9	−3.1	−1.2	−0.9		14.7	12.2	9.4	7.8	6.3	
	1980	−0.6	−1.2	−1.2	−2.3	−3.3	−2.2	−2.4	−4.0		9.8	6.9	5.6	4.4	
	1990	−0.1	−0.6	−0.4	−1.3	−1.9	−0.7	−0.4	−0.1	4.0		4.0	3.5	2.7	
	2000	0.4	0.0	0.2	−0.5	−0.8	0.4	0.9	1.5	4.3	4.7		2.9	2.1	
	2010	0.3	0.0	0.2	−0.4	−0.7	0.3	0.7	1.1	2.9	2.3	0.0		1.5	
	2022	0.2	−0.1	0.0	−0.5	−0.8	0.1	0.3	0.6	1.7	1.0	−0.7	−1.3		
Real exchange rate vs USD	**1900**		1.9	1.4	−0.4	−1.0	−3.8	−3.6	−3.4	−2.8	−3.0	−3.2	−2.6	−2.5	**Exchange rate vs USD**
	1910	1.5		0.8	−1.5	−2.0	−5.2	−4.7	−4.3	−3.5	−3.7	−3.7	−3.0	−2.9	
	1920	0.6	−0.3		−3.7	−3.3	−7.2	−6.0	−5.3	−4.2	−4.3	−4.2	−3.4	−3.2	
	1930	−0.4	−1.3	−2.4		−2.9	−8.9	−6.7	−5.7	−4.3	−4.4	−4.3	−3.4	−3.2	
	1940	0.4	0.1	0.2	2.9		−14.4	−8.6	−6.6	−4.6	−4.7	−4.6	−3.4	−3.2	
	1950	−1.7	−2.4	−3.1	−3.5	−9.5		−2.3	−2.4	−1.1	−2.0	−2.5	−1.5	−1.5	
	1960	−1.2	−1.7	−2.1	−2.0	−4.3	1.2		−2.6	−0.5	−2.0	−2.5	−1.3	−1.4	
	1970	−0.9	−1.3	−1.5	−1.3	−2.7	0.9	0.6		1.7	−1.7	−2.5	−1.0	−1.2	
	1980	0.2	0.0	0.1	0.6	0.0	3.4	4.5	8.6		−4.9	−4.5	−1.9	−1.9	
	1990	0.1	−0.1	0.0	0.4	−0.1	2.4	2.8	3.9	−0.6		−4.1	−0.3	−0.9	
	2000	−0.2	−0.4	−0.4	−0.1	−0.6	1.3	1.3	1.5	−1.9	−3.1		3.7	0.6	
	2010	0.2	0.0	0.1	0.4	0.0	1.7	1.8	2.1	0.1	0.4	4.1		−2.0	
	2022	−0.1	−0.2	−0.2	0.0	−0.4	1.0	1.0	1.0	−0.7	−0.7	0.4	−2.6		

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Sweden



Alfred Nobel bequeathed 94% of his wealth to establish and endow the five Nobel Prizes (first awarded in 1901). On a per-capita basis and including the Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel, Sweden has had 32 Nobel Laureates, one of the highest achievements, relative to its population, in the world.

Alfred Nobel had instructed that the prize fund be invested in safe securities. Were a Nobel prize to be awarded for investment returns, it would be given to Sweden for its achievement as the only country to have real returns for equities, bonds and bills all ranked in the top five.

The Stockholm Stock Exchange was founded in 1863 and is the primary securities exchange of the Nordic countries. Since 1998, it has been part of the OMX grouping. Over the long haul, Swedish equity returns were supported by a policy of neutrality through two world wars, the benefits of resource wealth, and the development of industrial holding companies in the 1980s. Since 1900, equities returned 6.3% per year in real terms.

In Sweden, industrials account for 39% of the market capitalization of the FTSE World Sweden index, while financials account for 24%. The largest companies are Atlas Copco (10% of the index), followed by Investor (9%) and Volvo 6%).

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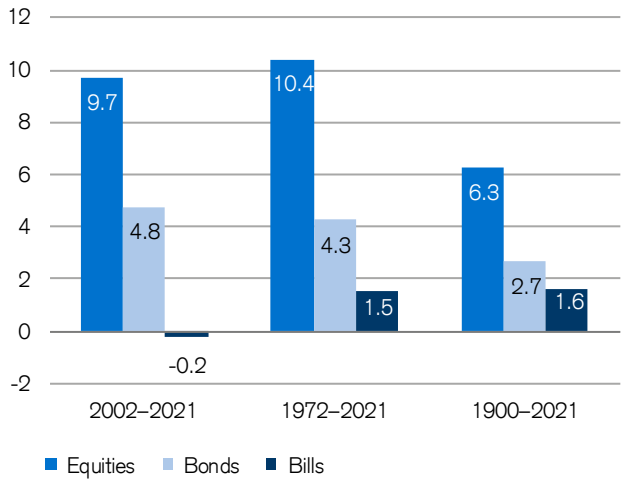
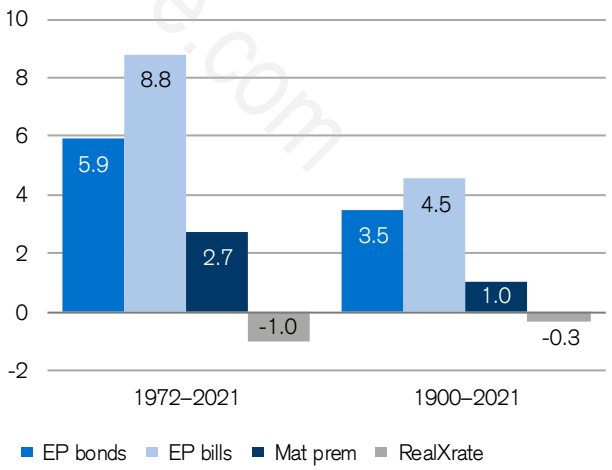
Figure 123: Annualized real returns and risk premiums (%) for Sweden, 1900–2021



Note: The three asset classes are equities, long-term government bonds, and Treasury bills. All returns include reinvested income, are adjusted for inflation, and are expressed as geometric mean returns.



Note: EP bonds and EP bills denote the equity premium relative to bonds and to bills; Mat prem denotes the maturity premium for bonds relative to bills; RealXRate denotes the inflation-adjusted change in the exchange rate against the US dollar.

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Figure 124: Real returns on Swedish asset classes, 1900–2021

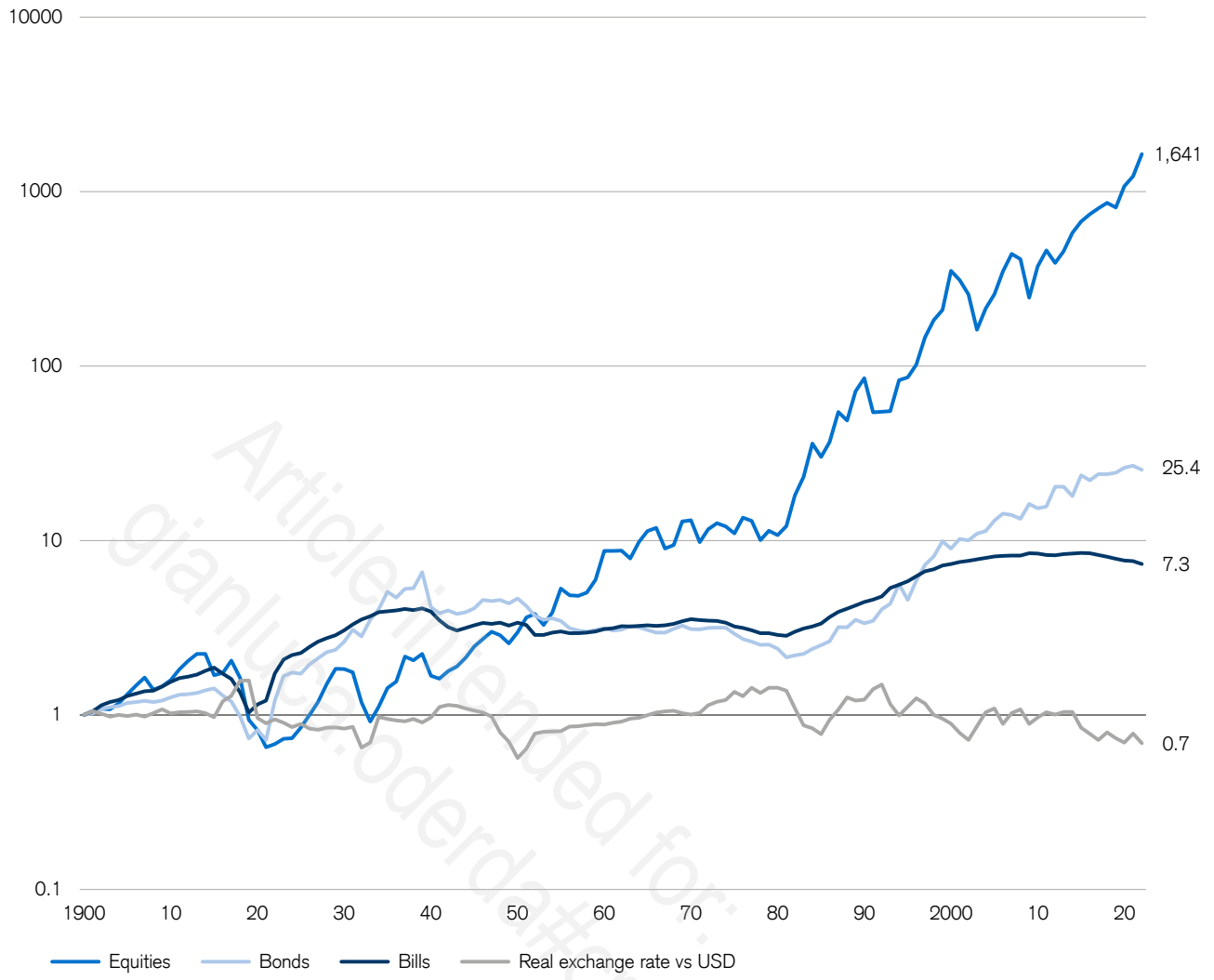

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Table 68: Returns on Swedish asset classes, 1900–2021

		Mean returns % p.a.					Annual returns %				10-year returns % p.a.				Current
Return	Asset	GM	AM	SE	SD	SC	Lowest		Highest		Lowest		Highest		year rank
Nominal	Equities	9.8	11.9	1.9	21.5	0.12	–39.3	2008	69.8	1999	–7.1	1923	32.4	1989	13
	Bonds	6.1	6.5	0.9	9.9	–0.22	–32.5	1939	35.0	1993	0.2	1957	15.4	1993	108
	Bills	5.0	5.1	0.3	3.4	0.93	–0.7	2018	15.2	1981	0.1	2020	12.6	1990	116
	Inflation	3.3	3.5	0.6	6.5	0.52	–25.2	1921	39.4	1918	–5.1	1930	10.2	1983	42
Real	Equities	6.3	8.4	1.9	21.0	0.10	–42.5	1918	67.5	1999	–10.6	1922	23.0	1989	14
	Bonds	2.7	3.4	1.2	12.7	0.03	–37.0	1939	68.2	1921	–5.8	1920	15.7	1930	102
	Bills	1.6	1.8	0.6	6.4	0.50	–23.2	1918	42.7	1921	–3.4	1918	10.7	1928	112
	Exchange rate	–0.3	0.3	1.0	10.9	0.15	–39.1	1919	40.6	1933	–7.1	2001	5.8	1941	110
Premiums	Equities vs bills	4.5	6.5	1.8	20.4	0.10	–41.8	2008	64.6	1999	–12.4	1922	17.7	1989	8
	Equities vs bonds	3.5	5.7	1.9	21.3	0.02	–50.6	2008	84.4	1999	–12.6	1922	19.0	1989	7
	Bonds vs bills	1.0	1.4	0.8	9.3	–0.26	–34.1	1939	30.4	2014	–3.0	1959	7.5	2004	75

GM=geometric mean; AM=arithmetic mean, SE=standard error of mean; SD=standard deviation; SC=serial correlation; 10-year returns to end of given year.
Source: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

Table 69: Swedish real returns, inflation and premiums, 1900–2021

	1 Jan	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000	2010	2022	
Real equity total returns	**1900**		2.3	0.0	–1.2	–2.2	–0.9	1.7	2.1	1.9	3.7	3.7	2.9	3.5	**Equity premium vs bonds**
	1910	4.7		–2.3	–2.9	–3.7	–1.7	1.6	2.0	1.8	3.8	3.9	3.0	3.6	
	1920	–1.0	–6.4		–3.5	–4.4	–1.5	2.6	2.9	2.5	4.7	4.7	3.6	4.2	
	1930	2.0	0.7	8.4		–5.3	–0.4	4.7	4.6	3.8	6.2	5.9	4.5	5.0	
	1940	1.3	0.2	3.7	–0.9		4.7	10.1	8.1	6.2	8.6	7.9	6.0	6.4	
	1950	2.2	1.6	4.4	2.5	5.9		15.8	9.9	6.7	9.6	8.6	6.3	6.6	
	1960	3.7	3.5	6.1	5.3	8.6	11.4		4.3	2.4	7.7	6.8	4.4	5.2	
	1970	3.7	3.6	5.7	5.0	7.1	7.7	4.1		0.6	9.4	7.7	4.5	5.4	
	1980	3.0	2.8	4.4	3.6	4.8	4.4	1.0	–1.9		19.0	11.5	5.8	6.6	
	1990	5.1	5.1	6.9	6.6	8.2	8.7	7.9	9.8	23.0		4.4	–0.2	3.0	
	2000	6.0	6.2	7.9	7.8	9.3	10.0	9.7	11.6	19.1	15.2		–4.6	2.3	
	2010	5.5	5.6	7.0	6.9	8.0	8.4	7.8	8.7	12.5	7.7	0.6		8.5	
	2022	6.3	6.4	7.7	7.7	8.8	9.2	8.8	9.7	12.7	9.7	7.2	13.1		
Real equity capital gains	**1900**		0.2	–1.7	–1.7	–2.1	–0.3	1.7	1.9	1.7	3.3	3.9	3.5	4.5	**Equity premium vs bills**
	1910	1.4		–3.6	–2.6	–2.8	–0.4	2.0	2.2	1.9	3.7	4.4	3.8	4.9	
	1920	–4.5	–10.1		–1.7	–2.5	0.7	3.5	3.4	2.8	4.8	5.4	4.7	5.8	
	1930	–2.2	–3.9	2.7		–3.3	1.9	5.3	4.7	3.7	5.9	6.5	5.5	6.7	
	1940	–3.1	–4.5	–1.6	–5.7		7.4	9.8	7.4	5.6	7.9	8.2	6.8	7.9	
	1950	–2.2	–3.1	–0.7	–2.3	1.1		12.3	7.4	4.9	8.0	8.3	6.7	8.0	
	1960	–0.8	–1.2	1.1	0.6	3.9	6.9		2.8	1.4	6.6	7.4	5.7	7.3	
	1970	–0.6	–0.9	1.0	0.6	2.8	3.7	0.6		0.1	8.6	8.9	6.4	8.2	
	1980	–1.2	–1.6	–0.1	–0.7	0.6	0.4	–2.6	–5.8		17.7	13.6	8.6	10.2	
	1990	0.9	0.8	2.5	2.4	4.1	4.9	4.3	6.2	19.7		9.6	4.3	8.0	
	2000	2.0	2.0	3.7	3.8	5.5	6.4	6.3	8.2	16.0	12.5		–0.8	7.2	
	2010	1.6	1.6	3.0	3.0	4.3	4.9	4.5	5.5	9.5	4.8	–2.4		14.5	
	2022	2.3	2.4	3.7	3.8	5.1	5.6	5.4	6.4	9.5	6.5	3.9	9.5		
Real bonds	**1900**		–2.0	–1.7	–0.5	0.2	0.6	0.0	–0.2	–0.2	–0.3	0.2	0.5	1.0	**Bond maturity premium**
	1910	2.4		–1.4	0.3	0.9	1.3	0.4	0.1	0.0	–0.1	0.5	0.8	1.3	
	1920	–1.0	–4.2		1.9	2.0	2.2	0.9	0.4	0.3	0.1	0.7	1.0	1.6	
	1930	3.3	3.7	12.4		2.2	2.4	0.5	0.1	–0.1	–0.2	0.5	0.9	1.5	
	1940	3.6	4.0	8.5	4.7		2.6	–0.2	–0.6	–0.6	–0.7	0.2	0.8	1.5	
	1950	3.1	3.3	6.0	2.9	1.1		–3.0	–2.2	–1.6	–1.5	–0.2	0.5	1.3	
	1960	1.9	1.8	3.4	0.6	–1.4	–3.8		–1.4	–1.0	–1.0	0.5	1.2	2.0	
	1970	1.6	1.5	2.7	0.4	–1.0	–2.0	–0.1		–0.5	–0.8	1.1	1.8	2.7	
	1980	1.1	0.9	1.8	–0.2	–1.4	–2.2	–1.3	–2.5		–1.0	1.9	2.6	3.4	
	1990	1.4	1.2	2.0	0.4	–0.4	–0.8	0.2	0.4	3.4		5.0	4.5	4.9	
	2000	2.2	2.2	3.0	1.8	1.3	1.3	2.7	3.6	6.8	10.4		4.0	4.8	
	2010	2.5	2.5	3.3	2.2	1.9	2.0	3.2	4.1	6.4	7.9	5.5		5.5	
	2022	2.7	2.7	3.4	2.5	2.2	2.4	3.4	4.1	5.8	6.5	4.8	4.3		
Real bills	**1900**		1.0	4.8	1.6	1.4	1.9	2.4	2.6	3.3	3.8	3.7	3.5	3.3	**Inflation**
	1910	4.5		8.8	1.9	1.5	2.2	2.6	2.8	3.7	4.2	4.0	3.8	3.5	
	1920	0.7	–2.9		–4.6	–2.0	0.1	1.1	1.7	2.8	3.5	3.4	3.2	3.0	
	1930	3.8	3.5	10.3		0.6	2.5	3.1	3.3	4.4	4.9	4.6	4.3	3.9	
	1940	3.5	3.1	6.3	2.5		4.3	4.4	4.2	5.3	5.8	5.3	4.8	4.3	
	1950	2.5	2.0	3.7	0.5	–1.4		4.4	4.1	5.7	6.2	5.5	4.8	4.3	
	1960	1.9	1.4	2.5	0.0	–1.1	–0.8		3.8	6.3	6.8	5.8	4.9	4.2	
	1970	1.8	1.4	2.3	0.4	–0.3	0.2	1.3		8.8	8.2	6.5	5.2	4.3	
	1980	1.3	0.9	1.5	–0.1	–0.8	–0.5	–0.4	–2.1		7.7	5.3	4.0	3.2	
	1990	1.7	1.3	1.9	0.6	0.3	0.7	1.2	1.2	4.5		3.0	2.3	1.9	
	2000	2.0	1.7	2.3	1.3	1.1	1.6	2.2	2.5	4.8	5.1		1.5	1.4	
	2010	2.0	1.7	2.2	1.3	1.1	1.5	2.0	2.2	3.7	3.3	1.4		1.3	
	2022	1.6	1.4	1.8	1.0	0.8	1.1	1.4	1.4	2.3	1.6	0.0	–1.2		
Real exchange rate vs USD	**1900**		0.2	–1.0	0.1	–0.2	–1.0	–0.5	–0.4	–0.1	–0.5	–0.8	–0.6	–0.7	**Exchange rate vs USD**
	1910	0.2		–2.1	0.1	–0.3	–1.3	–0.6	–0.5	–0.1	–0.6	–0.9	–0.6	–0.8	
	1920	–0.2	–0.6		2.4	0.6	–1.1	–0.2	–0.2	0.2	–0.4	–0.7	–0.5	–0.6	
	1930	–0.6	–1.0	–1.4		–1.2	–2.8	–1.1	–0.8	–0.2	–0.8	–1.2	–0.8	–1.0	
	1940	–0.1	–0.2	0.0	1.5		–4.3	–1.1	–0.7	0.0	–0.8	–1.2	–0.8	–0.9	
	1950	–1.1	–1.5	–1.7	–1.9	–5.2		2.3	1.2	1.5	0.1	–0.5	–0.2	–0.5	
	1960	–0.2	–0.3	–0.2	0.2	–0.5	4.5		0.0	1.1	–0.6	–1.2	–0.6	–0.9	
	1970	0.0	0.0	0.1	0.5	0.1	2.9	1.3		2.2	–0.9	–1.7	–0.8	–1.1	
	1980	0.4	0.5	0.7	1.1	1.0	3.1	2.5	3.6		–3.9	–3.5	–1.8	–1.8	
	1990	0.2	0.2	0.3	0.6	0.5	1.9	1.1	1.0	–1.6		–3.2	–0.7	–1.2	
	2000	–0.1	–0.1	–0.1	0.1	–0.1	0.9	0.0	–0.4	–2.3	–3.1		1.8	–0.3	
	2010	0.0	–0.1	0.0	0.2	0.0	0.9	0.2	–0.1	–1.3	–1.2	0.8		–2.0	
	2022	–0.3	–0.3	–0.3	–0.2	–0.4	0.3	–0.4	–0.7	–1.7	–1.8	–1.2	–2.8		

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Switzerland



For a small country with just 0.1% of the world's population and less than 0.01% of its land mass, Switzerland punches well above its weight financially and wins several "gold medals" when it comes to global financial performance.

The Swiss stock market traces its origins to exchanges in Geneva (1850), Zurich (1873), and Basel (1876). It is now the world's sixth-largest equity market, accounting for 2.6% of total world value. Since 1900, Swiss equities have achieved a real return of 4.7% (equal to the median across our countries).

Meanwhile, Switzerland has been the world's best-performing government bond market, with an annualized real USD return of 3.0% (it ranks second in real local currency return terms, with an annualized return since 1900 of 2.3%). Switzerland has also had the world's lowest 122-year inflation rate of just 2.1%.

Switzerland is one of the world's most important banking centers, and private banking has been a major Swiss competence for over 300 years. Swiss neutrality, sound economic policy, low inflation and a strong currency have bolstered the country's reputation as a safe haven.

A large proportion of all cross-border private assets invested worldwide is still managed in Switzerland.

Switzerland's healthcare industry accounts for over a third (36%) of the value of the FTSE World Switzerland Index. Nestle (21%), Roche (17%), and Novartis (10%) together account for half of the index's value.

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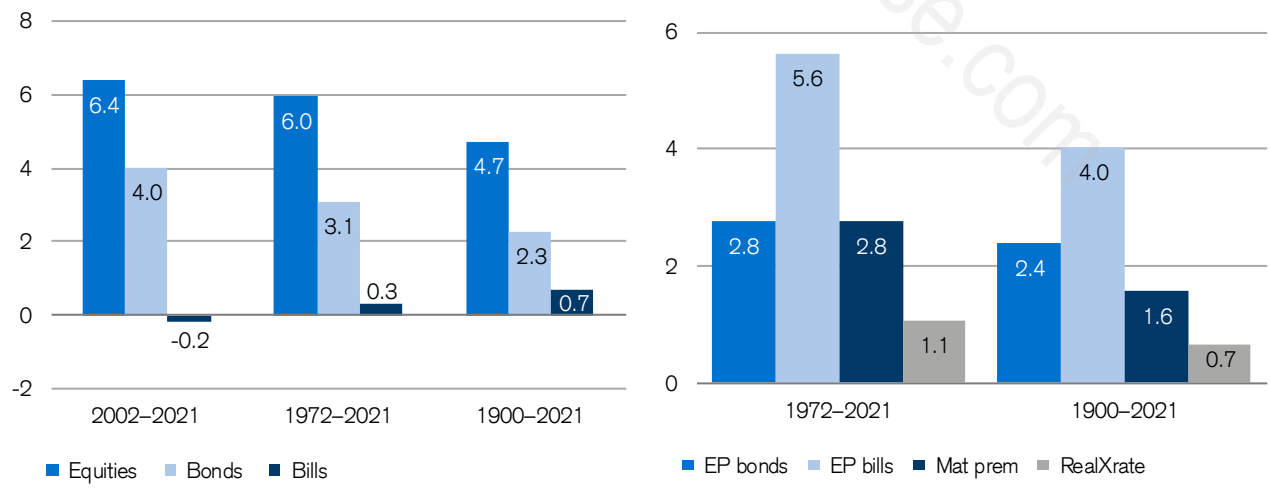
Figure 125: Annualized real returns and risk premiums (%) for Switzerland, 1900–2021



Note: The three asset classes are equities, long-term government bonds, and Treasury bills. All returns include reinvested income, are adjusted for inflation, and are expressed as geometric mean returns.

Note: EP bonds and EP bills denote the equity premium relative to bonds and to bills; Mat prem denotes the maturity premium for bonds relative to bills; RealXRate denotes the inflation-adjusted change in the exchange rate against the US dollar.

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Figure 126: Real returns on Swiss asset classes, 1900–2021

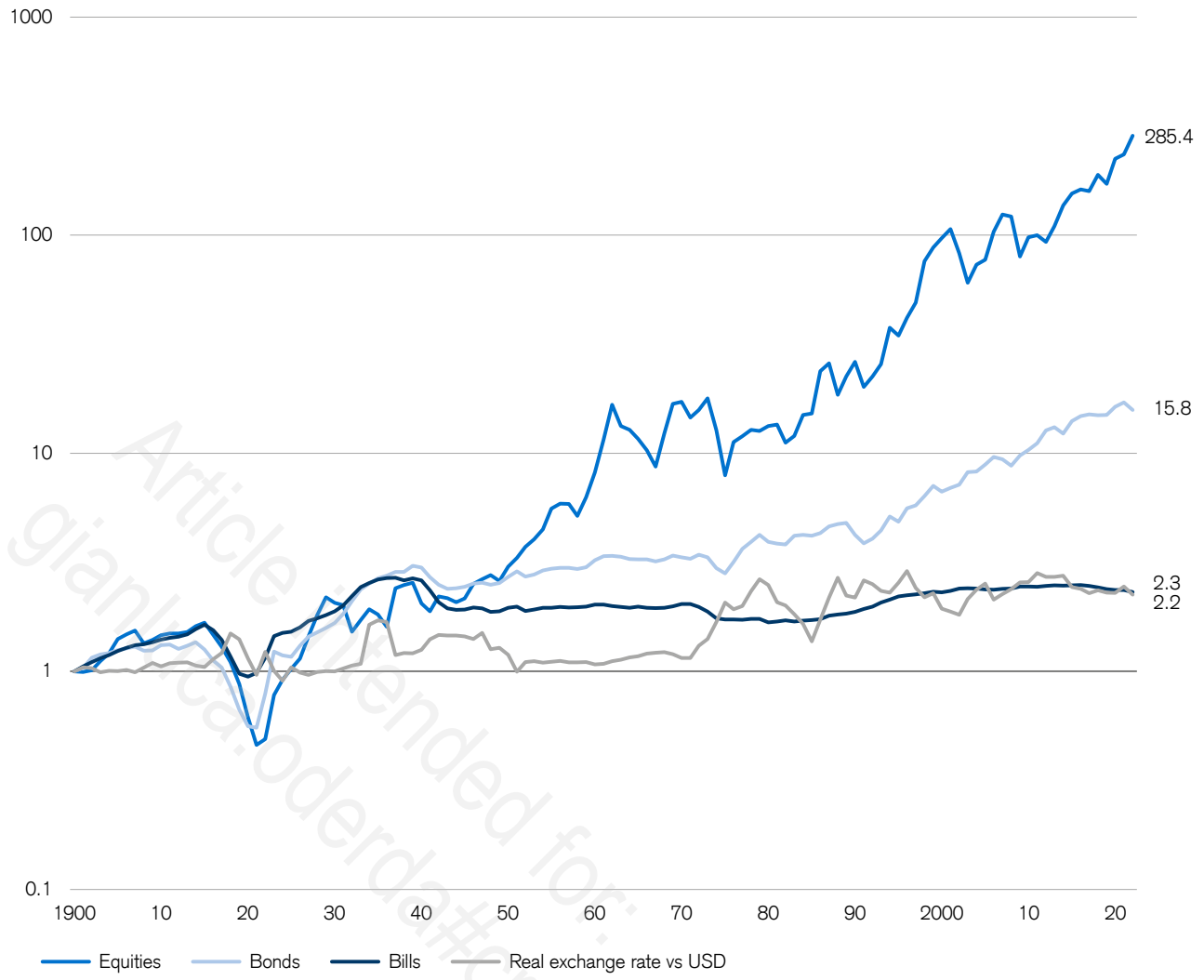

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Table 70: Returns on Swiss asset classes, 1900–2021

		Mean returns % p.a.					Annual returns %				10-year returns % p.a.				Current
Return	Asset	GM	AM	SE	SD	SC	Lowest		Highest		Lowest		Highest		year rank
Nominal	Equities	6.9	8.5	1.7	18.6	0.08	–34.1	2008	61.4	1985	–4.2	1921	20.2	2000	20
	Bonds	4.4	4.6	0.5	6.0	0.12	–8.9	1919	28.4	1922	–0.5	1920	8.8	1930	118
	Bills	2.8	2.8	0.2	2.0	0.86	–0.9	2016	8.6	1990	–0.5	2020	5.5	1994	117
	Inflation	2.1	2.2	0.5	5.0	0.71	–17.7	1922	25.7	1918	–3.5	1930	8.8	1919	58
Real	Equities	4.7	6.5	1.7	19.3	0.15	–37.8	1974	59.4	1922	–11.1	1920	18.2	2000	21
	Bonds	2.3	2.7	0.8	9.3	0.40	–21.4	1918	56.1	1922	–8.4	1920	12.7	1930	113
	Bills	0.7	0.8	0.4	4.8	0.68	–16.5	1918	25.8	1922	–3.8	1919	7.4	1930	107
	Exchange rate	0.7	1.2	1.0	10.9	0.07	–29.3	1936	51.2	1933	–4.0	1984	8.2	1978	105
Premiums	Equities vs bills	4.0	5.7	1.7	18.5	0.10	–37.0	1974	54.8	1985	–8.5	1921	15.9	2000	16
	Equities vs bonds	2.4	3.9	1.6	17.4	0.08	–41.3	2008	51.9	1985	–6.2	1921	13.7	1961	9
	Bonds vs bills	1.6	1.8	0.6	6.1	0.19	–13.4	1919	24.1	1922	–5.0	1920	5.6	2011	110

GM=geometric mean; AM=arithmetic mean, SE=standard error of mean; SD=standard deviation; SC=serial correlation; 10-year returns to end of given year.
Source: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

Table 71: Swiss real returns, inflation and premiums, 1900–2021

	1 Jan	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000	2010	2022	
Real equity total returns	**1900**		1.1	0.5	0.7	–0.9	0.2	1.6	2.4	1.5	2.1	2.7	2.1	2.4	**Equity premium vs bonds**
	1910	3.9		–0.2	0.5	–1.6	0.0	1.7	2.6	1.6	2.2	2.9	2.2	2.5	
	1920	–2.4	–8.3		1.2	–2.3	0.1	2.1	3.1	1.9	2.5	3.3	2.4	2.8	
	1930	2.4	1.7	12.9		–5.7	–0.5	2.4	3.6	2.0	2.7	3.6	2.6	3.0	
	1940	1.8	1.1	6.2	–0.1		5.0	6.7	7.0	4.1	4.5	5.2	3.8	4.1	
	1950	2.2	1.8	5.5	1.9	4.0		8.5	8.0	3.8	4.4	5.3	3.6	3.9	
	1960	3.6	3.5	6.7	4.7	7.2	10.4		7.4	1.5	3.0	4.5	2.7	3.2	
	1970	4.1	4.2	6.9	5.4	7.3	9.1	7.7		–4.1	0.9	3.5	1.5	2.4	
	1980	3.3	3.2	5.3	3.8	4.8	5.1	2.5	–2.5		6.2	7.6	3.5	4.1	
	1990	3.7	3.7	5.5	4.3	5.2	5.6	4.0	2.1	7.0		8.9	2.1	3.4	
	2000	4.7	4.8	6.5	5.7	6.6	7.2	6.4	5.9	10.4	14.0		–4.2	1.0	
	2010	4.3	4.3	5.8	4.9	5.7	6.0	5.1	4.4	6.9	6.8	0.1		5.6	
	2022	4.7	4.8	6.2	5.5	6.2	6.5	5.9	5.5	7.6	7.7	5.0	9.3		
Real equity capital gains	**1900**		0.5	–2.1	0.3	–0.6	0.9	2.4	3.1	2.6	3.0	3.8	3.4	4.0	**Equity premium vs bills**
	1910	0.5		–4.7	0.2	–1.0	1.0	2.7	3.5	2.9	3.3	4.2	3.7	4.3	
	1920	–6.7	–13.3		5.3	0.9	2.9	4.7	5.3	4.3	4.5	5.3	4.7	5.3	
	1930	–2.4	–3.8	6.7		–3.3	1.7	4.4	5.2	4.0	4.3	5.4	4.6	5.3	
	1940	–2.9	–3.9	1.1	–4.2		7.0	8.5	8.2	6.0	5.9	6.9	5.8	6.4	
	1950	–2.4	–3.1	0.5	–2.4	–0.6		10.1	8.9	5.6	5.7	6.8	5.6	6.3	
	1960	–0.9	–1.2	2.1	0.6	3.2	7.1		7.7	3.4	4.2	6.0	4.7	5.7	
	1970	0.0	–0.1	2.8	1.9	4.0	6.4	5.6		–0.6	2.6	5.5	4.0	5.3	
	1980	–0.7	–0.8	1.4	0.4	1.6	2.3	0.0	–5.4		5.9	8.7	5.5	6.7	
	1990	–0.1	–0.2	1.8	1.0	2.1	2.8	1.4	–0.6	4.4		11.6	5.4	7.0	
	2000	1.0	1.1	3.0	2.5	3.7	4.6	3.9	3.4	8.0	11.8		–0.5	5.0	
	2010	0.7	0.8	2.5	1.9	2.9	3.5	2.7	2.0	4.6	4.8	–1.9		9.9	
	2022	1.4	1.4	3.0	2.6	3.5	4.1	3.6	3.2	5.3	5.7	3.0	7.2		
Real bonds	**1900**		–0.6	–2.6	–0.4	0.3	0.7	0.8	0.7	1.1	0.9	1.1	1.3	1.6	**Bond maturity premium**
	1910	2.8		–4.5	–0.3	0.7	1.0	1.1	0.9	1.3	1.1	1.3	1.5	1.8	
	1920	–2.9	–8.2		4.1	3.3	2.9	2.5	2.0	2.3	1.9	2.0	2.2	2.4	
	1930	1.7	1.2	11.5		2.6	2.3	2.0	1.5	2.0	1.6	1.7	2.0	2.2	
	1940	2.8	2.8	8.7	6.0		1.9	1.7	1.2	1.8	1.4	1.6	1.9	2.2	
	1950	2.0	1.8	5.4	2.5	–1.0		1.4	0.8	1.8	1.2	1.5	1.9	2.2	
	1960	2.0	1.8	4.5	2.2	0.4	1.8		0.2	1.9	1.2	1.5	2.0	2.4	
	1970	1.7	1.6	3.6	1.7	0.4	1.0	0.3		3.6	1.6	1.9	2.4	2.8	
	1980	1.7	1.6	3.3	1.7	0.7	1.2	1.0	1.7		–0.4	1.1	2.0	2.6	
	1990	1.6	1.5	2.9	1.6	0.7	1.1	0.9	1.2	0.7		2.5	3.2	3.5	
	2000	1.9	1.8	3.1	2.0	1.3	1.8	1.8	2.3	2.7	4.7		3.9	4.0	
	2010	2.1	2.1	3.3	2.3	1.8	2.3	2.4	2.9	3.3	4.6	4.5		4.1	
	2022	2.3	2.2	3.3	2.5	2.1	2.5	2.6	3.0	3.4	4.2	4.0	3.6		
Real bills	**1900**		1.3	5.0	2.2	1.3	2.0	1.8	2.0	2.4	2.5	2.5	2.3	2.1	**Inflation**
	1910	3.4		8.8	2.7	1.3	2.1	1.9	2.2	2.6	2.7	2.6	2.4	2.2	
	1920	–0.3	–3.8		–3.1	–2.2	0.0	0.3	0.9	1.5	1.8	1.8	1.7	1.5	
	1930	2.1	1.5	7.1		–1.3	1.6	1.5	1.9	2.5	2.6	2.6	2.4	2.1	
	1940	2.4	2.1	5.2	3.3		4.5	2.8	3.0	3.5	3.4	3.2	2.9	2.5	
	1950	1.3	0.8	2.5	0.2	–2.9		1.2	2.2	3.1	3.2	3.0	2.6	2.2	
	1960	1.2	0.7	1.9	0.2	–1.3	0.3		3.2	4.1	3.8	3.4	2.9	2.3	
	1970	1.0	0.6	1.5	0.2	–0.8	0.2	0.1		5.0	4.2	3.5	2.8	2.2	
	1980	0.6	0.3	1.0	–0.2	–1.1	–0.5	–0.9	–1.9		3.4	2.7	2.1	1.5	
	1990	0.7	0.4	1.0	0.0	–0.7	–0.1	–0.3	–0.4	1.1		2.1	1.5	1.0	
	2000	0.8	0.6	1.1	0.3	–0.2	0.3	0.3	0.4	1.6	2.1		0.9	0.4	
	2010	0.8	0.6	1.1	0.3	–0.1	0.4	0.4	0.5	1.3	1.4	0.6		0.0	
	2022	0.7	0.5	0.9	0.2	–0.1	0.2	0.2	0.2	0.8	0.7	0.0	–0.5		
Real exchange rate vs USD	**1900**		0.3	–0.2	0.1	0.5	0.4	0.4	0.3	1.5	1.4	1.2	1.5	1.5	**Exchange rate vs USD**
	1910	0.5		–0.7	0.1	0.6	0.5	0.4	0.3	1.7	1.5	1.3	1.6	1.6	
	1920	0.7	0.8		0.9	1.2	0.9	0.7	0.5	2.1	1.9	1.6	1.9	1.8	
	1930	0.0	–0.3	–1.3		1.5	0.9	0.6	0.4	2.4	2.0	1.7	2.0	1.9	
	1940	0.6	0.6	0.5	2.3		0.3	0.1	0.1	2.6	2.1	1.7	2.1	1.9	
	1950	0.4	0.3	0.1	0.9	–0.5		0.0	0.0	3.4	2.6	2.0	2.4	2.2	
	1960	0.1	0.0	–0.2	0.2	–0.8	–1.0		0.0	5.1	3.5	2.5	2.9	2.5	
	1970	0.2	0.1	0.0	0.3	–0.3	–0.2	0.7		10.5	5.3	3.4	3.6	3.0	
	1980	1.1	1.2	1.3	1.8	1.7	2.5	4.3	8.0		0.3	0.0	1.5	1.3	
	1990	0.9	0.9	0.9	1.3	1.1	1.5	2.4	3.2	–1.3		–0.4	2.0	1.6	
	2000	0.7	0.7	0.7	1.0	0.7	1.0	1.5	1.8	–1.2	–1.1		4.5	2.6	
	2010	0.9	0.9	0.9	1.2	1.0	1.3	1.8	2.0	0.1	0.8	2.8		1.0	
	2022	0.7	0.7	0.7	0.9	0.7	0.9	1.2	1.3	–0.2	0.1	0.7	–1.1		

Source: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

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Taiwan (Chinese Taipei)



In 1544, Portuguese explorers sighted an island between mainland China and Japan and named it “Ilha Formosa” or “beautiful island." It was given the name “Taiwan” by the Dutch East India Company in 1624. From 1895 to 1945, Taiwan was a Japanese colony before its return to Nationalist Chinese control. Although Chinese Taipei is not a member of the United Nations, it would rank 21st (equivalent to Luxembourg) in the latest Human Development Index if it were to be included.

The country became one of the “Asian tigers” following a period of remarkable economic growth through industrialization in the mid-1960s and then capital-intensive and knowledge-based industries in the 1980s. Taiwan (Chinese Taipei) is a democracy with a booming economy as a major exporter of electronics and other high-tech products.

The Taiwan Stock Exchange began operating in 1962 and is now the world's tenth largest equity market, with technology accounting for 69% of the market capitalization of the FTSE World Taiwan Index.

Taiwan Semiconductor (41% of the index) is the world's second most valuable semi-conductor company (just behind NVIDIA), helped by its status as the leading supplier to Apple.

Our data for Taiwan starts in 1967, except for bonds which begin in 1995.

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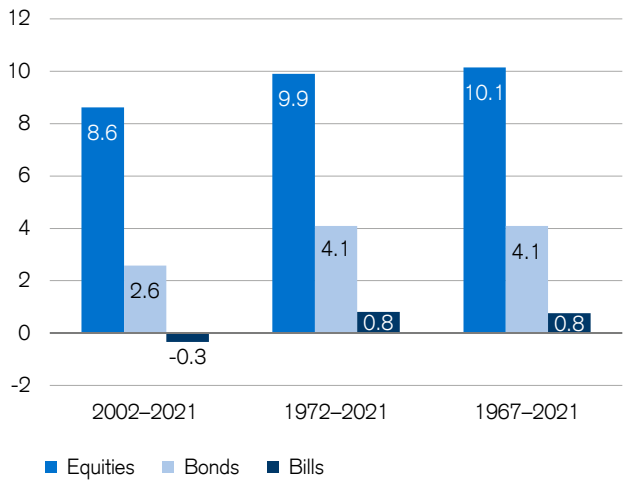
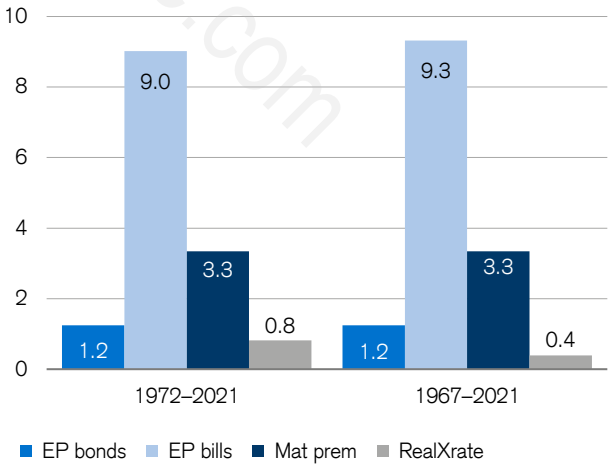
Figure 127: Annualized real returns and risk premiums (%) for Taiwan (Chinese Taipei), 1967–2021 (bonds from 1995)



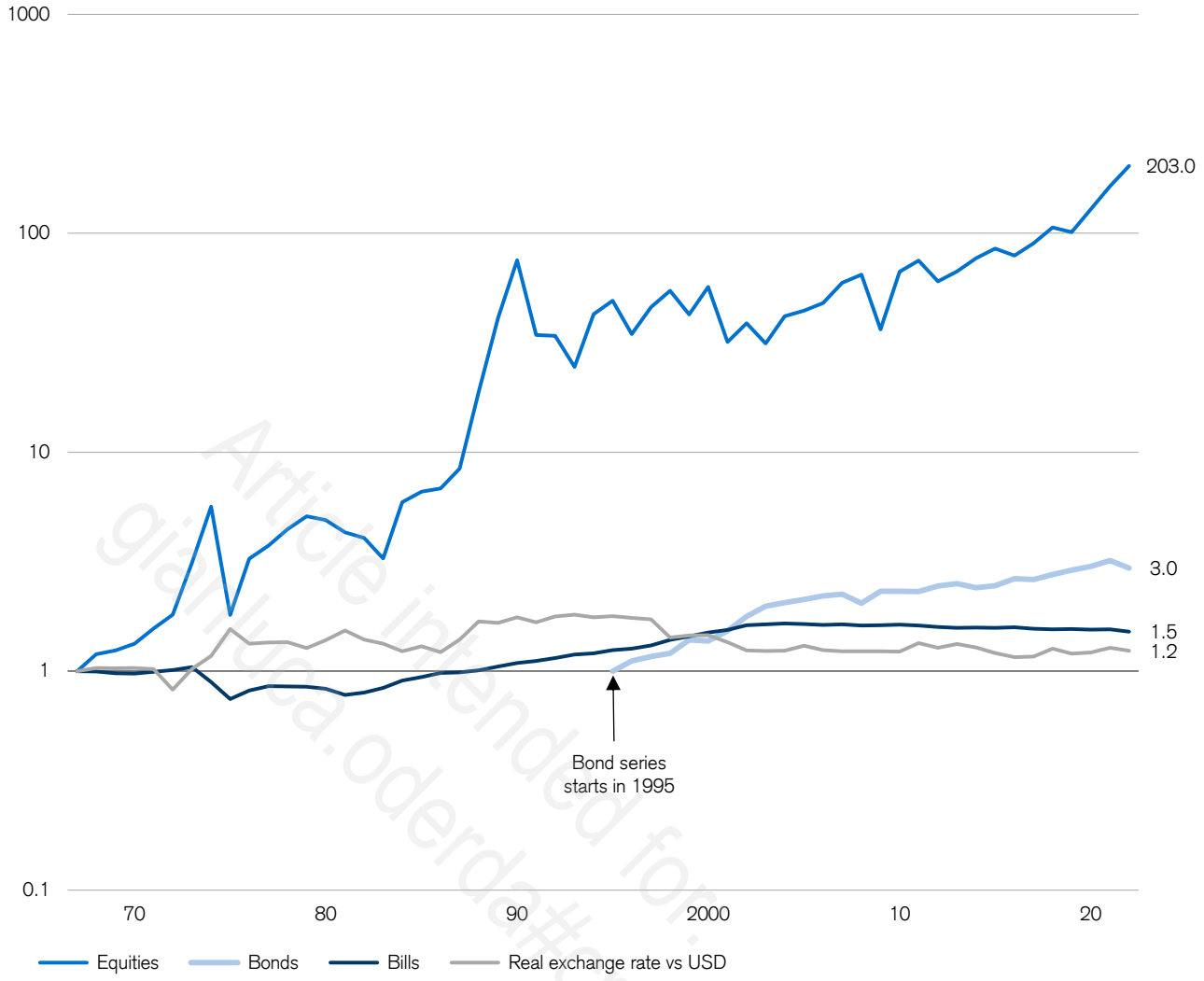
Note: The three asset classes are equities, long-term government bonds, and Treasury bills. All returns include reinvested income, are adjusted for inflation, and are expressed as geometric mean returns.



Note: EP bonds and EP bills denote the equity premium relative to bonds and to bills; Mat prem denotes the maturity premium for bonds relative to bills; RealXRate denotes the inflation-adjusted change in the exchange rate against the US dollar.

Source: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

Figure 128: Real returns on Taiwan (Chinese Taipei) asset classes, 1967–2021 (bonds from 1995)



Sources: Elroy Dimson, Paul Marsh, and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

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Table 72: Returns on Taiwan (Chinese Taipei) asset classes, 1967–2021 (bonds from 1995)

		Mean returns % p.a.					Annual returns %				10-year returns % p.a.				Current
Return	**Asset**	**GM**	**AM**	**SE**	**SD**	**SC**	**Lowest**		**Highest**		**Lowest**		**Highest**		**year rank**
Nominal	Equities	14.1	20.7	5.5	40.6	–0.02	–57.1	1974	128.1	1987	–0.6	2008	36.6	1989	19
	Bonds	5.3	5.5	1.2	6.3	–0.14	–5.8	2007	17.7	1998	2.8	2016	9.1	2004	28
	Bills	4.4	4.4	0.5	3.5	0.90	0.2	2021	14.4	1980	0.4	2018	9.4	1983	56
	Inflation	3.6	3.8	0.8	6.3	0.48	–1.7	2001	34.0	1974	0.8	2006	11.8	1981	23
Real	Equities	10.1	16.8	5.3	39.3	–0.02	–68.0	1974	123.8	1987	–2.8	1999	31.4	1989	16
	Bonds	4.1	4.3	1.2	6.3	–0.08	–8.9	2007	16.2	2001	1.5	2014	7.8	2004	28
	Bills	0.8	0.9	0.6	4.2	0.33	–16.5	1974	9.3	1975	–2.4	1980	3.7	1991	54
	Exchange rate	0.4	0.8	1.2	9.1	–0.03	–19.3	1971	32.8	1974	–3.7	2002	5.4	1981	40
Premiums	Equities vs bills	9.3	15.7	5.2	38.6	–0.02	–61.6	1974	119.2	1987	–5.8	1999	27.9	1989	15
	Equities vs bonds	1.2	5.6	5.6	29.2	–0.43	–50.4	2008	83.8	2009	–8.2	2004	8.4	2018	4
	Bonds vs bills	3.3	3.5	1.1	5.5	–0.30	–7.5	2007	12.8	2008	1.9	2014	4.9	2004	28

GM=geometric mean; AM=arithmetic mean, SE=standard error of mean; SD=standard deviation; SC=serial correlation; 10-year returns to end of given year.
Source: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

Table 73: Taiwan (Chinese Taipei) real returns, inflation and premiums, 1967–2021 (bonds from 1995)

Real equity total returns

1 Jan	1900	1910	1920	1930	1940	1950	1967	1970	1980	1990	2000	2010	2022	Equity premium vs bonds
1900														
1910														
1920														
1930														
1940														
1950														
1967								10.1						
1970							13.0	13.9						
1980							20.7	22.4	31.4		–3.4	–3.5	1.2	
1990							13.0	13.3	13.0	–2.8		–3.6	2.3	
2000							10.3	10.3	9.1	–0.6	1.6		7.5	
2010							10.1	10.1	9.3	3.1	6.0	9.7		
2022														

Real equity capital gains

1 Jan	1900	1910	1920	1930	1940	1950	1967	1970	1980	1990	2000	2010	2022	Equity premium vs bills
1900														
1910														
1920														
1930														
1940														
1950														
1967								11.0	14.6	20.2	11.6	9.0	9.3	
1970							0.6		15.7	21.7	11.7	8.9	9.2	
1980							5.7	7.3		27.9	9.7	6.7	7.7	
1990							15.0	17.3	28.2		–5.8	–2.6	2.1	
2000							8.8	9.7	10.9	–4.0		0.8	5.9	
2010							6.4	6.9	6.7	–2.7	–1.2		10.4	
2022							6.3	6.6	6.4	0.4	2.5	5.8		

Real bonds

1 Jan	1900	1910	1920	1930	1940	1950	1967	1970	1980	1990	2000	2010	2022	Bond maturity premium
1900														
1910														
1920														
1930														
1940														
1950														
1967														
1970														
1980														
1990											2.7	3.9	3.3	
2000										6.5		4.5	3.5	
2010										5.8	5.4		2.7	
2022										4.1	3.5	2.0		

Real bills

1 Jan	1900	1910	1920	1930	1940	1950	1967	1970	1980	1990	2000	2010	2022	Inflation
1900														
1910														
1920														
1930														
1940														
1950														
1967								5.4	8.4	6.5	5.4	4.3	3.6	
1970							–0.8		9.3	6.6	5.4	4.2	3.5	
1980							–1.4	–1.6		4.0	3.4	2.6	2.1	
1990							0.4	0.6	2.7		2.9	1.9	1.6	
2000							1.2	1.4	3.0	3.2		0.9	1.0	
2010							1.1	1.3	2.3	2.0	0.8		1.0	
2022							0.8	0.9	1.4	1.0	0.1	–0.6		

Real exchange rate vs USD

1 Jan	1900	1910	1920	1930	1940	1950	1967	1970	1980	1990	2000	2010	2022	Exchange rate vs USD
1900														
1910														
1920														
1930														
1940														
1950														
1967								0.4	1.0	2.1	0.9	0.6	0.8	
1970							1.2		1.1	2.3	0.9	0.6	0.8	
1980							2.6	3.0		3.5	0.8	0.5	0.7	
1990							2.5	2.7	2.4		–1.8	–1.0	–0.2	
2000							1.2	1.2	0.3	–1.9		–0.2	0.6	
2010							0.5	0.4	–0.4	–1.8	–1.7		1.2	
2022							0.4	0.3	–0.3	–1.1	–0.7	0.1		

Source: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

Article intended for: gianluca.oderda@credit-suisse.com

Thailand



Known as Siam until 1939, Thailand is located in mainland Southeast Asia at the center of the Indochinese Peninsula, surrounded by Myanmar, Laos, Cambodia and Malaysia. The adoption of the first development plan in 1963 spurred the shift from agriculture to industry and, during the 1980s and 1990s, numerous export-oriented industries emerged.

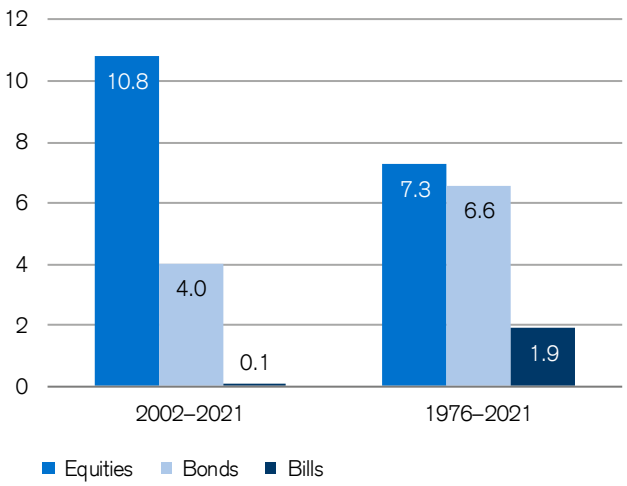
Strong growth and impressive poverty reduction have seen Thailand widely cited as a development success story. However, in 1997, a sudden and rapid decline in the value of the Thai baht triggered a financial crisis that quickly spread to other Asian countries. It ranks 78th (between Mexico and Grenada) in the latest UN Human Development Index.

The first Thai stock exchange, the Bangkok Stock Exchange, was established in July 1962 only to cease operations in the early 1970s. The Securities Exchange of Thailand (SET) started trading in 1975 to subsequently become ASEAN's second-largest stock exchange by market capitalization and the world's 25th largest equity market, with financials and energy accounting for 34% of the market capitalization of the FTSE World Thailand Index. PTT (10% of the index), Siam Cement and CP ALL (each 6%) are the largest companies.

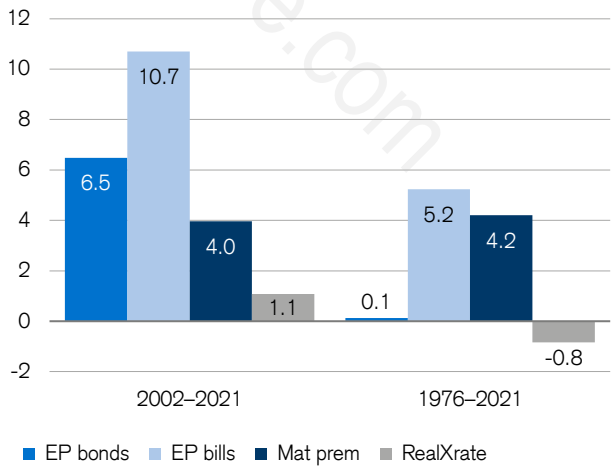
Our data for Thailand start in 1976, except for bonds which begin in 1980.

Article intended for: cfanluva.coerda#credit-suisse.com

Figure 129: Annualized real returns and risk premiums (%) for Thailand, 1976–2021 (bonds from 1980)



Note: The three asset classes are equities, long-term government bonds, and Treasury bills. All returns include reinvested income, are adjusted for inflation, and are expressed as geometric mean returns.



Note: EP bonds and EP bills denote the equity premium relative to bonds and to bills; Mat prem denotes the maturity premium for bonds relative to bills; RealXRate denotes the inflation-adjusted change in the exchange rate against the US dollar.

Source: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

Figure 130: Real returns on Thai asset classes, 1976–2021 (bonds from 1980)

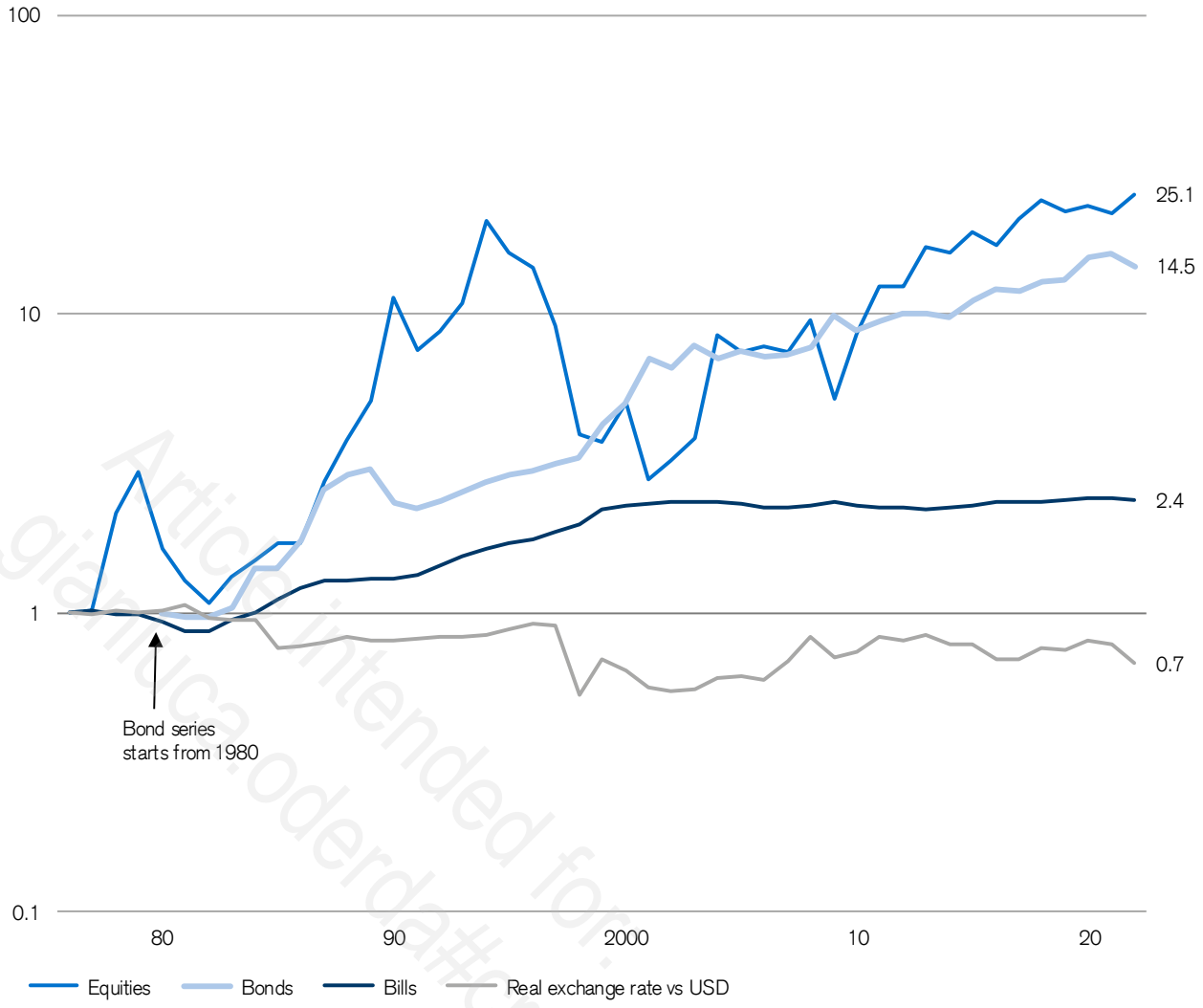


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Table 74: Returns on Thai asset classes, 1976–2021 (bonds from 1980)

		Mean returns % p.a.					Annual returns %				10-year returns % p.a.				Current
Return	Asset	GM	AM	SE	SD	SC	Lowest		Highest		Lowest		Highest		year rank
Nominal	Equities	11.3	18.3	6.3	42.6	–0.02	–53.1	1997	133.4	1989	–6.6	2002	34.5	1993	24
	Bonds	10.1	11.0	2.2	14.0	0.00	–17.3	1989	50.9	1986	4.5	2018	17.0	2000	42
	Bills	5.8	5.9	0.6	4.4	0.84	0.4	2021	16.6	1998	1.9	2020	11.1	1998	47
	Inflation	3.8	3.9	0.5	3.7	0.70	–0.9	2015	16.8	1980	1.1	2020	7.2	1985	31
Real	Equities	7.3	14.0	6.0	40.8	–0.02	–56.4	1997	122.3	2003	–9.9	2002	29.9	1993	22
	Bonds	6.6	7.4	2.2	14.0	0.04	–22.3	1989	48.1	1986	1.3	1997	12.2	2000	42
	Bills	1.9	2.0	0.6	4.0	0.63	–6.9	1980	11.7	1998	–0.6	2012	5.8	1999	44
	Exchange rate	–0.8	–0.2	1.6	10.8	–0.31	–42.1	1997	31.7	1998	–4.4	1997	4.6	2007	45
Premiums	Equities vs bills	5.2	12.1	6.0	40.9	–0.01	–58.8	1997	123.0	2003	–14.3	2000	23.6	1993	17
	Equities vs bonds	0.1	8.1	7.2	46.5	–0.10	–60.4	2000	182.4	1989	–19.4	2002	21.6	1993	9
	Bonds vs bills	4.2	4.9	1.9	12.6	–0.08	–22.7	1989	40.1	1986	–3.0	1997	8.2	2008	39

GM=geometric mean; AM=arithmetic mean, SE=standard error of mean; SD=standard deviation; SC=serial correlation; 10-year returns to end of given year.
Source: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

Table 75: Thai real returns, inflation and premiums, 1976–2021 (bonds from 1980)

	1 Jan	1900	1910	1920	1930	1940	1950	1960	1976	1980	1990	2000	2010	2022	
Real equity total returns	**1900**														**Equity premium vs bonds**
	1910														
	1920														
	1930														
	1940														
	1950														
	1960														
	1976														
	1980								13.1		11.4	–2.4	–1.7	0.1	
	1990								18.9	21.3		–14.5	–7.7	–3.2	
	2000								7.0	5.8	–7.7		–0.3	2.5	
	2010								6.6	5.7	–1.3	5.5		4.9	
	2022								7.3	6.7	2.5	7.5	9.3		
Real equity capital gains	**1900**														**Equity premium vs bills**
	1910														
	1920														
	1930														
	1940														
	1950														
	1960														
	1976									15.1	16.7	3.4	4.0	5.2	
	1980								6.2		17.3	1.1	2.6	4.3	
	1990								11.4	13.5		–12.8	–4.1	0.6	
	2000								1.8	1.0	–10.1		5.5	7.3	
	2010								1.8	1.3	–4.4	1.8		8.9	
	2022								2.8	2.5	–0.8	3.8	5.6		
Real bonds	**1900**														**Bond maturity premium**
	1910														
	1920														
	1930														
	1940														
	1950														
	1960														
	1976														
	1980										5.3	3.7	4.4	4.2	
	1990									8.9		2.0	3.9	3.9	
	2000									8.4	7.9		5.8	4.7	
	2010									7.6	6.9	5.8		3.8	
	2022									6.6	5.9	4.9	4.2		
Real bills	**1900**														**Inflation**
	1910														
	1920														
	1930														
	1940														
	1950														
	1960														
	1976									8.7	6.2	5.6	4.7	3.8	
	1980								–1.7		5.2	5.0	4.1	3.4	
	1990								1.9	3.4		4.8	3.6	2.8	
	2000								3.5	4.6	5.8		2.5	1.9	
	2010								2.5	3.1	2.9	0.0		1.4	
	2022								1.9	2.3	1.9	0.2	0.3		
Real exchange rate vs USD	**1900**														**Exchange rate vs USD**
	1910														
	1920														
	1930														
	1940														
	1950														
	1960														
	1976									0.3	–1.6	–2.7	–1.4	–1.1	
	1980								0.5		–2.4	–3.2	–1.7	–1.2	
	1990								–1.5	–2.3		–4.1	–1.3	–0.8	
	2000								–1.8	–2.3	–2.4		1.6	0.7	
	2010								–0.9	–1.0	–0.4	1.5		0.0	
	2022								–0.8	–1.0	–0.5	0.3	–0.8		

Source: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

Article intended for: gianluca.oderda#credit-suisse.com

United Kingdom



Organized stock trading in the United Kingdom dates from 1698, and the London Stock Exchange was formally established in 1801. By 1900, the UK equity market was the largest in the world, and London was the world's leading financial center, specializing in global and cross-border finance. Early in the 20th century, the US equity market overtook the UK and, nowadays, New York is a larger financial center than London. What continues to set London apart, and justifies its claim to being the world's leading international financial center, is the global, cross-border nature of much of its business.

Today, London is ranked as the second most important financial center (after New York) in the Global Financial Centers Index. It is the world's banking center, with 550 international banks and 170 global securities firms having offices in London.

The UK's foreign exchange market is the biggest in the world, and Britain has the world's number-three stock market, number-three insurance market, and the fourth-largest bond market.

London is the world's largest fund management center, managing almost half of Europe's institutional equity capital and three-quarters of Europe's hedge fund assets. More than three-quarters of Eurobond deals are originated and executed there. More than a third of the world's swap transactions and more than a quarter of global foreign exchange transactions take place in London, which is also a major center for commodities trading, shipping and many other services.

AstraZeneca is the largest UK stock by market capitalization. Other major companies include Unilever, Shell, Diageo, HSBC Holdings, Glaxo SmithKline, and BP.

Anders Bjerre-Nielsen
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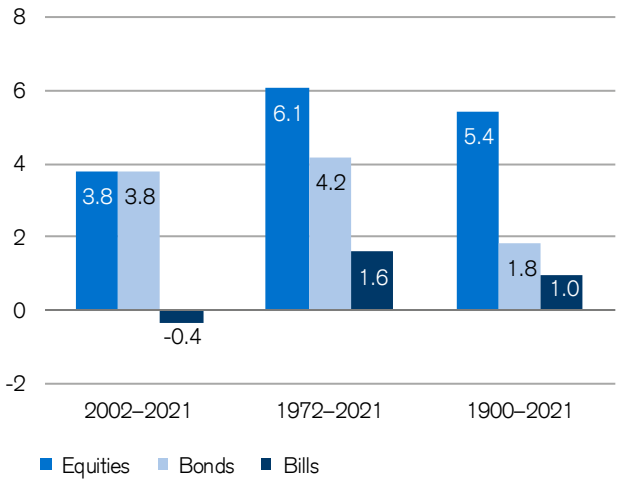
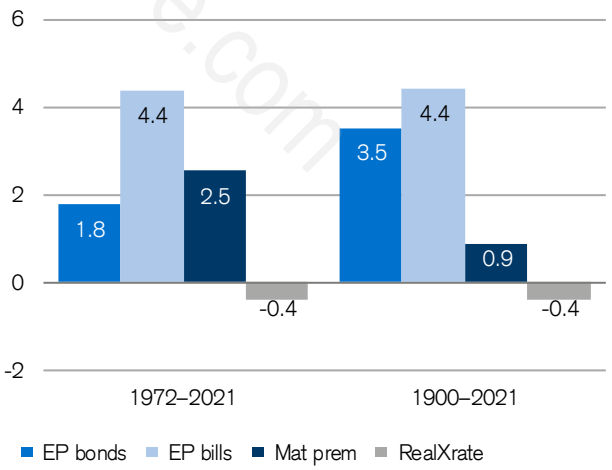
Figure 131: Annualized real returns and risk premiums (%) for the UK, 1900–2021



Note: The three asset classes are equities, long-term government bonds, and Treasury bills. All returns include reinvested income, are adjusted for inflation, and are expressed as geometric mean returns.



Note: EP bonds and EP bills denote the equity premium relative to bonds and to bills; Mat prem denotes the maturity premium for bonds relative to bills; RealXRate denotes the inflation-adjusted change in the exchange rate against the US dollar.

Source: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

Figure 132: Real returns on UK asset classes, 1900–2021

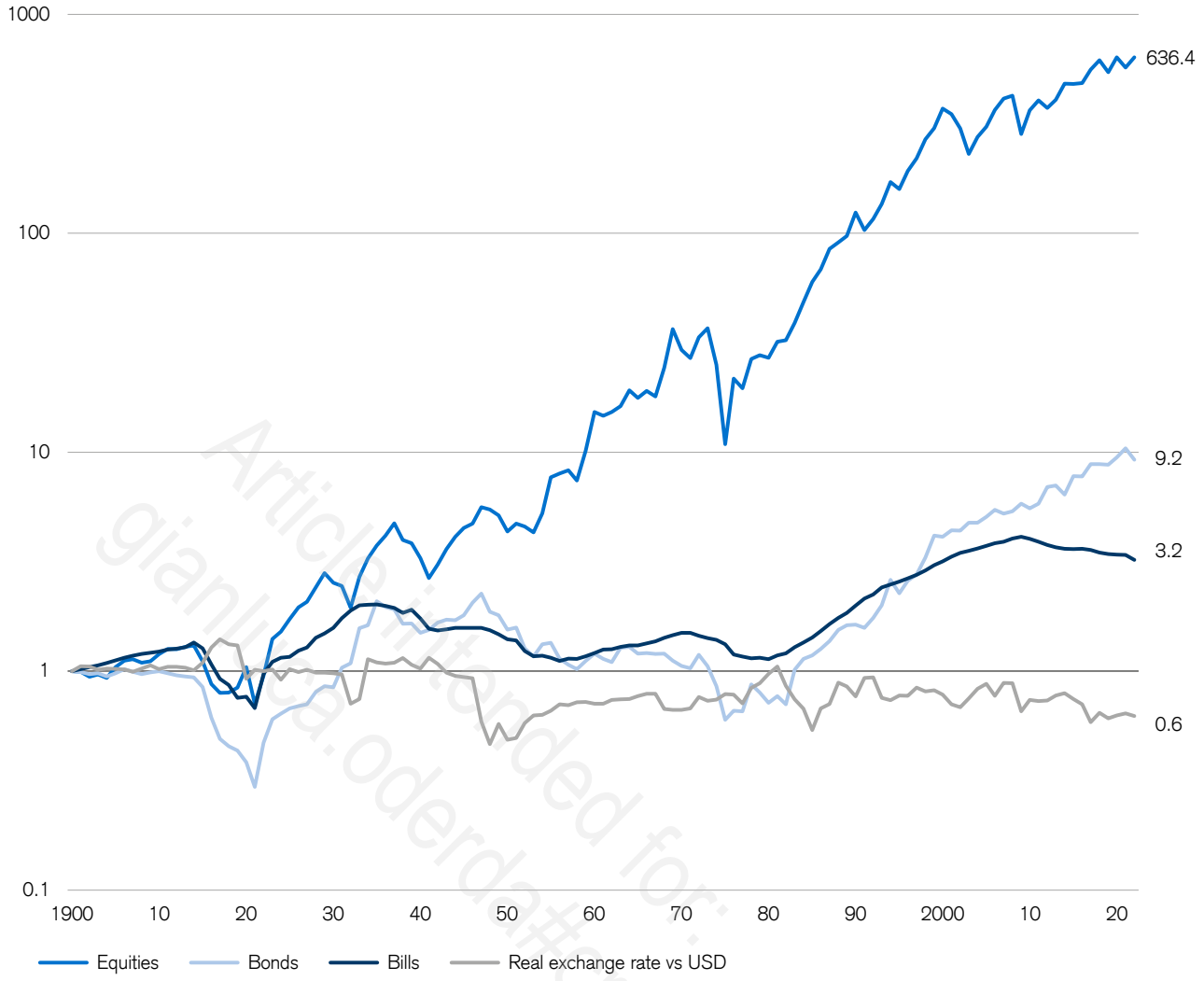


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Table 76: Returns on UK asset classes, 1900–2021

		Mean returns % p.a.					Annual returns %				10-year returns % p.a.				Current
Return	Asset	GM	AM	SE	SD	SC	Lowest		Highest		Lowest		Highest		year rank
Nominal	Equities	9.2	11.0	1.9	21.0	–0.09	–48.8	1974	145.6	1975	1.1	2008	31.5	1984	37
	Bonds	5.5	6.1	1.1	11.8	0.03	–17.4	1974	53.1	1982	–2.5	1956	18.7	1984	110
	Bills	4.6	4.6	0.3	3.8	0.92	0.0	2021	17.2	1980	0.4	2020	12.1	1989	122
	Inflation	3.6	3.8	0.6	6.2	0.50	–26.0	1921	23.2	1975	–5.4	1930	13.1	1981	30
Real	Equities	5.4	7.2	1.8	19.5	–0.08	–56.6	1974	99.3	1975	–5.6	1920	18.6	1984	49
	Bonds	1.8	2.7	1.2	13.5	0.12	–29.9	1974	59.4	1921	–11.3	1920	13.4	1930	110
	Bills	1.0	1.1	0.6	6.2	0.40	–15.7	1915	43.0	1921	–6.0	1920	9.9	1930	111
	Exchange rate	–0.4	0.2	1.0	11.2	–0.05	–36.7	1946	52.2	1933	–8.6	1947	4.5	1980	85
Premiums	Equities vs bills	4.4	6.1	1.7	19.3	–0.14	–54.6	1974	121.8	1975	–4.9	1974	17.7	1984	25
	Equities vs bonds	3.5	4.9	1.5	17.1	–0.12	–38.4	2008	80.8	1975	–3.9	2008	16.3	1959	10
	Bonds vs bills	0.9	1.4	1.0	10.7	–0.03	–26.6	1974	36.6	1932	–6.9	1974	7.5	2020	97

GM=geometric mean; AM=arithmetic mean, SE=standard error of mean; SD=standard deviation; SC=serial correlation; 10-year returns to end of given year.
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Table 77: UK real returns, inflation and premiums, 1900–2021

	1 Jan	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000	2010	2022	
Real equity total returns	**1900**		1.8	5.1	3.7	2.0	2.1	4.3	4.9	4.6	4.9	4.6	3.9	3.5	**Equity premium vs bonds**
	1910	1.8		8.6	4.7	2.0	2.2	4.8	5.4	5.0	5.3	4.9	4.1	3.7	
	1920	0.2	–1.3		1.0	–1.1	0.1	3.9	4.8	4.5	4.9	4.5	3.6	3.2	
	1930	3.1	3.8	9.3		–3.1	–0.3	4.9	5.7	5.2	5.5	5.0	3.9	3.5	
	1940	3.0	3.4	5.9	2.6		2.5	9.2	8.8	7.4	7.4	6.4	5.0	4.3	
	1950	3.0	3.3	4.9	2.7	2.8		16.3	12.1	9.0	8.6	7.2	5.4	4.5	
	1960	4.6	5.2	6.9	6.2	8.0	13.4		8.1	5.6	6.2	5.0	3.3	2.8	
	1970	4.9	5.5	6.9	6.3	7.6	10.0	6.7		3.1	5.2	4.0	2.2	1.8	
	1980	4.2	4.6	5.6	4.8	5.4	6.3	2.9	–0.8		7.3	4.5	1.9	1.5	
	1990	5.5	6.0	7.1	6.7	7.5	8.7	7.2	7.5	16.5		1.7	–0.7	–0.3	
	2000	6.1	6.6	7.6	7.4	8.2	9.3	8.3	8.8	14.0	11.6		–3.1	–1.2	
	2010	5.5	5.9	6.7	6.4	7.0	7.7	6.5	6.5	9.1	5.5	–0.2		0.4	
	2022	5.4	5.8	6.5	6.2	6.6	7.2	6.2	6.1	7.8	5.2	2.5	4.8		
Real equity capital gains	**1900**		–0.3	1.6	1.6	1.6	2.3	4.3	4.3	4.0	4.7	4.9	4.2	4.4	**Equity premium vs bills**
	1910	–2.5		3.5	2.5	2.2	2.9	5.3	5.1	4.7	5.3	5.5	4.6	4.9	
	1920	–4.4	–6.3		1.6	1.6	2.8	5.7	5.5	4.9	5.6	5.7	4.8	5.0	
	1930	–1.8	–1.4	3.7		1.6	3.4	7.1	6.5	5.5	6.3	6.3	5.2	5.4	
	1940	–1.8	–1.5	1.0	–1.7		5.1	10.0	8.1	6.5	7.2	7.1	5.7	5.8	
	1950	–1.6	–1.4	0.3	–1.3	–0.9		15.1	9.6	7.0	7.8	7.5	5.8	5.9	
	1960	–0.1	0.4	2.2	1.7	3.5	8.0		4.5	3.2	5.5	5.7	4.0	4.5	
	1970	0.2	0.7	2.1	1.8	2.9	4.9	1.9		2.0	6.0	6.1	3.9	4.5	
	1980	–0.6	–0.3	0.7	0.2	0.6	1.1	–2.1	–6.0		10.1	8.3	4.5	5.2	
	1990	0.6	1.0	2.1	1.9	2.6	3.5	2.0	2.1	10.9		6.5	1.9	3.7	
	2000	1.3	1.7	2.7	2.6	3.3	4.2	3.3	3.7	9.0	7.0		–2.5	2.4	
	2010	0.8	1.2	2.0	1.8	2.3	2.9	1.9	1.9	4.7	1.7	–3.4		6.7	
	2022	0.8	1.1	1.9	1.7	2.1	2.6	1.7	1.7	3.6	1.4	–1.1	0.9		
Real bonds	**1900**		–2.1	–3.4	–2.1	–0.4	0.2	0.0	–0.5	–0.6	–0.2	0.3	0.3	0.9	**Bond maturity premium**
	1910	0.0		–4.7	–2.1	0.2	0.8	0.4	–0.2	–0.4	0.0	0.5	0.5	1.1	
	1920	–4.7	–9.1		0.6	2.7	2.7	1.7	0.7	0.4	0.7	1.2	1.1	1.7	
	1930	–0.6	–0.8	8.2		4.8	3.7	2.1	0.7	0.3	0.7	1.3	1.2	1.8	
	1940	1.0	1.4	7.0	5.9		2.6	0.7	–0.6	–0.8	–0.1	0.7	0.7	1.5	
	1950	0.9	1.1	4.8	3.1	0.3		–1.1	–2.2	–1.8	–0.8	0.3	0.4	1.3	
	1960	0.3	0.4	2.9	1.2	–1.1	–2.5		–3.4	–2.2	–0.7	0.7	0.7	1.7	
	1970	0.1	0.1	2.0	0.6	–1.2	–1.9	–1.3		–1.1	0.7	2.0	1.7	2.7	
	1980	–0.4	–0.5	1.1	–0.3	–1.8	–2.5	–2.5	–3.8		2.6	3.7	2.6	3.7	
	1990	0.5	0.6	2.1	1.1	0.2	0.1	1.0	2.2	8.5		4.7	2.6	4.0	
	2000	1.4	1.6	3.0	2.3	1.7	2.0	3.1	4.6	9.1	9.7		0.6	3.7	
	2010	1.6	1.7	3.0	2.4	1.9	2.1	3.1	4.2	7.1	6.3	3.0		6.3	
	2022	1.8	2.0	3.2	2.6	2.2	2.5	3.3	4.3	6.3	5.6	3.7	4.3		
Real bills	**1900**		1.1	4.9	2.2	1.8	2.0	2.4	2.6	3.7	4.0	3.9	3.7	3.6	**Inflation**
	1910	2.1		8.9	2.8	2.0	2.2	2.7	2.8	4.1	4.4	4.2	4.0	3.8	
	1920	–1.3	–4.6		–2.9	–1.3	0.1	1.2	1.6	3.4	3.7	3.6	3.5	3.3	
	1930	1.5	1.3	7.5		0.4	1.7	2.6	2.8	4.7	4.9	4.6	4.3	4.0	
	1940	1.4	1.2	4.2	1.0		3.0	3.7	3.6	5.8	5.8	5.3	4.9	4.5	
	1950	0.7	0.3	2.0	–0.6	–2.2		4.4	3.9	6.7	6.5	5.8	5.2	4.7	
	1960	0.3	0.0	1.2	–0.9	–1.8	–1.5		3.4	7.8	7.2	6.2	5.3	4.7	
	1970	0.6	0.3	1.4	–0.1	–0.5	0.3	2.2		12.4	9.1	7.1	5.8	5.0	
	1980	0.2	–0.1	0.7	–0.7	–1.1	–0.7	–0.3	–2.7		6.0	4.5	3.7	3.3	
	1990	0.8	0.6	1.4	0.4	0.3	0.9	1.7	1.4	5.8		3.1	2.5	2.4	
	2000	1.2	1.1	1.8	1.0	1.0	1.6	2.4	2.5	5.3	4.8		1.9	2.1	
	2010	1.3	1.2	1.9	1.2	1.2	1.8	2.4	2.5	4.3	3.6	2.4		2.3	
	2022	1.0	0.9	1.4	0.8	0.8	1.2	1.6	1.5	2.5	1.5	0.1	–1.8		
Real exchange rate vs USD	**1900**		0.1	–1.2	0.0	–0.4	–1.4	–0.9	–1.0	–1.0	–1.2	–1.1	–1.0	–1.0	**Exchange rate vs USD**
	1910	0.2		–2.6	0.0	–0.6	–1.8	–1.1	–1.2	–1.1	–1.4	–1.2	–1.1	–1.1	
	1920	–0.4	–1.0		2.7	0.4	–1.5	–0.7	–0.9	–0.9	–1.2	–1.1	–0.9	–1.0	
	1930	–0.1	–0.2	0.6		–1.9	–3.5	–1.8	–1.8	–1.6	–1.8	–1.6	–1.4	–1.4	
	1940	0.1	0.0	0.5	0.5		–5.1	–1.8	–1.7	–1.5	–1.8	–1.5	–1.3	–1.3	
	1950	–1.4	–1.8	–2.1	–3.4	–7.2		1.6	0.0	–0.2	–1.0	–0.8	–0.6	–0.8	
	1960	–0.6	–0.7	–0.7	–1.1	–1.8	3.9		–1.5	–1.2	–1.8	–1.4	–1.1	–1.2	
	1970	–0.6	–0.7	–0.7	–1.0	–1.4	1.6	–0.7		–0.8	–2.0	–1.3	–1.0	–1.1	
	1980	0.0	–0.1	0.1	0.0	–0.1	2.3	1.6	3.9		–3.1	–1.6	–1.1	–1.2	
	1990	–0.3	–0.4	–0.3	–0.4	–0.6	1.1	0.3	0.7	–2.4		0.0	0.0	–0.6	
	2000	–0.2	–0.3	–0.2	–0.3	–0.5	0.9	0.2	0.5	–1.1	0.2		0.0	–0.8	
	2010	–0.3	–0.3	–0.2	–0.4	–0.5	0.7	0.1	0.3	–0.9	–0.2	–0.6		–1.5	
	2022	–0.4	–0.4	–0.4	–0.5	–0.6	0.3	–0.2	–0.1	–1.1	–0.6	–1.0	–1.4		

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United States



In the 20th century, the United States rapidly became the world's foremost political, military, and economic power. After the fall of communism, it became the world's sole superpower. It is also the world's number one oil producer.

The USA is also a financial superpower. It has the world's largest economy, and the dollar is the world's reserve currency. Its stock market accounts for 60% of total world value (on a free-float, investible basis), which is almost ten times as large as Japan, its closest rival. The USA also has the world's largest bond market.

US financial markets are by far the best-documented in the world and, until recently, most of the long-run evidence cited on historical investment performance drew almost exclusively on the US experience. Since 1900, the US equity market has given an annualized real return of 6.7%, the highest common-currency return for any Yearbook country.

There is an obvious danger of placing too much reliance on the impressive long-run past performance of US stocks. The New York Stock Exchange traces its origins back to 1792. At that time, the Dutch and UK stock markets were already nearly 200 and 100 years old, respectively. Thus, in just a little over 200 years, the USA has gone from zero to a 60% weighting in the world's equity market.

Extrapolating from such a successful market can lead to "success" bias. Investors can gain a misleading view of equity returns elsewhere, or of future equity returns for the USA itself. That is why this Yearbook focuses on global investment returns, rather than just US returns.

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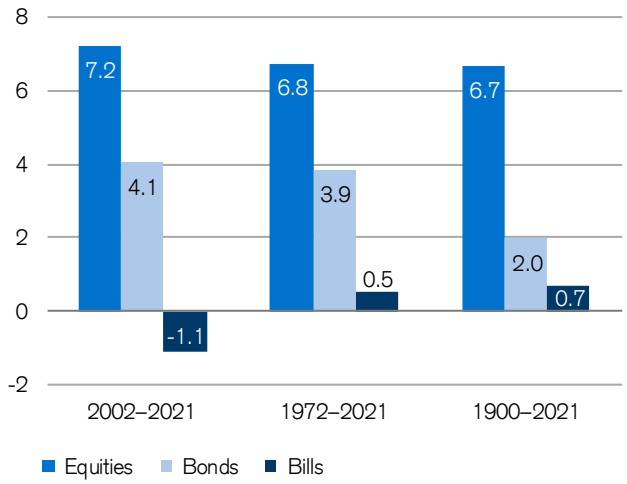
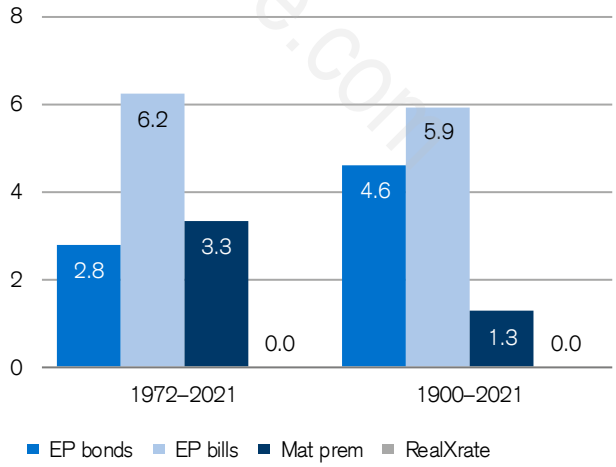
Figure 133: Annualized real returns and risk premiums (%) for the USA, 1900–2021



Note: The three asset classes are equities, long-term government bonds, and Treasury bills. All returns include reinvested income, are adjusted for inflation, and are expressed as geometric mean returns.



Note: EP bonds and EP bills denote the equity premium relative to bonds and to bills; Mat prem denotes the maturity premium for bonds relative to bills; RealXRate denotes the inflation-adjusted change in the exchange rate against the US dollar.

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Figure 134: Real returns on US asset classes, 1900–2021

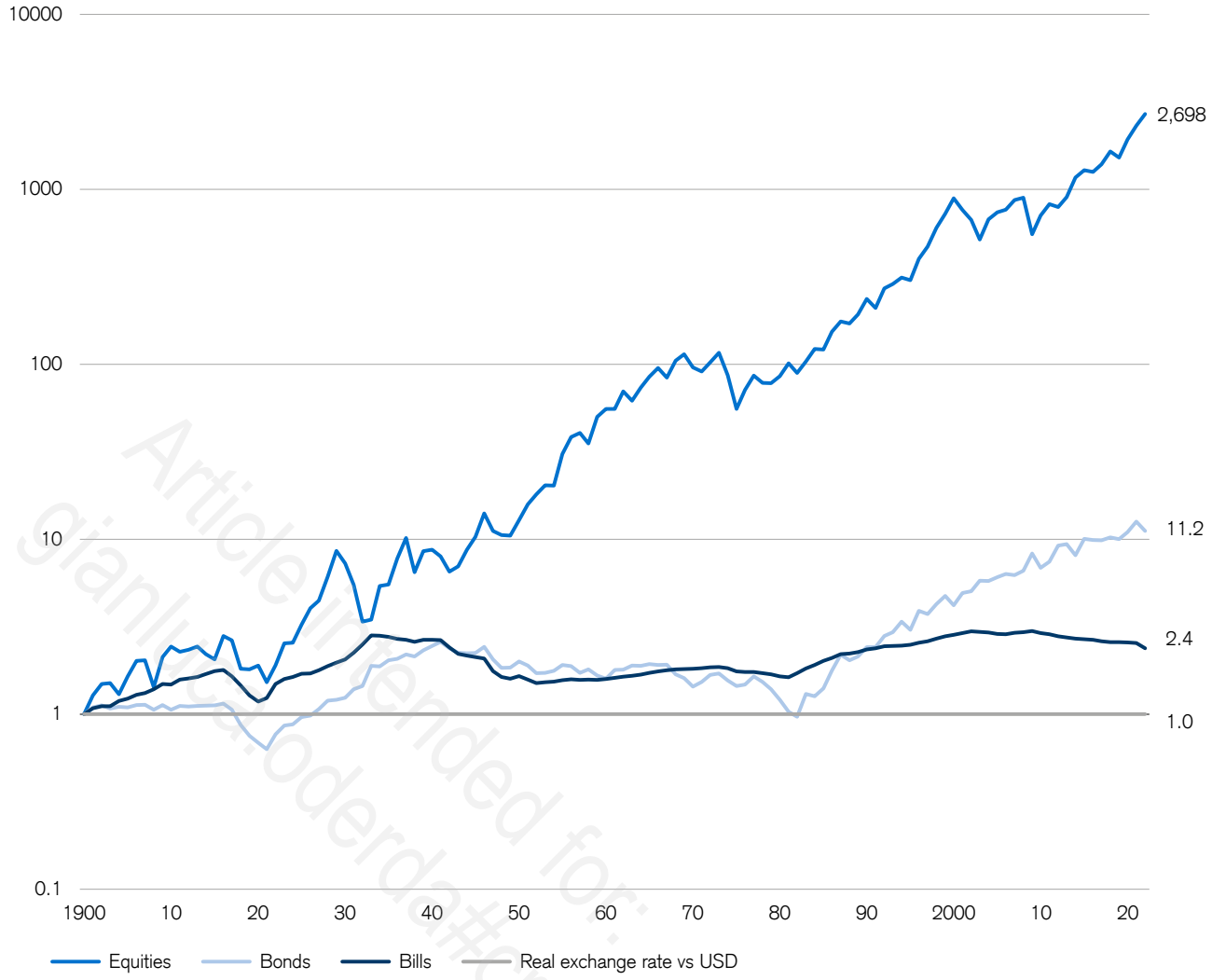

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Table 78: Returns on US asset classes, 1900–2021

		Mean returns % p.a.					Annual returns %				10-year returns % p.a.				Current
Return	Asset	GM	AM	SE	SD	SC	Lowest		Highest		Lowest		Highest		year rank
Nominal	Equities	9.8	11.6	1.8	19.6	–0.03	–44.3	1931	57.0	1933	–2.0	1938	19.1	1958	34
	Bonds	5.0	5.3	0.8	9.0	–0.13	–14.9	2009	40.4	1982	–0.1	1959	15.6	1991	114
	Bills	3.6	3.7	0.3	2.9	0.91	0.0	1938	14.7	1981	0.1	1942	9.2	1987	116
	Inflation	2.9	3.0	0.4	4.7	0.62	–10.8	1921	20.4	1918	–2.7	1933	8.7	1982	15
Real	Equities	6.7	8.6	1.8	19.8	–0.02	–38.6	1931	55.8	1933	–4.1	1974	16.9	1958	45
	Bonds	2.0	2.5	0.9	10.4	0.00	–18.1	1917	35.2	1982	–5.5	1920	11.2	1991	114
	Bills	0.7	0.8	0.4	4.6	0.61	–15.0	1946	20.2	1921	–5.1	1950	6.2	1930	114
Premiums	Equities vs bills	5.9	7.8	1.8	19.4	–0.01	–44.9	1931	56.6	1933	–4.3	1974	17.1	1958	21
	Equities vs bonds	4.6	6.7	1.9	20.5	–0.09	–50.9	2008	57.1	1933	–8.0	2008	18.4	1959	13
	Bonds vs bills	1.3	1.6	0.8	8.7	–0.11	–15.0	2009	27.0	2011	–4.6	1981	7.6	1993	101

GM=geometric mean; AM=arithmetic mean, SE=standard error of mean; SD=standard deviation; SC=serial correlation; 10-year returns to end of given year.
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Table 79: US real returns, inflation and premiums, 1900–2021

	1 Jan	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000	2010	2022	
Real equity total returns	**1900**		8.7	5.2	6.1	3.2	3.8	6.1	6.2	5.5	5.2	5.5	4.3	4.6	**Equity premium vs bonds**
	1910	9.3		1.9	4.8	1.5	2.6	5.6	5.8	5.0	4.8	5.2	3.9	4.2	
	1920	3.3	–2.5		7.8	1.2	2.8	6.5	6.6	5.5	5.2	5.6	4.1	4.5	
	1930	6.8	5.6	14.3		–4.9	0.5	6.1	6.3	5.1	4.8	5.3	3.7	4.1	
	1940	5.6	4.3	7.9	1.8		6.1	12.1	10.3	7.8	6.9	7.1	4.9	5.3	
	1950	5.2	4.2	6.6	2.9	4.0		18.4	12.4	8.3	7.1	7.2	4.7	5.2	
	1960	6.9	6.5	8.8	7.0	9.7	15.8		6.7	3.6	3.5	4.6	2.2	3.2	
	1970	6.7	6.3	8.2	6.7	8.3	10.6	5.6		0.6	1.9	3.9	1.1	2.5	
	1980	5.7	5.2	6.6	5.1	5.9	6.5	2.2	–1.1		3.3	5.6	1.3	3.0	
	1990	6.3	5.9	7.1	6.0	6.8	7.6	4.9	4.6	10.7		8.0	0.3	2.9	
	2000	7.0	6.8	8.0	7.1	8.0	8.8	7.2	7.7	12.4	14.2		–6.9	0.6	
	2010	6.1	5.8	6.8	5.9	6.5	6.9	5.2	5.1	7.3	5.6	–2.3		7.4	
	2022	6.7	6.5	7.4	6.6	7.2	7.7	6.5	6.6	8.6	7.9	5.2	11.8		
Real equity capital gains	**1900**		5.1	2.4	4.3	3.0	4.2	6.1	5.8	5.1	5.3	5.9	5.1	5.9	**Equity premium vs bills**
	1910	4.7		–0.3	3.9	2.3	4.0	6.3	5.9	5.0	5.3	6.0	5.1	6.0	
	1920	–1.9	–8.0		8.2	3.6	5.4	8.0	7.2	6.0	6.1	6.8	5.7	6.6	
	1930	1.4	–0.2	8.4		–0.8	4.0	7.9	7.0	5.5	5.7	6.6	5.4	6.5	
	1940	0.3	–1.1	2.6	–3.0		9.1	12.6	9.7	7.2	7.1	7.9	6.4	7.4	
	1950	–0.1	–1.3	1.1	–2.4	–1.8		16.2	10.0	6.5	6.6	7.7	5.9	7.2	
	1960	1.6	1.0	3.3	1.7	4.1	10.3		4.2	2.0	3.6	5.6	4.0	5.8	
	1970	1.7	1.2	3.1	1.9	3.5	6.3	2.4		–0.2	3.3	6.1	3.9	6.1	
	1980	0.8	0.3	1.7	0.5	1.3	2.4	–1.4	–5.0		6.8	9.4	5.3	7.6	
	1990	1.4	1.0	2.4	1.4	2.3	3.4	1.1	0.5	6.3		12.0	4.5	7.8	
	2000	2.4	2.1	3.5	2.8	3.8	4.9	3.6	4.0	8.9	11.5		–2.5	6.0	
	2010	1.8	1.5	2.6	1.9	2.6	3.4	2.1	2.0	4.4	3.5	–4.0		13.7	
	2022	2.5	2.3	3.4	2.9	3.6	4.4	3.5	3.7	5.8	5.7	3.1	9.5		
Real bonds	**1900**		–3.2	–2.7	–1.7	–0.2	0.4	0.0	–0.3	–0.4	0.0	0.4	0.8	1.3	**Bond maturity premium**
	1910	0.6		–2.1	–0.9	0.8	1.3	0.7	0.2	0.0	0.4	0.8	1.2	1.7	
	1920	–1.9	–4.3		0.4	2.3	2.5	1.4	0.6	0.4	0.8	1.2	1.6	2.1	
	1930	0.7	0.8	6.1		4.3	3.6	1.7	0.7	0.4	0.9	1.3	1.7	2.2	
	1940	2.3	2.8	6.6	7.1		2.8	0.4	–0.5	–0.6	0.2	0.8	1.4	2.0	
	1950	1.4	1.6	3.6	2.4	–2.0		–1.9	–2.1	–1.7	–0.4	0.4	1.1	1.9	
	1960	0.8	0.8	2.1	0.8	–2.1	–2.2		–2.3	–1.5	0.1	1.0	1.7	2.5	
	1970	0.5	0.5	1.5	0.4	–1.8	–1.6	–1.0		–0.7	1.3	2.1	2.8	3.5	
	1980	0.2	0.2	1.0	–0.1	–1.8	–1.7	–1.4	–1.7		3.4	3.6	4.0	4.5	
	1990	1.0	1.0	1.8	1.1	0.0	0.5	1.4	2.6	7.2		3.7	4.2	4.8	
	2000	1.4	1.5	2.3	1.8	0.9	1.5	2.4	3.6	6.4	5.7		4.8	5.4	
	2010	1.8	1.9	2.6	2.2	1.5	2.1	3.0	4.0	6.0	5.4	5.0		5.9	
	2022	2.0	2.1	2.8	2.4	1.9	2.4	3.2	4.0	5.4	4.9	4.5	4.1		
Real bills	**1900**		1.0	4.0	2.4	1.2	2.1	2.1	2.1	2.8	3.0	3.0	3.0	2.9	**Inflation**
	1910	4.0		7.2	3.0	1.3	2.3	2.3	2.3	3.0	3.3	3.3	3.2	3.1	
	1920	0.8	–2.2		–0.9	–1.5	0.7	1.1	1.4	2.4	2.7	2.8	2.7	2.7	
	1930	2.4	1.7	5.7		–2.0	1.6	1.8	2.0	3.0	3.4	3.3	3.2	3.1	
	1940	2.5	2.0	4.1	2.6		5.4	3.8	3.4	4.3	4.5	4.2	4.0	3.7	
	1950	1.0	0.3	1.1	–1.1	–4.7		2.2	2.4	4.0	4.3	4.0	3.8	3.5	
	1960	0.8	0.2	0.7	–0.8	–2.5	–0.3		2.5	4.9	5.0	4.5	4.1	3.7	
	1970	0.9	0.3	0.9	–0.3	–1.3	0.5	1.3		7.4	6.2	5.1	4.5	3.9	
	1980	0.6	0.2	0.6	–0.4	–1.2	0.0	0.2	–1.0		5.1	4.0	3.5	3.1	
	1990	1.0	0.6	1.0	0.2	–0.3	0.9	1.3	1.3	3.6		2.9	2.7	2.5	
	2000	1.1	0.7	1.1	0.5	0.1	1.1	1.5	1.5	2.8	1.9		2.5	2.3	
	2010	1.0	0.7	1.0	0.4	0.1	1.0	1.2	1.2	1.9	1.1	0.2		2.2	
	2022	0.7	0.4	0.7	0.2	–0.1	0.5	0.7	0.5	0.9	0.1	–0.8	–1.6		

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World



To see how equities and bonds have performed in aggregate, we compute a World index embracing all countries. The equity index starts in 1900 with the DMS 23 countries. Additional countries enter the index as data becomes available. This includes the twelve new Yearbook markets added in 2021/22, as well as 55 further countries for which we have equity data (see **Figure 1** in Chapter 1 for details). Thus, in recent years, the DMS World index includes 90 countries.

The World bond index is computed in the same way, initially comprising the DMS 23 countries, and adding in the twelve new markets as data becomes available. No bond data is available for the other 55 countries, so the World bond index is based on the DMS 35 countries.

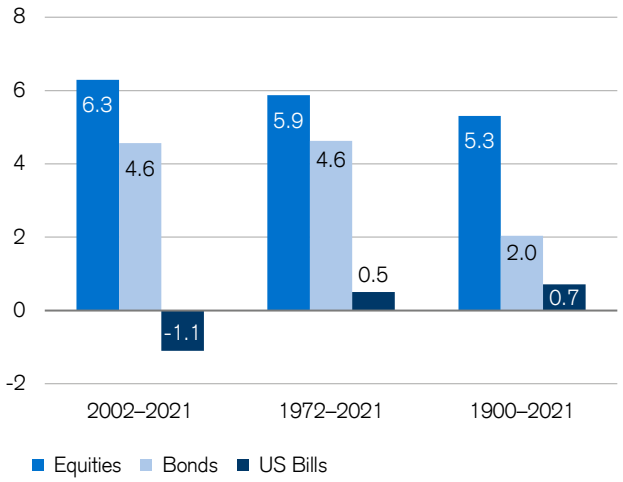
In the World equity index, countries are weighted by their start-year market capitalizations (free-float adjusted from 2001). The World bond index is weighted by GDP. The weighting schemes are discussed in Chapter 1.

To avoid survivorship bias, all countries are fully included in the world indexes once data becomes available. Two markets register a total loss – Russia in 1917 and China in 1949. They then re-enter the world indexes after their markets reopened in the 1990s. We also record a total loss on German bonds during the hyper-inflationary period of 1922–23. The DMS World indexes represent the long-run returns on a globally diversified portfolio from the perspective of an investor in a given country. The charts and tables below show the returns for a US global investor. The indexes are expressed in US dollars, real returns are measured relative to US inflation, and the equity premium versus bills is relative to US Treasury bills.

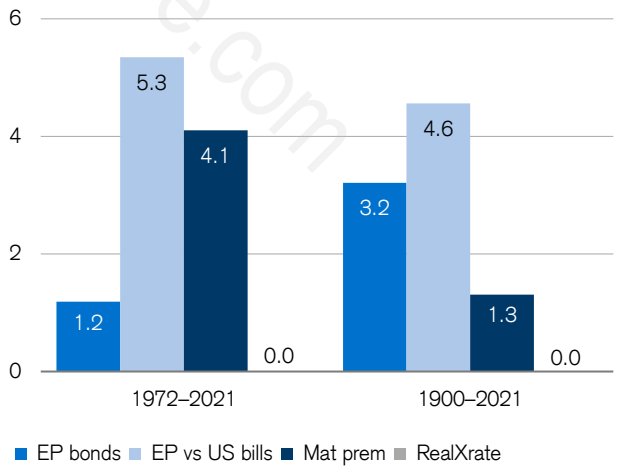
Over the last 122 years, the left-hand chart below shows that the annualized real return on the world index was 5.3% for equities and 2.0% for bonds. The right-hand chart shows that the World equity index had an annualized equity risk premium, relative to Treasury bills, of 4.6% over the last 122 years.

Anne Schenker, gianluca.schenker@credit-suisse.com

Figure 135: Annualized real USD returns and risk premiums (%) for the World index, 1900–2021



Note: The three asset classes are equities, long-term government bonds, and US Treasury bills. All returns include reinvested income, are adjusted for inflation, and are expressed as geometric mean returns.



Note: EP bonds and EP bills denote the equity premium relative to bonds and to US bills; Mat prem denotes the maturity premium for bonds relative to US bills; RealXRate denotes the inflation-adjusted change in the exchange rate against the US dollar.

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Figure 136: Real returns on World asset classes, 1900–2021

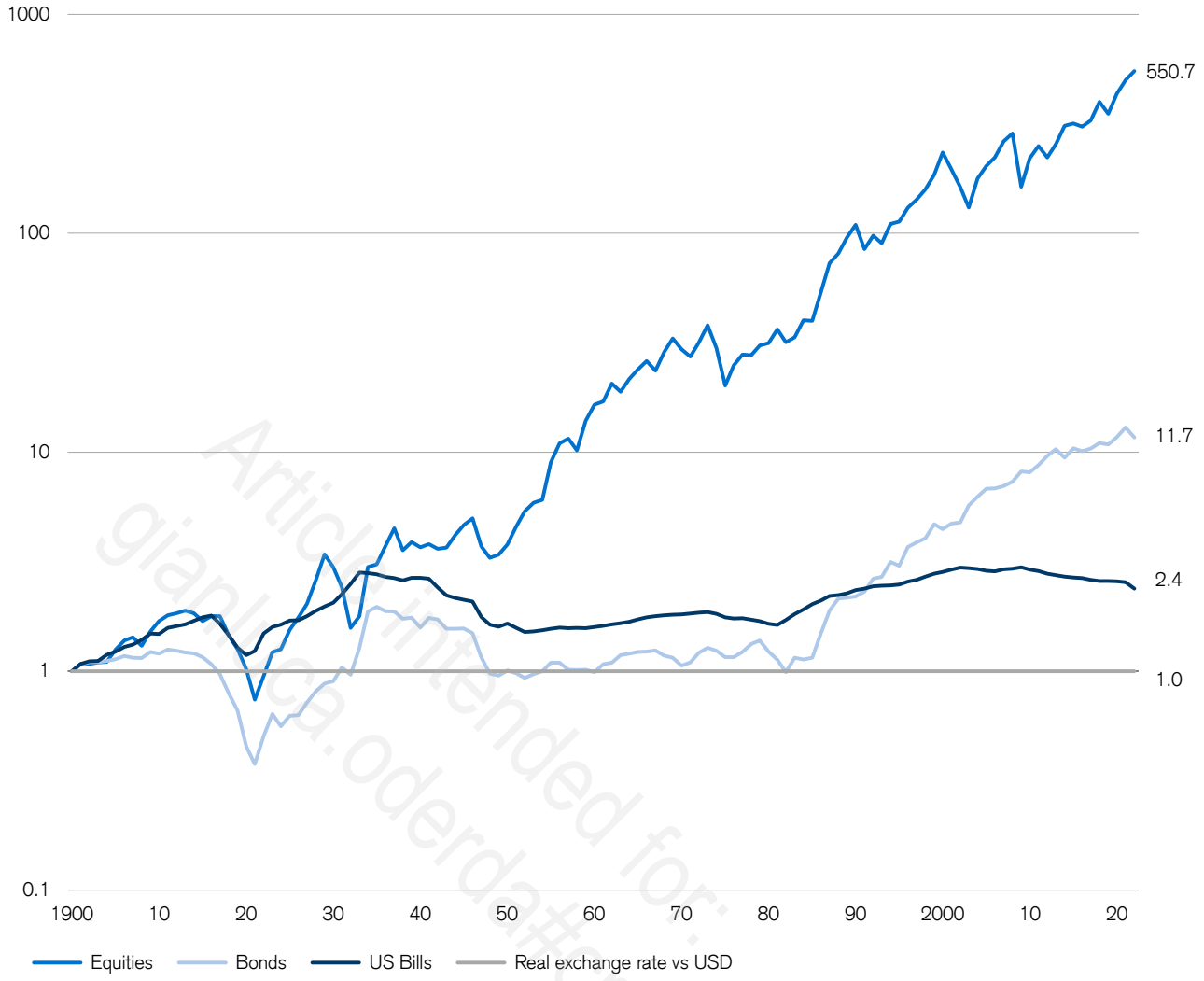

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Table 80: Returns on World asset classes, 1900–2021 (in USD)

		Mean returns % p.a.					Annual returns %				10-year returns % p.a.				Current
Return	Asset	GM	AM	SE	SD	SC	Lowest		Highest		Lowest		Highest		year rank
Nominal	Equities	8.4	9.8	1.5	17.0	0.04	–42.8	2008	68.9	1933	–1.5	1920	19.0	1989	39
	Bonds	5.0	5.4	0.8	9.4	0.21	–21.7	1919	47.6	1933	–4.5	1920	14.9	1993	110
	US bills	3.6	3.7	0.3	2.9	0.91	0.0	1938	14.7	1981	0.1	1942	9.2	1987	116
	US inflation	2.9	3.0	0.4	4.7	0.62	–10.8	1921	20.4	1918	–2.7	1933	8.7	1982	15
Real	Equities	5.3	6.8	1.6	17.3	0.07	–42.9	2008	67.6	1933	–8.5	1920	15.8	1959	57
	Bonds	2.0	2.6	1.0	11.0	0.31	–31.6	1919	46.5	1933	–11.3	1920	12.8	1933	113
	US bills	0.7	0.8	0.4	4.6	0.61	–15.0	1946	20.2	1921	–5.1	1950	6.2	1930	114
Premiums	Equities vs US bills	4.6	6.0	1.5	16.9	0.05	–43.7	2008	68.4	1933	–6.2	1920	16.2	1959	25
	Equities vs bonds	3.2	4.4	1.4	15.1	–0.02	–48.7	2008	36.2	1958	–6.6	2008	16.0	1959	13
	Bonds vs US bills	1.3	1.7	0.8	9.3	0.22	–25.9	1919	47.2	1933	–9.1	1920	8.1	1993	96

GM=geometric mean; AM=arithmetic mean, SE=standard error of mean; SD=standard deviation; SC=serial correlation; 10-year returns to end of given year.
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Table 81: World real returns, inflation and premiums, 1900–2021

	1 Jan	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000	2010	2022	
Real	**1900**		3.5	4.1	4.1	2.1	2.7	4.8	4.9	4.1	4.4	4.0	3.0	3.2	**Equity**
equity	**1910**	5.4		4.8	4.4	1.7	2.5	5.1	5.1	4.2	4.6	4.1	3.0	3.2	**premium**
total	**1920**	0.1	–4.9		3.9	0.2	1.7	5.1	5.2	4.1	4.5	4.0	2.8	3.0	**vs bonds**
returns	**1930**	3.7	2.9	11.3		–3.5	0.6	5.5	5.5	4.2	4.6	4.0	2.7	2.9	
	1940	3.3	2.6	6.6	2.1		4.9	10.3	8.6	6.2	6.3	5.3	3.6	3.7	
	1950	2.7	2.0	4.5	1.2	0.3		16.0	10.5	6.6	6.7	5.4	3.4	3.6	
	1960	4.8	4.7	7.2	5.9	7.8	15.8		5.3	2.2	3.7	2.9	1.0	1.7	
	1970	5.0	4.9	7.0	5.9	7.2	10.8	6.0		–0.8	3.0	2.2	–0.1	1.0	
	1980	4.4	4.3	5.9	4.8	5.5	7.3	3.3	0.7		6.9	3.7	0.2	1.5	
	1990	5.4	5.4	6.9	6.2	7.0	8.8	6.5	6.8	13.2		0.5	–3.0	–0.2	
	2000	5.6	5.6	7.0	6.4	7.2	8.6	6.9	7.2	10.5	7.9		–6.4	–0.5	
	2010	5.0	5.0	6.2	5.5	6.0	7.0	5.3	5.2	6.7	3.6	–0.6		4.7	
	2022	5.3	5.3	6.4	5.8	6.3	7.2	5.8	5.8	7.0	5.2	4.0	7.9		
Real	**1900**		1.4	–0.7	1.3	0.8	1.7	4.0	4.1	3.8	4.4	4.5	4.0	4.6	**Equity**
equity	**1910**	0.6		–2.8	1.2	0.6	1.8	4.5	4.5	4.1	4.7	4.9	4.3	4.9	**premium**
capital	**1920**	–4.7	–9.7		5.4	2.4	3.3	6.4	6.0	5.3	5.9	5.9	5.1	5.6	**vs US**
gains	**1930**	–1.4	–2.4	5.6		–0.5	2.3	6.8	6.2	5.3	6.0	5.9	5.1	5.7	**bills**
	1940	–1.7	–2.5	1.4	–2.7		5.2	10.6	8.6	6.8	7.3	7.1	5.9	6.4	
	1950	–2.3	–3.0	–0.6	–3.6	–4.5		16.2	10.3	7.3	7.8	7.4	6.0	6.6	
	1960	–0.3	–0.4	2.1	0.9	2.7	10.5		4.6	3.1	5.1	5.3	4.1	5.1	
	1970	0.1	0.1	2.1	1.3	2.6	6.4	2.4		1.7	5.4	5.6	3.9	5.2	
	1980	–0.3	–0.4	1.2	0.4	1.1	3.1	–0.5	–3.3		9.3	7.6	4.7	6.1	
	1990	0.7	0.8	2.4	1.8	2.7	4.6	2.7	2.9	9.5		5.9	2.5	5.1	
	2000	1.2	1.3	2.7	2.3	3.2	4.8	3.4	3.8	7.5	5.6		–0.8	4.8	
	2010	0.8	0.9	2.1	1.7	2.3	3.5	2.1	2.1	3.9	1.2	–2.9		9.7	
	2022	1.3	1.3	2.5	2.2	2.8	3.8	2.8	2.8	4.3	2.8	1.6	5.4		
Real	**1900**		–2.0	–4.7	–2.7	–1.3	–1.0	–0.8	–0.8	–0.4	–0.1	0.4	0.9	1.3	**Bond**
bonds	**1910**	1.8		–7.3	–3.1	–1.1	–0.7	–0.5	–0.6	–0.1	0.2	0.7	1.2	1.6	**maturity**
	1920	–3.9	–9.3		1.4	2.2	1.6	1.2	0.9	1.1	1.3	1.8	2.2	2.5	**premium**
	1930	–0.4	–1.4	7.1		3.1	1.7	1.2	0.7	1.1	1.3	1.8	2.3	2.7	
	1940	1.2	0.9	6.5	5.8		0.3	0.2	–0.1	0.6	0.9	1.6	2.2	2.6	
	1950	0.0	–0.4	2.7	0.6	–4.4		0.2	–0.2	0.7	1.1	1.9	2.6	2.9	
	1960	0.0	–0.4	2.0	0.3	–2.3	–0.2		–0.6	0.9	1.4	2.3	3.0	3.4	
	1970	0.1	–0.2	1.7	0.4	–1.3	0.2	0.7		2.5	2.4	3.3	4.0	4.2	
	1980	0.3	0.0	1.7	0.6	–0.6	0.7	1.1	1.5		2.3	3.8	4.5	4.6	
	1990	0.9	0.8	2.3	1.5	0.7	2.0	2.7	3.7	6.0		5.3	5.6	5.3	
	2000	1.5	1.5	2.9	2.3	1.7	3.0	3.8	4.9	6.6	7.3		5.9	5.3	
	2010	1.9	1.9	3.3	2.8	2.4	3.5	4.3	5.2	6.5	6.8	6.2		4.8	
	2022	2.0	2.1	3.2	2.8	2.5	3.5	4.1	4.7	5.5	5.4	4.5	3.1		
Real	**1900**		1.0	4.0	2.4	1.2	2.1	2.1	2.1	2.8	3.0	3.0	3.0	2.9	**US**
US bills	**1910**	4.0		7.2	3.0	1.3	2.3	2.3	2.3	3.0	3.3	3.3	3.2	3.1	**inflation**
	1920	0.8	–2.2		–0.9	–1.5	0.7	1.1	1.4	2.4	2.7	2.8	2.7	2.7	
	1930	2.4	1.7	5.7		–2.0	1.6	1.8	2.0	3.0	3.4	3.3	3.2	3.1	
	1940	2.5	2.0	4.1	2.6		5.4	3.8	3.4	4.3	4.5	4.2	4.0	3.7	
	1950	1.0	0.3	1.1	–1.1	–4.7		2.2	2.4	4.0	4.3	4.0	3.8	3.5	
	1960	0.8	0.2	0.7	–0.8	–2.5	–0.3		2.5	4.9	5.0	4.5	4.1	3.7	
	1970	0.9	0.3	0.9	–0.3	–1.3	0.5	1.3		7.4	6.2	5.1	4.5	3.9	
	1980	0.6	0.2	0.6	–0.4	–1.2	0.0	0.2	–1.0		5.1	4.0	3.5	3.1	
	1990	1.0	0.6	1.0	0.2	–0.3	0.9	1.3	1.3	3.6		2.9	2.7	2.5	
	2000	1.1	0.7	1.1	0.5	0.1	1.1	1.5	1.5	2.8	1.9		2.5	2.3	
	2010	1.0	0.7	1.0	0.4	0.1	1.0	1.2	1.2	1.9	1.1	0.2		2.2	
	2022	0.7	0.4	0.7	0.2	–0.1	0.5	0.7	0.5	0.9	0.1	–0.8	–1.6		

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World ex USA



In addition to the World indexes, we also construct World indexes that exclude the USA, using exactly the same principles. Although we are excluding just one country, the USA today accounts for 60% of the total stock market capitalization of the 90 countries included in the DMS World equity index. Our 89-country, World ex-USA equity index thus represents just 40% of today's value of the DMS World index.

The charts below show the returns for a US global investor. The indexes are expressed in US dollars, real returns are measured relative to US inflation, and the equity premium versus bills is relative to US Treasury bills.

We noted in Chapter 1 that, until relatively recently, most of the long-run evidence cited on historical asset returns drew almost exclusively on the US experience. We argued that focusing on such a successful economy can lead to "success" bias. Investors can gain a misleading view of equity returns elsewhere, or of future equity returns for the USA itself.

The chart below confirms this concern. It shows that, from the perspective of a US-based international investor, the real return on the World ex-USA equity index was 4.5% per year, which is 2.1% per year below that for the USA.

This differential of 2.1% per annum leads to very large differences in terminal wealth when compounded over 122 years. A US-based investor who invested solely in their domestic market would have enjoyed a terminal wealth more than ten times greater than from investing in the rest of the world, excluding their own country. This does not, however, take account of the risk reduction from diversification that they would have enjoyed from diversifying abroad.

Our World index ex-USA thus stresses the importance of looking at global returns, rather than focusing on, and generalizing from, the USA.

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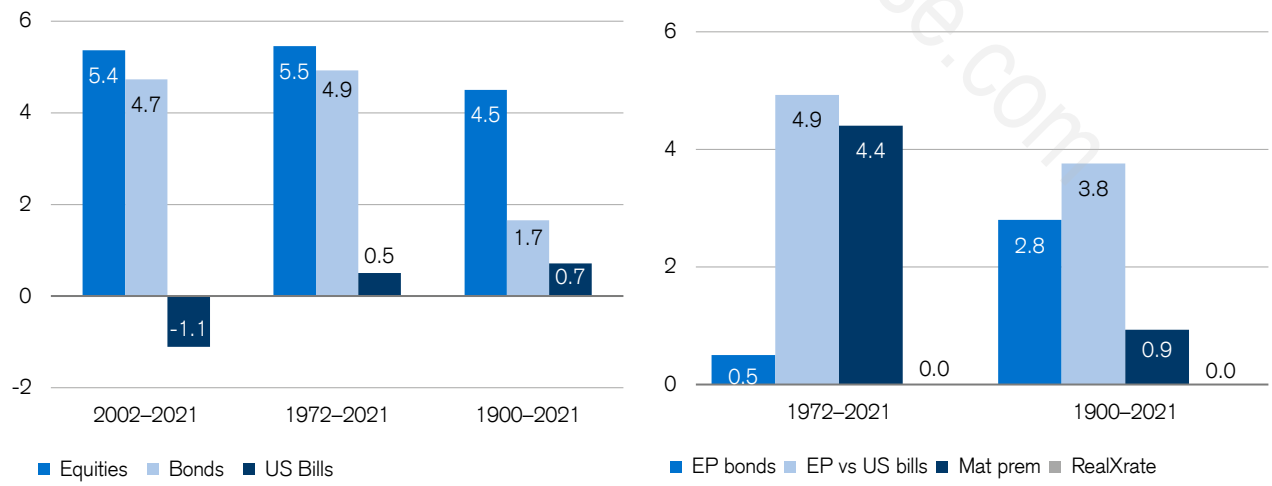
Figure 137: Annualized real USD returns and risk premiums (%) for the World ex-USA, 1900–2021



Note: The three asset classes are equities, long-term government bonds, and US Treasury bills. All returns include reinvested income, are adjusted for inflation, and are expressed as geometric mean returns.

Note: EP bonds and EP bills denote the equity premium relative to bonds and to US bills; Mat prem denotes the maturity premium for bonds relative to US bills; RealXRate denotes the inflation-adjusted change in the exchange rate against the US dollar.

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Figure 138: Real returns on World ex–US asset classes, 1900–2021 (in USD)

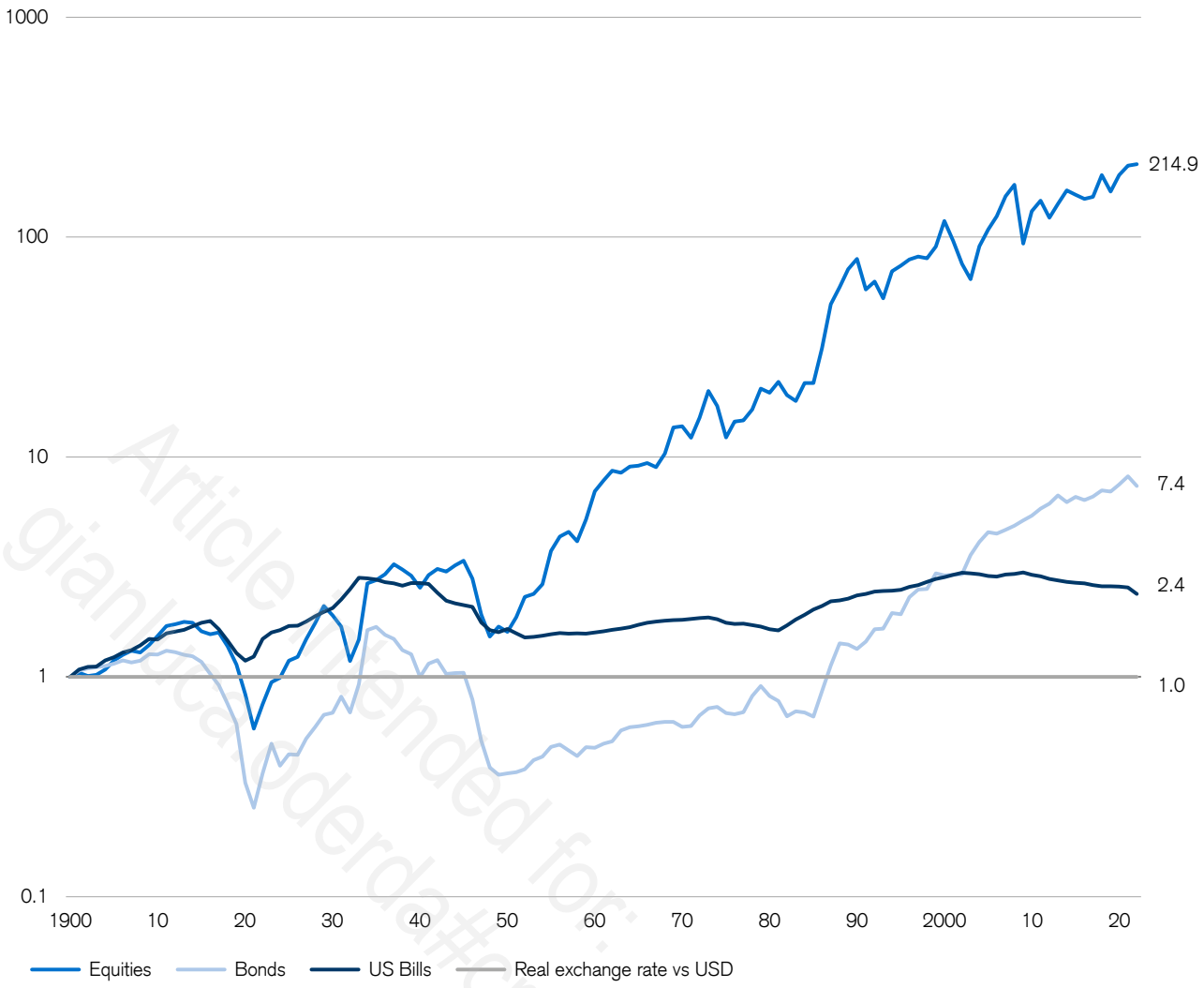

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Table 82: Returns on World ex-US asset classes, 1900–2021 (in USD)

		Mean returns % p.a.					Annual returns %				10-year returns % p.a.				Current
Return	**Asset**	**GM**	**AM**	**SE**	**SD**	**SC**	**Lowest**		**Highest**		**Lowest**		**Highest**		**year rank**
Nominal	Equities	7.5	9.1	1.7	18.6	0.11	–46.0	2008	81.0	1933	–3.3	1920	20.9	1987	60
	Bonds	4.6	5.4	1.2	13.3	0.26	–38.2	1919	77.7	1933	–8.7	1920	15.3	1994	105
	US bills	3.6	3.7	0.3	2.9	0.91	0.0	1938	14.7	1981	0.1	1942	9.2	1987	116
	US inflation	2.9	3.0	0.4	4.7	0.62	–10.8	1921	20.4	1918	–2.7	1933	8.7	1982	15
Real	Equities	4.5	6.2	1.7	18.8	0.15	–46.0	2008	79.6	1933	–10.2	1920	15.9	1959	77
	Bonds	1.7	2.7	1.3	14.6	0.33	–46.1	1919	76.3	1933	–15.2	1920	15.3	1933	106
	US bills	0.7	0.8	0.4	4.6	0.61	–15.0	1946	20.2	1921	–5.1	1950	6.2	1930	114
Premiums	Equities vs US bills	3.8	5.4	1.7	18.3	0.11	–46.8	2008	80.4	1933	–8.0	1920	16.3	1959	53
	Equities vs bonds	2.8	3.9	1.3	14.3	–0.04	–49.0	2008	35.6	1919	–5.6	2002	12.8	1959	30
	Bonds vs US bills	0.9	1.7	1.2	13.1	0.25	–41.5	1919	77.1	1933	–13.1	1920	9.2	1933	90

GM=geometric mean; AM=arithmetic mean, SE=standard error of mean; SD=standard deviation; SC=serial correlation; 10-year returns to end of given year.
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Table 83: World ex–US real returns, inflation and premiums, 1900–2021 (in USD)

	1 Jan	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000	2010	2022	
Real equity total returns	**1900**		2.0	4.7	3.5	2.4	3.0	4.6	4.6	4.1	4.6	3.8	2.9	2.8	**Equity premium vs bonds**
	1910	4.4		7.6	4.2	2.5	3.3	5.1	5.0	4.4	5.0	4.0	3.0	2.9	
	1920	–0.9	–5.9		0.9	0.0	1.9	4.5	4.5	3.8	4.6	3.5	2.5	2.4	
	1930	2.2	1.1	8.6		–0.9	2.3	5.7	5.5	4.4	5.2	3.9	2.7	2.6	
	1940	2.4	1.7	5.7	2.9		5.7	9.2	7.7	5.8	6.5	4.7	3.3	3.0	
	1950	0.9	0.1	2.2	–0.9	–4.5		12.8	8.7	5.8	6.7	4.6	2.9	2.7	
	1960	3.3	3.1	5.5	4.4	5.2	15.9		4.8	2.5	4.8	2.6	1.0	1.1	
	1970	3.8	3.7	5.8	5.1	5.8	11.4	7.1		0.3	4.8	1.9	0.1	0.4	
	1980	3.8	3.7	5.4	4.8	5.2	8.7	5.3	3.6		9.5	2.7	0.0	0.5	
	1990	5.0	5.1	6.7	6.4	7.1	10.3	8.5	9.2	15.0		–3.7	–4.4	–2.2	
	2000	4.9	4.9	6.4	6.1	6.6	9.0	7.3	7.4	9.4	4.1		–5.1	–1.6	
	2010	4.5	4.5	5.8	5.4	5.8	7.6	6.0	5.8	6.5	2.5	1.0		1.5	
	2022	4.5	4.5	5.6	5.3	5.6	7.0	5.7	5.4	5.9	3.2	2.7	4.2		
Real equity capital gains	**1900**		0.4	–1.7	–0.3	–0.1	–0.1	2.5	2.9	3.1	4.0	3.8	3.5	3.8	**Equity premium vs US bills**
	1910	–0.5		–3.8	–0.6	–0.3	–0.2	2.9	3.4	3.5	4.5	4.2	3.8	4.1	
	1920	–5.6	–10.4		2.8	1.5	1.1	4.7	4.9	4.8	5.7	5.2	4.7	4.9	
	1930	–2.8	–4.0	3.0		0.3	0.2	5.3	5.4	5.2	6.2	5.6	5.0	5.1	
	1940	–2.6	–3.3	0.5	–1.9		0.2	7.9	7.2	6.5	7.4	6.5	5.7	5.7	
	1950	–3.8	–4.6	–2.5	–5.1	–8.3		16.3	10.8	8.7	9.3	7.8	6.6	6.5	
	1960	–1.5	–1.7	0.6	–0.1	0.8	10.7		5.7	5.1	7.1	5.8	4.8	5.0	
	1970	–0.9	–1.0	1.1	0.6	1.4	6.7	2.8		4.6	7.8	5.8	4.6	4.9	
	1980	–0.9	–0.9	0.8	0.3	0.9	4.2	1.1	–0.6		11.0	6.5	4.5	4.9	
	1990	0.5	0.6	2.3	2.2	3.0	6.0	4.5	5.4	11.8		2.1	1.4	3.1	
	2000	0.6	0.7	2.2	2.1	2.8	5.2	3.8	4.2	6.7	1.8		0.8	3.6	
	2010	0.4	0.5	1.8	1.6	2.1	4.0	2.7	2.7	3.8	0.0	–1.7		5.9	
	2022	0.5	0.6	1.7	1.6	2.0	3.5	2.4	2.4	3.1	0.5	–0.1	1.3		
Real bonds	**1900**		–1.6	–6.2	–3.6	–2.4	–3.0	–2.0	–1.6	–0.9	–0.6	0.0	0.6	0.9	**Bond maturity premium**
	1910	2.4		–10.6	–4.6	–2.7	–3.3	–2.1	–1.6	–0.8	–0.5	0.2	0.8	1.2	
	1920	–5.4	–12.6		1.8	1.5	–0.8	0.2	0.3	1.0	1.0	1.6	2.1	2.4	
	1930	–1.2	–3.0	7.6		1.2	–2.1	–0.4	–0.1	0.8	0.9	1.6	2.2	2.4	
	1940	0.0	–0.8	5.7	3.8		–5.2	–1.1	–0.5	0.7	0.8	1.7	2.3	2.6	
	1950	–2.0	–3.1	0.3	–3.1	–9.6		3.1	2.0	2.7	2.4	3.1	3.6	3.7	
	1960	–1.2	–1.9	0.9	–1.2	–3.7	2.7		0.9	2.6	2.2	3.1	3.7	3.8	
	1970	–0.7	–1.3	1.2	–0.4	–1.7	2.5	2.2		4.3	2.8	3.9	4.5	4.4	
	1980	–0.2	–0.6	1.5	0.4	–0.5	2.7	2.8	3.3		1.4	3.6	4.5	4.5	
	1990	0.3	0.1	2.0	1.1	0.6	3.3	3.5	4.2	5.0		6.0	6.1	5.4	
	2000	1.1	0.9	2.8	2.1	1.8	4.2	4.6	5.4	6.5	8.0		6.2	5.2	
	2010	1.5	1.5	3.2	2.6	2.4	4.6	5.0	5.7	6.5	7.2	6.5		4.3	
	2022	1.7	1.6	3.1	2.6	2.5	4.3	4.5	5.0	5.4	5.5	4.4	2.6		
Real US bills	**1900**		1.0	4.0	2.4	1.2	2.1	2.1	2.1	2.8	3.0	3.0	3.0	2.9	**US inflation**
	1910	4.0		7.2	3.0	1.3	2.3	2.3	2.3	3.0	3.3	3.3	3.2	3.1	
	1920	0.8	–2.2		–0.9	–1.5	0.7	1.1	1.4	2.4	2.7	2.8	2.7	2.7	
	1930	2.4	1.7	5.7		–2.0	1.6	1.8	2.0	3.0	3.4	3.3	3.2	3.1	
	1940	2.5	2.0	4.1	2.6		5.4	3.8	3.4	4.3	4.5	4.2	4.0	3.7	
	1950	1.0	0.3	1.1	–1.1	–4.7		2.2	2.4	4.0	4.3	4.0	3.8	3.5	
	1960	0.8	0.2	0.7	–0.8	–2.5	–0.3		2.5	4.9	5.0	4.5	4.1	3.7	
	1970	0.9	0.3	0.9	–0.3	–1.3	0.5	1.3		7.4	6.2	5.1	4.5	3.9	
	1980	0.6	0.2	0.6	–0.4	–1.2	0.0	0.2	–1.0		5.1	4.0	3.5	3.1	
	1990	1.0	0.6	1.0	0.2	–0.3	0.9	1.3	1.3	3.6		2.9	2.7	2.5	
	2000	1.1	0.7	1.1	0.5	0.1	1.1	1.5	1.5	2.8	1.9		2.5	2.3	
	2010	1.0	0.7	1.0	0.4	0.1	1.0	1.2	1.2	1.9	1.1	0.2		2.2	
	2022	0.7	0.4	0.7	0.2	–0.1	0.5	0.7	0.5	0.9	0.1	–0.8	–1.6		

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Europe



In 1900, 16 of the DMS 23 Yearbook countries were European. Most are today in the European Union (EU). They comprise ten Eurozone states (Austria, Belgium, Finland, France, Germany, Ireland, Italy, the Netherlands, Portugal and Spain), two EU states outside the Eurozone (Denmark and Sweden), and four others (Norway, Russia, Switzerland and the UK). Loosely, we might argue that these represent the Old World. It is interesting to assess how well European countries as a group have performed, compared with our world index. We have therefore constructed a European index using the same methodology as for the world index. While the Europe equity index starts in 1900 with16 countries, this grows to 35 countries by 2021.

Of these 19 additional markets, Greece is a member of the DMS 35, while the remainder are drawn from our 55-country supplementary dataset. Fourteen of these new markets emerged following the breakup of the Soviet Union and the former Yugoslavia – new markets from within the Old World. Fifteen are now members of the EU, of which seven are in the Eurozone. The countries and their start dates are shown in **Figure 1** in Chapter 1. Since the supplementary database does not cover bonds, the DMS Europe bond index is based on 17 countries. As with our other composite indexes, the European indexes can be designated in any desired common currency. For consistency, the figures below are in US dollars from the perspective of a US international investor. The indexes can be converted to other currencies using the real exchange rates described in Chapter 3 and reported for each country in this chapter.

The left-hand chart below shows that the real equity return on European equities was 4.3%. This compares with 5.3% for the world index, indicating that the Old World countries have underperformed. This may relate to some nations' loss of imperial powers and colonial territories, the destruction from the two world wars (where Europe was at the epicenter), the fact that many New World countries were resource-rich, or perhaps to the greater vibrancy of New World economies.

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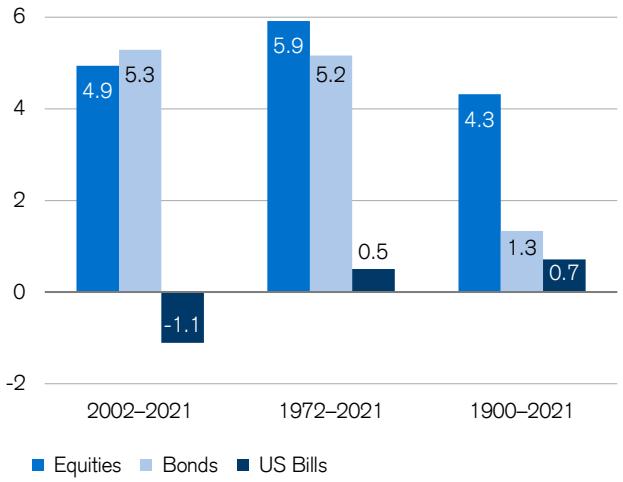
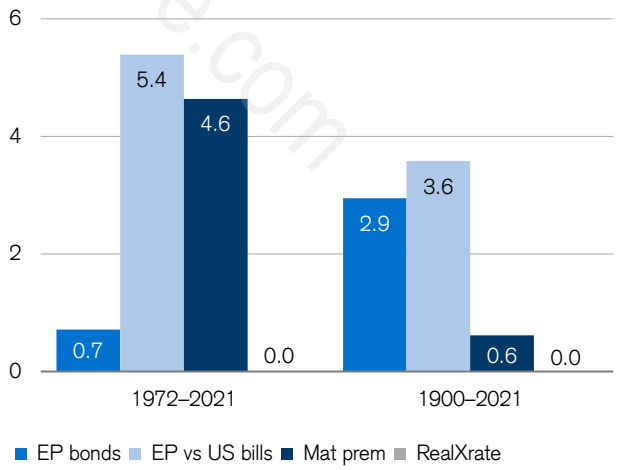
Figure 139: Annualized real USD returns and risk premiums (%) for Europe, 1900–2021



Note: The three asset classes are equities, long-term government bonds, and US Treasury bills. All returns include reinvested income, are adjusted for inflation, and are expressed as geometric mean returns.



Note: EP bonds and EP bills denote the equity premium relative to bonds and to US bills; Mat prem denotes the maturity premium for bonds relative to US bills; RealXRate denotes the inflation-adjusted change in the exchange rate against the US dollar.

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Figure 140: Real returns on European asset classes, 1900–2021 (in USD)

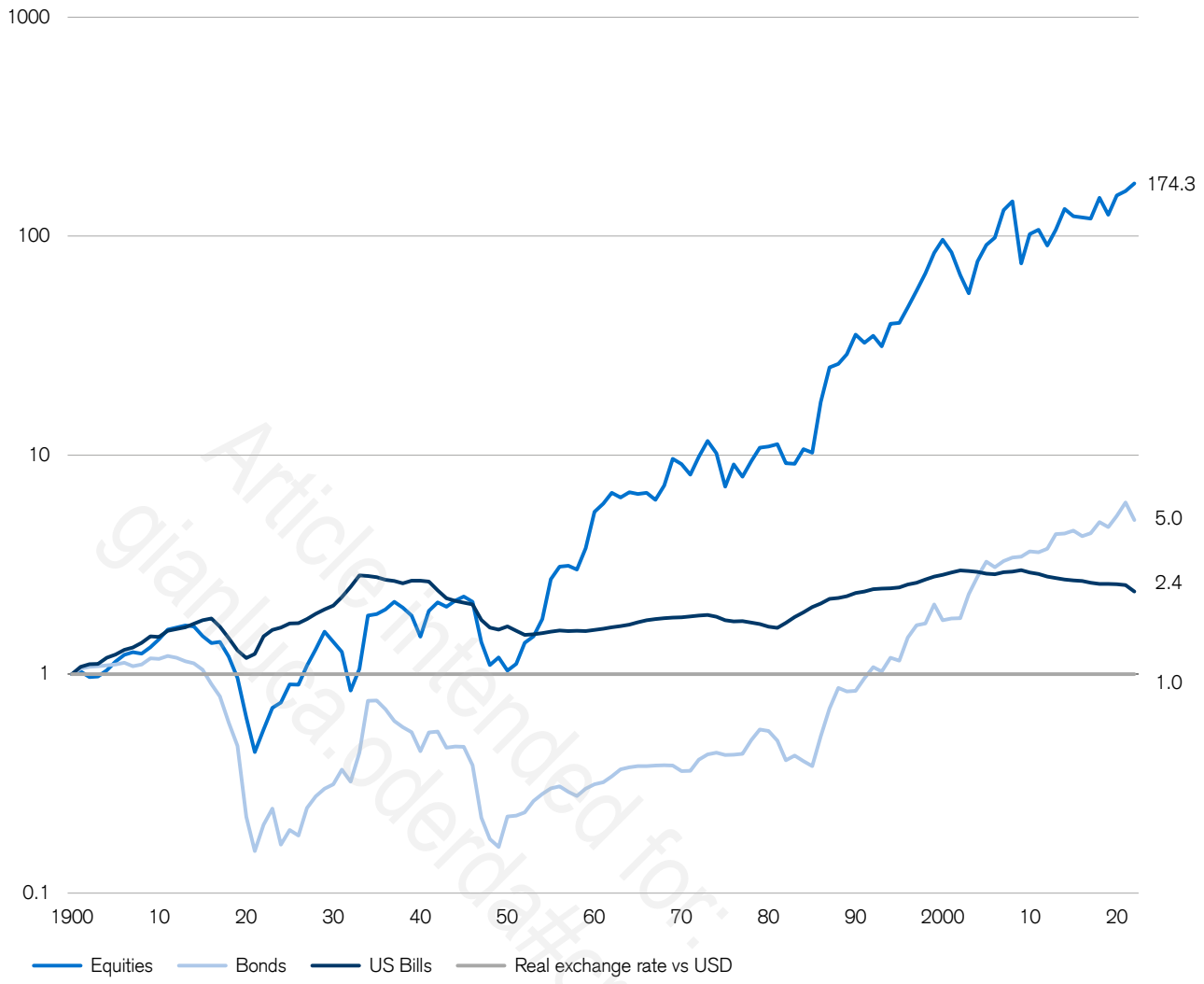

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Table 84: Returns on European asset classes, 1900–2021 (in USD)

		Mean returns % p.a.					Annual returns %				10-year returns % p.a.				Current
Return	Asset	GM	AM	SE	SD	SC	Lowest		Highest		Lowest		Highest		year rank
Nominal	Equities	7.3	9.1	1.8	19.4	0.11	–47.9	2008	76.5	1933	–5.4	1920	20.8	1959	39
	Bonds	4.3	5.3	1.3	14.8	0.23	–45.7	1919	73.5	1933	–12.7	1923	15.8	1994	111
	US bills	3.6	3.7	0.3	2.9	0.91	0.0	1938	14.7	1981	0.1	1942	9.2	1987	116
	US inflation	2.9	3.0	0.4	4.7	0.62	–10.8	1921	20.4	1918	–2.7	1933	8.7	1982	15
Real	Equities	4.3	6.1	1.8	19.6	0.14	–48.0	2008	75.2	1933	–12.1	1920	18.3	1960	49
	Bonds	1.3	2.6	1.4	15.9	0.28	–52.6	1919	72.2	1933	–18.5	1920	16.3	1933	112
	US bills	0.7	0.8	0.4	4.6	0.61	–15.0	1946	20.2	1921	–5.1	1950	6.2	1930	114
Premiums	Equities vs US bills	3.6	5.3	1.7	19.0	0.10	–48.7	2008	76.0	1933	–9.9	1920	18.6	1959	31
	Equities vs bonds	2.9	4.2	1.4	15.7	–0.03	–48.5	2008	54.6	1923	–6.4	2009	14.3	1960	7
	Bonds vs US bills	0.6	1.7	1.3	14.6	0.24	–48.6	1919	73.0	1933	–17.1	1923	10.2	1933	109

GM=geometric mean; AM=arithmetic mean, SE=standard error of mean; SD=standard deviation; SC=serial correlation; 10-year returns to end of given year.
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Table 85: European real returns, inflation and premiums, 1900–2021 (in USD)

	1 Jan	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000	2010	2022	
Real equity total returns	**1900**		2.1	5.4	5.1	3.1	3.1	4.9	4.7	3.8	4.2	4.1	3.1	2.9	**Equity premium vs bonds**
	1910	3.7		8.7	6.7	3.4	3.4	5.5	5.2	4.1	4.5	4.3	3.2	3.0	
	1920	–2.3	–7.9		4.6	0.8	1.6	4.7	4.5	3.3	3.9	3.8	2.6	2.5	
	1930	1.1	–0.1	8.3		–2.9	0.2	4.7	4.4	3.0	3.8	3.6	2.3	2.2	
	1940	1.0	0.1	4.3	0.6		3.3	8.7	7.0	4.6	5.2	4.8	3.1	2.9	
	1950	0.1	–0.8	1.7	–1.5	–3.5		14.2	8.8	5.0	5.7	5.1	3.0	2.8	
	1960	2.9	2.7	5.6	4.7	6.8	18.2		3.7	0.6	3.0	2.9	0.9	1.1	
	1970	3.2	3.1	5.5	4.8	6.2	11.5	5.2		–2.4	2.6	2.6	0.3	0.6	
	1980	3.0	2.9	4.9	4.2	5.1	8.2	3.5	1.9		7.8	5.2	1.2	1.3	
	1990	4.0	4.1	5.9	5.5	6.6	9.2	6.4	7.0	12.5		2.6	–2.0	–0.6	
	2000	4.7	4.8	6.5	6.2	7.2	9.5	7.4	8.2	11.5	10.5		–6.4	–2.1	
	2010	4.3	4.4	5.8	5.5	6.2	7.9	6.0	6.2	7.7	5.4	0.6		1.7	
	2022	4.3	4.4	5.7	5.4	6.0	7.4	5.7	5.8	6.8	5.1	2.7	4.6		
Real equity capital gains	**1900**		–0.2	–3.1	–1.3	–1.5	–0.9	2.1	2.3	2.4	3.1	3.6	3.3	3.6	**Equity premium vs US bills**
	1910	–0.9		–5.9	–1.8	–1.9	–1.1	2.6	2.8	2.8	3.5	4.0	3.6	3.9	
	1920	–6.7	–12.1		2.5	0.2	0.5	4.8	4.6	4.3	4.9	5.3	4.8	4.9	
	1930	–3.6	–4.9	2.9		–2.0	–0.4	5.6	5.1	4.7	5.3	5.7	5.0	5.2	
	1940	–3.7	–4.6	–0.6	–3.9		1.3	9.6	7.6	6.4	6.8	7.1	6.1	6.1	
	1950	–4.3	–5.1	–2.7	–5.3	–6.7		18.6	10.9	8.2	8.3	8.3	6.9	6.8	
	1960	–1.6	–1.7	1.1	0.5	2.7	13.1		3.8	3.3	5.0	5.9	4.7	5.0	
	1970	–1.2	–1.2	1.1	0.6	2.2	7.0	1.2		2.9	5.7	6.6	5.0	5.3	
	1980	–1.4	–1.4	0.5	0.0	1.0	3.7	–0.7	–2.7		8.6	8.5	5.7	5.9	
	1990	–0.4	–0.3	1.5	1.2	2.3	4.7	2.0	2.4	7.7		8.4	4.3	5.0	
	2000	0.3	0.5	2.2	2.0	3.1	5.2	3.3	3.9	7.4	7.1		0.4	3.6	
	2010	0.1	0.2	1.6	1.5	2.3	3.9	2.1	2.3	4.0	2.2	–2.4		6.3	
	2022	0.2	0.3	1.6	1.5	2.1	3.4	1.9	2.1	3.2	1.9	–0.4	1.3		
Real bonds	**1900**		–2.3	–8.0	–6.1	–4.4	–3.9	–2.7	–2.3	–1.4	–1.1	–0.5	0.2	0.6	**Bond maturity premium**
	1910	1.6		–13.4	–7.9	–5.1	–4.3	–2.7	–2.3	–1.2	–1.0	–0.3	0.5	0.9	
	1920	–7.2	–15.3		–2.1	–0.6	–1.1	0.1	0.1	1.0	0.9	1.5	2.1	2.4	
	1930	–3.8	–6.4	3.5		0.9	–0.6	0.9	0.7	1.6	1.4	2.0	2.7	2.9	
	1940	–2.0	–3.2	3.5	3.5		–2.0	0.8	0.6	1.8	1.5	2.2	2.9	3.1	
	1950	–2.9	–4.1	0.0	–1.7	–6.6		3.8	1.9	3.0	2.4	3.1	3.8	3.9	
	1960	–1.9	–2.6	0.9	0.0	–1.7	3.4		0.1	2.7	2.0	2.9	3.8	3.9	
	1970	–1.4	–1.9	1.0	0.3	–0.7	2.4	1.4		5.4	3.0	3.9	4.7	4.7	
	1980	–0.7	–1.1	1.5	1.1	0.5	3.0	2.8	4.3		0.7	3.1	4.5	4.5	
	1990	–0.2	–0.4	1.9	1.7	1.3	3.4	3.3	4.3	4.3		5.7	6.5	5.7	
	2000	0.6	0.5	2.6	2.5	2.3	4.2	4.4	5.4	6.0	7.7		7.3	5.7	
	2010	1.2	1.1	3.2	3.1	3.0	4.8	5.0	5.9	6.5	7.6	7.5		4.5	
	2022	1.3	1.3	3.1	3.1	3.0	4.4	4.6	5.2	5.4	5.8	4.9	2.8		
Real US bills	**1900**		1.0	4.0	2.4	1.2	2.1	2.1	2.1	2.8	3.0	3.0	3.0	2.9	**US inflation**
	1910	4.0		7.2	3.0	1.3	2.3	2.3	2.3	3.0	3.3	3.3	3.2	3.1	
	1920	0.8	–2.2		–0.9	–1.5	0.7	1.1	1.4	2.4	2.7	2.8	2.7	2.7	
	1930	2.4	1.7	5.7		–2.0	1.6	1.8	2.0	3.0	3.4	3.3	3.2	3.1	
	1940	2.5	2.0	4.1	2.6		5.4	3.8	3.4	4.3	4.5	4.2	4.0	3.7	
	1950	1.0	0.3	1.1	–1.1	–4.7		2.2	2.4	4.0	4.3	4.0	3.8	3.5	
	1960	0.8	0.2	0.7	–0.8	–2.5	–0.3		2.5	4.9	5.0	4.5	4.1	3.7	
	1970	0.9	0.3	0.9	–0.3	–1.3	0.5	1.3		7.4	6.2	5.1	4.5	3.9	
	1980	0.6	0.2	0.6	–0.4	–1.2	0.0	0.2	–1.0		5.1	4.0	3.5	3.1	
	1990	1.0	0.6	1.0	0.2	–0.3	0.9	1.3	1.3	3.6		2.9	2.7	2.5	
	2000	1.1	0.7	1.1	0.5	0.1	1.1	1.5	1.5	2.8	1.9		2.5	2.3	
	2010	1.0	0.7	1.0	0.4	0.1	1.0	1.2	1.2	1.9	1.1	0.2		2.2	
	2022	0.7	0.4	0.7	0.2	–0.1	0.5	0.7	0.5	0.9	0.1	–0.8	–1.6		

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Developed markets



We also produce long-run indexes from 1900 for both developed and emerging markets. To do this, we need a way of identifying whether a market was developed or emerging at each year in the past. Most of the countries for which we have data in 1900 are today classified as developed. However, back in 1900, several would then have been deemed emerging.

From the start of MSCI's EM index in 1987, we adopt MSCI's annual classification to determine which markets were developed. We do not use MSCI index values. Prior to 1987, we use our own algorithm to determine which markets were developed. This is based on GDP per capita and is explained in Chapter 1.

Using these classifications, we create the DMS Developed markets index using the same methodology as for our other composite indexes. We estimate the index returns annually for all those markets which were deemed developed at the start of the year in question.

The index had 16 constituents in 1900. These were joined by Finland in 1932, Japan in 1966, Spain in 1974, Hong Kong SAR in 1977, Singapore in 1980, Luxembourg in 1982, Portugal in 1998, Greece from 2002–13 and Israel in 2011. By 2021, the developed markets index thus spanned 24 countries. As with our other composite indexes, the DMS Developed markets index is designated in US dollars from the perspective of a US international investor.

Over the last 122 years, the left-hand chart below shows that the annualized real return on the developed markets equity index was 5.4%. This is a little higher than the 5.3% for the World index, indicating that developed markets have outperformed emerging markets over the long run. For a fuller discussion, see Chapter 2.

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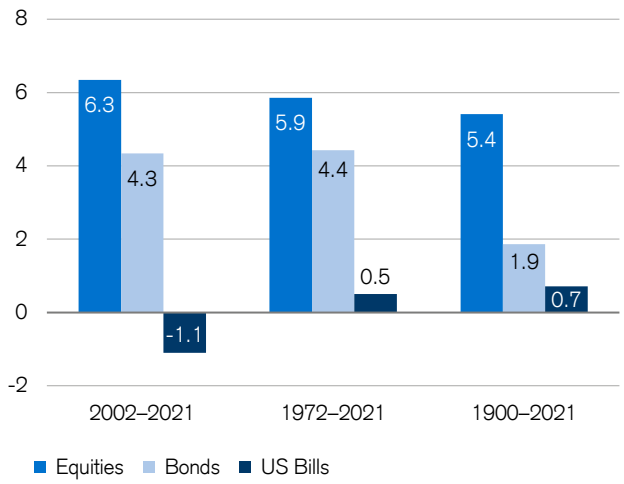
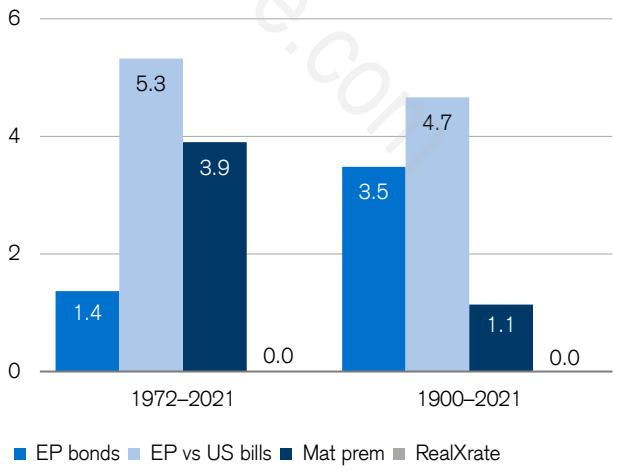
Figure 141: Annualized real USD returns & risk premiums (%) for developed markets, 1900–2021 (in USD)



Note: The three asset classes are equities, long-term government bonds, and US Treasury bills. All returns include reinvested income, are adjusted for inflation, and are expressed as geometric mean returns.



Note: EP bonds and EP bills denote the equity premium relative to bonds and to US bills; Mat prem denotes the maturity premium for bonds relative to US bills; RealXRate denotes the inflation-adjusted change in the exchange rate against the US dollar.

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Figure 142: Real returns on developed market asset classes, 1900–2021 (in USD)

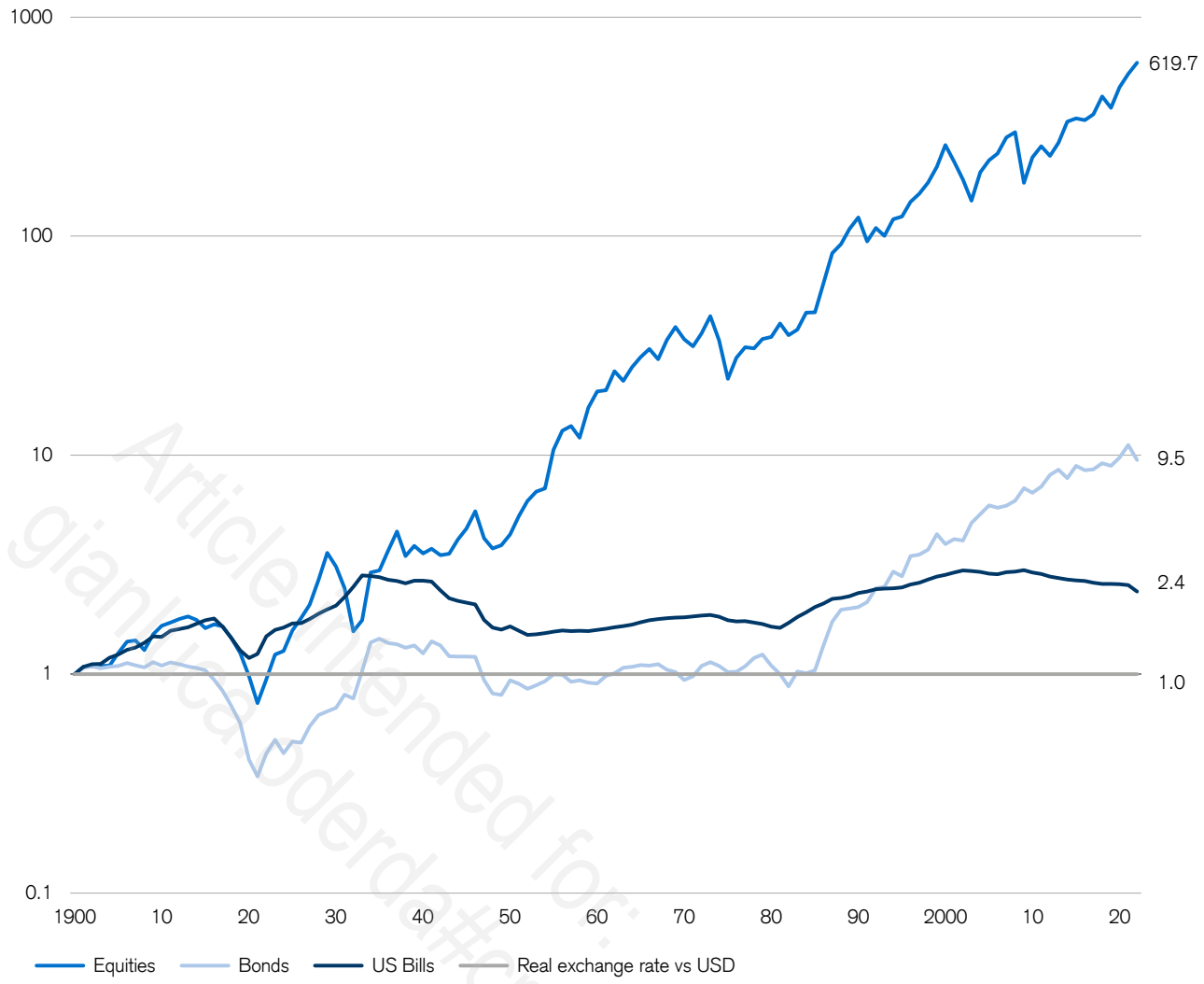

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Table 86: Returns on developed market asset classes, 1900–2021 (in USD)

		Mean returns % p.a.					Annual returns %				10-year returns % p.a.				Current
Return	Asset	GM	AM	SE	SD	SC	Lowest		Highest		Lowest		Highest		year rank
Nominal	Equities	8.5	9.9	1.5	17.1	0.05	–42.5	1931	66.4	1933	–1.2	1938	19.2	1989	31
	Bonds	4.8	5.2	0.8	9.2	0.15	–21.9	1919	35.7	1933	–4.5	1920	15.4	1993	118
	US bills	3.6	3.7	0.3	2.9	0.91	0.0	1938	14.7	1981	0.1	1942	9.2	1987	116
	Inflation	2.9	3.0	0.4	4.7	0.62	–10.8	1921	20.4	1918	–2.7	1933	8.7	1982	15
Real	Equities	5.4	6.9	1.6	17.4	0.08	–41.3	2008	65.1	1933	–8.1	1920	16.2	1959	49
	Bonds	1.9	2.4	1.0	10.8	0.24	–31.8	1919	34.7	1933	–11.3	1920	12.3	1933	117
	US bills	0.7	0.8	0.4	4.6	0.61	–15.0	1946	20.2	1921	–5.1	1950	6.2	1930	114
Premiums	Equities vs US bills	4.7	6.1	1.5	17.1	0.07	–43.1	1931	65.9	1933	–5.9	1920	16.6	1959	23
	Equities vs bonds	3.5	4.8	1.5	16.1	–0.04	–48.6	2008	40.3	1958	–6.5	2009	16.6	1959	6
	Bonds vs US bills	1.1	1.5	0.8	9.1	0.18	–26.1	1919	35.3	1933	–9.1	1920	8.5	1993	114

GM=geometric mean; AM=arithmetic mean, SE=standard error of mean; SD=standard deviation; SC=serial correlation; 10-year returns to end of given year.
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Table 87: Developed market real returns, inflation and premiums, 1900–2021 (in USD)

	1 Jan	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000	2010	2022	
Real equity total returns	**1900**		4.3	4.5	5.1	2.7	3.1	5.2	5.3	4.4	4.7	4.3	3.3	3.5	**Equity premium vs bonds**
	1910	5.2		4.7	5.5	2.1	2.8	5.4	5.4	4.4	4.7	4.3	3.2	3.4	
	1920	–0.1	–5.2		6.3	0.9	2.2	5.6	5.6	4.4	4.7	4.2	3.0	3.3	
	1930	3.8	3.2	12.2		–4.2	0.3	5.4	5.4	4.0	4.5	4.0	2.6	3.0	
	1940	3.2	2.6	6.7	1.4		4.9	10.6	8.8	6.2	6.3	5.4	3.6	3.9	
	1950	3.0	2.4	5.1	1.7	2.0		16.6	10.8	6.6	6.6	5.5	3.4	3.7	
	1960	5.1	5.0	7.8	6.3	8.9	16.2		5.3	2.0	3.5	2.9	0.9	1.8	
	1970	5.2	5.1	7.3	6.2	7.8	10.8	5.7		–1.2	2.6	2.1	–0.1	1.1	
	1980	4.5	4.4	6.1	5.0	5.9	7.2	2.9	0.3		6.6	3.8	0.2	1.7	
	1990	5.5	5.5	7.1	6.3	7.3	8.7	6.3	6.6	13.4		1.0	–2.8	0.2	
	2000	5.7	5.8	7.2	6.5	7.4	8.5	6.7	7.0	10.6	7.9		–6.5	–0.1	
	2010	5.1	5.0	6.2	5.5	6.1	6.8	5.0	4.9	6.5	3.2	–1.3		5.6	
	2022	5.4	5.4	6.5	5.9	6.5	7.1	5.7	5.8	7.1	5.2	4.0	8.7		
Real equity capital gains	**1900**		1.2	–1.0	1.4	0.7	2.0	4.3	4.3	3.9	4.5	4.6	4.0	4.7	**Equity premium vs US bills**
	1910	0.6		–3.1	1.5	0.6	2.1	4.9	4.8	4.3	4.9	5.0	4.3	5.0	
	1920	–4.8	–9.9		6.2	2.4	3.9	7.0	6.4	5.5	6.1	6.1	5.2	5.8	
	1930	–1.2	–2.0	6.5		–1.2	2.8	7.2	6.5	5.4	6.1	6.0	5.1	5.8	
	1940	–1.7	–2.4	1.5	–3.3		7.0	11.7	9.2	7.1	7.6	7.3	6.0	6.6	
	1950	–1.9	–2.5	0.0	–3.0	–2.8		16.6	10.3	7.2	7.7	7.4	5.8	6.6	
	1960	0.1	0.0	2.7	1.4	3.8	10.9		4.3	2.7	4.9	5.2	3.8	5.0	
	1970	0.4	0.4	2.6	1.6	3.3	6.5	2.2		1.2	5.3	5.5	3.7	5.2	
	1980	–0.1	–0.2	1.5	0.5	1.5	3.0	–0.7	–3.6		9.4	7.6	4.5	6.2	
	1990	0.9	1.0	2.6	2.0	3.1	4.6	2.6	2.8	9.6		5.9	2.1	5.2	
	2000	1.4	1.5	3.0	2.5	3.5	4.8	3.3	3.7	7.6	5.5		–1.5	4.8	
	2010	0.9	1.0	2.3	1.7	2.5	3.4	1.9	1.9	3.8	0.9	–3.5		10.5	
	2022	1.4	1.5	2.7	2.3	3.0	3.8	2.7	2.8	4.4	2.8	1.6	6.0		
Real bonds	**1900**		–3.0	–5.2	–3.5	–1.9	–1.1	–0.9	–0.9	–0.5	–0.2	0.3	0.8	1.1	**Bond maturity premium**
	1910	0.9		–7.4	–3.8	–1.5	–0.7	–0.5	–0.6	–0.2	0.2	0.7	1.1	1.5	
	1920	–4.4	–9.4		–0.1	1.5	1.7	1.3	0.8	1.1	1.3	1.8	2.1	2.4	
	1930	–1.2	–2.2	5.6		3.1	2.6	1.7	1.0	1.3	1.6	2.0	2.4	2.7	
	1940	0.5	0.4	5.7	5.9		2.0	1.0	0.3	0.9	1.2	1.8	2.3	2.7	
	1950	–0.1	–0.4	2.8	1.5	–2.8		0.0	–0.5	0.5	1.0	1.8	2.4	2.7	
	1960	–0.2	–0.4	2.0	0.9	–1.6	–0.3		–1.0	0.8	1.4	2.2	2.8	3.2	
	1970	–0.1	–0.3	1.7	0.7	–0.9	0.0	0.4		2.5	2.6	3.3	3.8	4.0	
	1980	0.1	0.0	1.7	0.9	–0.3	0.5	0.9	1.5		2.7	3.7	4.3	4.4	
	1990	0.8	0.8	2.3	1.8	1.0	1.9	2.7	3.9	6.4		4.8	5.1	4.9	
	2000	1.4	1.4	2.9	2.5	1.9	2.9	3.7	4.9	6.6	6.9		5.3	4.9	
	2010	1.7	1.8	3.2	2.9	2.4	3.3	4.1	5.0	6.2	6.2	5.5		4.7	
	2022	1.9	2.0	3.1	2.9	2.5	3.3	3.9	4.6	5.3	5.0	4.1	2.9		
Real US bills	**1900**		1.0	4.0	2.4	1.2	2.1	2.1	2.1	2.8	3.0	3.0	3.0	2.9	**Inflation**
	1910	4.0		7.2	3.0	1.3	2.3	2.3	2.3	3.0	3.3	3.3	3.2	3.1	
	1920	0.8	–2.2		–0.9	–1.5	0.7	1.1	1.4	2.4	2.7	2.8	2.7	2.7	
	1930	2.4	1.7	5.7		–2.0	1.6	1.8	2.0	3.0	3.4	3.3	3.2	3.1	
	1940	2.5	2.0	4.1	2.6		5.4	3.8	3.4	4.3	4.5	4.2	4.0	3.7	
	1950	1.0	0.3	1.1	–1.1	–4.7		2.2	2.4	4.0	4.3	4.0	3.8	3.5	
	1960	0.8	0.2	0.7	–0.8	–2.5	–0.3		2.5	4.9	5.0	4.5	4.1	3.7	
	1970	0.9	0.3	0.9	–0.3	–1.3	0.5	1.3		7.4	6.2	5.1	4.5	3.9	
	1980	0.6	0.2	0.6	–0.4	–1.2	0.0	0.2	–1.0		5.1	4.0	3.5	3.1	
	1990	1.0	0.6	1.0	0.2	–0.3	0.9	1.3	1.3	3.6		2.9	2.7	2.5	
	2000	1.1	0.7	1.1	0.5	0.1	1.1	1.5	1.5	2.8	1.9		2.5	2.3	
	2010	1.0	0.7	1.0	0.4	0.1	1.0	1.2	1.2	1.9	1.1	0.2		2.2	
	2022	0.7	0.4	0.7	0.2	–0.1	0.5	0.7	0.5	0.9	0.1	–0.8	–1.6		

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Emerging markets



Our emerging markets index follows the same methodology used for the other composite indexes, and the same classification rule as the developed markets index (see above). At the start of each year, we deem a market to be emerging unless the rule indicates that it is a developed market at that point in time.

Unlike the major index providers, we do not distinguish between emerging, frontier, other or unclassified markets. Our focus is simply on the split between markets that are deemed developed and those with developing status. We group together all the latter markets as a single cohort and refer to them generically as "emerging."

In 1900, the DMS Emerging markets equity and bond indexes had seven country constituents. By 2021, the number of constituents in the emerging markets equity index had grown to 66 countries. The constituents, with their start dates, are shown in **Figure 1** in Chapter 1. The emerging markets bond index had 13 constituents, all drawn from the DMS 35. This is because our supplementary database of 55 countries does not yet have bond data (again, see **Figure 1**).

Over the last 122 years, the left-hand chart below shows that the annualized real return was 3.9% for the emerging markets equity index, and –0.2% for the bond index. These are much lower than for developed markets. The main reason for the underperformance was the dismal returns from emerging markets in the 1940s. Since 1960, emerging market equities have outperformed, although bonds continued to disappoint. For a fuller discussion, see Chapter 2.

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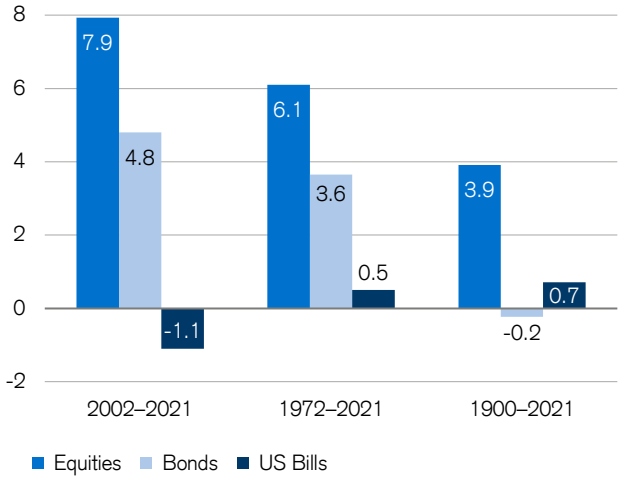
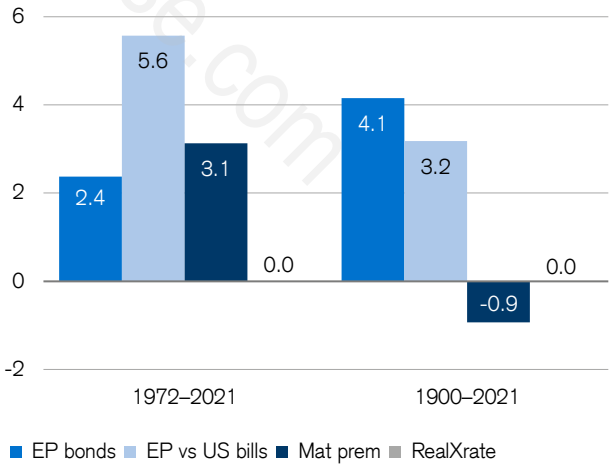
Figure 143: Annualized real USD returns and risk premiums (%) for emerging markets, 1900–2021 (in USD)



Note: The three asset classes are equities, long-term government bonds, and US Treasury bills. All returns include reinvested income, are adjusted for inflation, and are expressed as geometric mean returns.



Note: EP bonds and EP bills denote the equity premium relative to bonds and to US bills; Mat prem denotes the maturity premium for bonds relative to US bills; RealXRate denotes the inflation-adjusted change in the exchange rate against the US dollar.

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Figure 144: Real returns on emerging market asset classes, 1900–2021 (in USD)

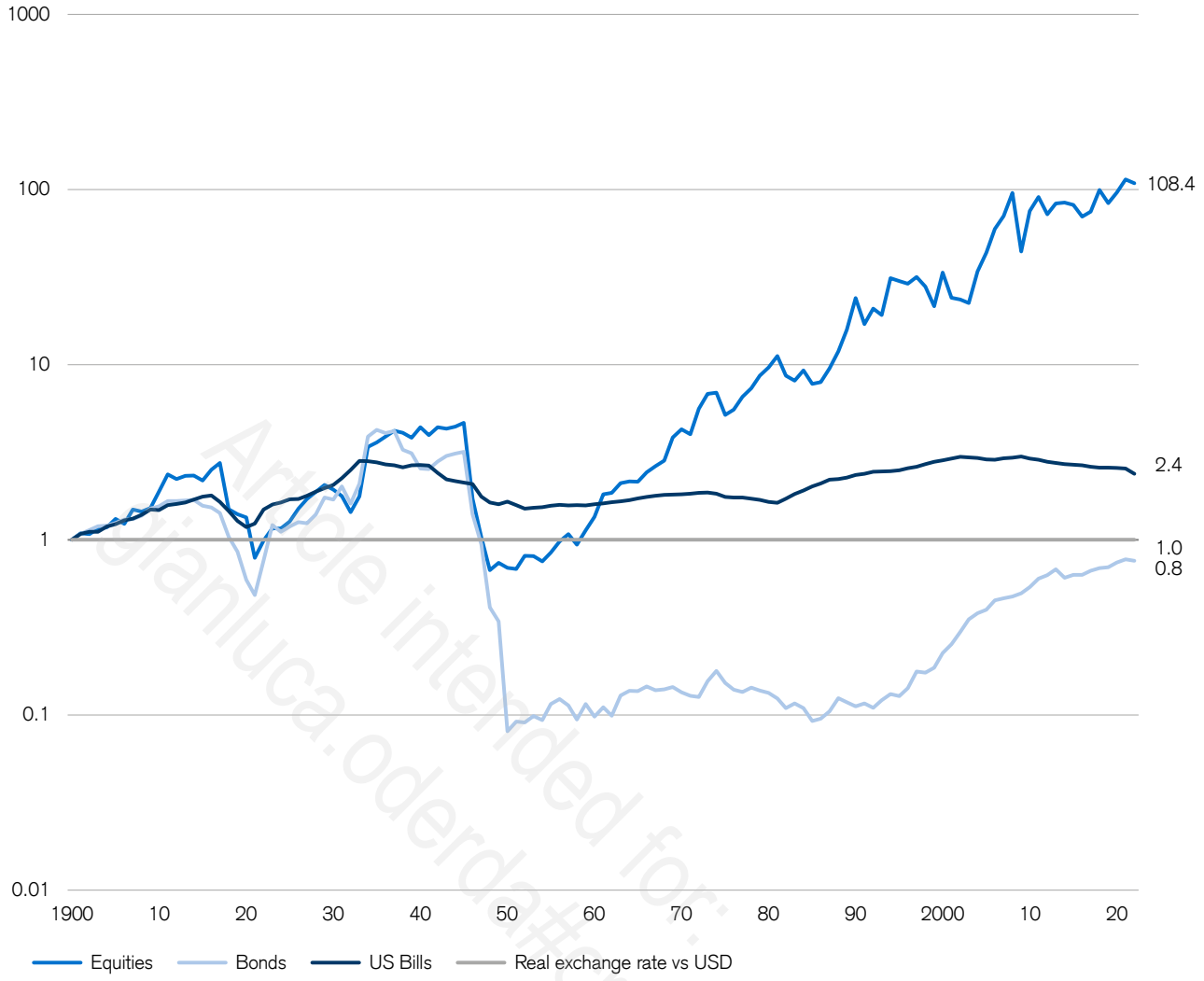

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Table 88: Returns on emerging market asset classes, 1900–2021 (in USD)

		Mean returns % p.a.					Annual returns %				10-year returns % p.a.				Current
Return	Asset	GM	AM	SE	SD	SC	Lowest		Highest		Lowest		Highest		year rank
Nominal	Equities	6.9	9.5	2.1	23.1	–0.06	–62.3	1945	93.0	1933	–12.5	1953	19.7	1980	81
	Bonds	2.7	4.6	1.6	17.8	0.18	–76.9	1949	87.6	1933	–26.4	1953	15.1	2005	60
	US bills	3.6	3.7	0.3	2.9	0.91	0.0	1938	14.7	1981	0.1	1942	9.2	1987	116
	Inflation	2.9	3.0	0.4	4.7	0.62	–10.8	1921	20.4	1918	–2.7	1933	8.7	1982	15
Real	Equities	3.9	6.5	2.0	22.6	–0.02	–63.1	1945	91.6	1933	–16.9	1949	14.5	1994	91
	Bonds	–0.2	1.8	1.7	18.7	0.27	–76.4	1949	86.2	1933	–29.6	1953	15.4	1930	81
	US bills	0.7	0.8	0.4	4.6	0.61	–15.0	1946	20.2	1921	–5.1	1950	6.2	1930	114
Premiums	Equities vs US bills	3.2	5.7	2.0	22.6	–0.06	–62.4	1945	92.5	1933	–13.4	1953	14.9	2012	74
	Equities vs bonds	4.1	7.3	3.0	33.1	–0.03	–55.5	2008	297.7	1949	–9.3	2003	24.1	1956	82
	Bonds vs US bills	–0.9	0.9	1.6	17.5	0.17	–77.1	1949	87.1	1933	–27.1	1953	11.0	2005	43

GM=geometric mean; AM=arithmetic mean, SE=standard error of mean; SD=standard deviation; SC=serial correlation; 10-year returns to end of given year.
Source: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2022, Morningstar. Not to be reproduced without express written permission from the authors.

Table 89: Emerging market real returns, inflation and premiums, 1900–2021 (in USD)

	1 Jan	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000	2010	2022	
Real equity total returns	**1900**		2.0	4.2	0.4	1.4	4.4	4.5	5.1	5.5	6.1	5.1	4.6	4.1	**Equity premium vs bonds**
	1910	6.5		6.4	–0.3	1.2	5.0	5.0	5.6	6.0	6.7	5.5	4.9	4.3	
	1920	1.5	–3.3		–6.6	–1.4	4.5	4.6	5.4	5.9	6.7	5.4	4.7	4.1	
	1930	2.2	0.1	3.7		4.2	10.6	8.7	8.7	8.7	9.1	7.2	6.2	5.4	
	1940	3.8	2.9	6.1	8.5		17.4	11.0	10.2	9.8	10.1	7.7	6.5	5.5	
	1950	–0.7	–2.5	–2.2	–5.0	–16.9		4.9	6.8	7.4	8.4	5.9	4.8	4.0	
	1960	0.5	–0.7	0.0	–1.2	–5.7	6.9		8.7	8.6	9.6	6.1	4.7	3.8	
	1970	2.1	1.4	2.3	2.0	–0.1	9.5	12.2		8.6	10.0	5.3	3.8	2.9	
	1980	2.9	2.4	3.3	3.3	2.0	9.2	10.3	8.5		11.5	3.7	2.2	1.6	
	1990	3.6	3.2	4.2	4.3	3.4	9.3	10.1	9.0	9.5		–3.6	–2.1	–1.3	
	2000	3.6	3.3	4.1	4.2	3.4	8.1	8.4	7.1	6.4	3.4		–0.6	–0.2	
	2010	4.0	3.8	4.6	4.7	4.1	8.1	8.4	7.4	7.1	5.9	8.4		0.2	
	2022	3.9	3.7	4.4	4.5	4.0	7.3	7.3	6.4	5.9	4.8	5.5	3.1		
Real equity capital gains	**1900**		2.5	0.6	–0.2	1.3	–1.7	–0.3	1.2	2.2	2.6	2.5	3.0	3.2	**Equity premium vs US bills**
	1910	0.0		–1.2	–1.5	0.9	–2.7	–0.8	1.0	2.2	2.6	2.5	3.1	3.2	
	1920	–4.4	–8.6		–1.8	1.9	–3.3	–0.7	1.5	2.8	3.2	3.0	3.5	3.7	
	1930	–3.7	–5.5	–2.3		5.7	–4.0	–0.3	2.3	3.7	4.1	3.7	4.2	4.3	
	1940	–2.1	–2.8	0.2	2.7		–12.8	–3.3	1.2	3.2	3.7	3.3	4.0	4.1	
	1950	–6.2	–7.7	–7.4	–9.8	–20.8		7.3	9.0	9.2	8.3	6.9	7.1	6.7	
	1960	–5.0	–6.0	–5.3	–6.3	–10.5	1.2		10.7	10.1	8.6	6.8	7.1	6.6	
	1970	–3.4	–4.0	–3.0	–3.2	–5.1	3.9	6.7		9.5	7.6	5.5	6.2	5.9	
	1980	–2.6	–3.0	–2.0	–1.9	–3.1	3.7	5.0	3.3		5.7	3.6	5.1	5.0	
	1990	–1.8	–2.0	–1.1	–0.9	–1.6	3.9	4.9	4.0	4.7		1.5	4.8	4.8	
	2000	–1.4	–1.6	–0.7	–0.5	–1.0	3.5	4.1	3.3	3.3	1.9		8.2	6.3	
	2010	–0.8	–0.9	0.0	0.3	–0.1	3.9	4.4	3.9	4.1	3.7	5.6		4.8	
	2022	–0.7	–0.7	0.1	0.3	0.0	3.3	3.7	3.1	3.1	2.6	2.9	0.6		
Real bonds	**1900**		0.5	–3.4	–0.6	–0.1	–5.9	–4.5	–3.6	–3.1	–3.3	–2.5	–1.5	–0.9	**Bond maturity premium**
	1910	4.5		–7.2	–1.2	–0.3	–7.4	–5.5	–4.3	–3.6	–3.8	–2.8	–1.7	–1.1	
	1920	–2.6	–9.2		5.2	3.3	–7.4	–5.1	–3.7	–3.0	–3.3	–2.3	–1.1	–0.4	
	1930	1.8	0.5	11.1		1.5	–13.2	–8.3	–5.8	–4.5	–4.6	–3.3	–1.9	–1.0	
	1940	2.4	1.7	7.6	4.2		–25.7	–12.8	–8.2	–6.0	–5.8	–4.1	–2.3	–1.3	
	1950	–4.9	–7.1	–6.4	–14.1	–29.2		2.3	2.1	1.7	–0.1	1.0	2.2	2.6	
	1960	–3.8	–5.4	–4.4	–9.1	–15.1	1.9		1.9	1.4	–0.8	0.6	2.2	2.7	
	1970	–2.8	–4.0	–2.9	–6.1	–9.3	2.6	3.3		0.9	–2.2	0.2	2.3	2.8	
	1980	–2.5	–3.4	–2.5	–5.0	–7.1	1.7	1.6	–0.1		–5.2	–0.1	2.8	3.3	
	1990	–2.4	–3.2	–2.3	–4.4	–6.1	0.8	0.5	–0.9	–1.7		5.2	7.0	6.1	
	2000	–1.5	–2.1	–1.2	–2.8	–4.0	2.1	2.1	1.7	2.7	7.3		8.8	6.5	
	2010	–0.6	–1.1	–0.1	–1.4	–2.2	3.2	3.5	3.5	4.8	8.2	9.1		4.6	
	2022	–0.2	–0.6	0.2	–0.9	–1.5	3.2	3.4	3.4	4.2	6.2	5.7	2.9		
Real US bills	**1900**		1.0	4.0	2.4	1.2	2.1	2.1	2.1	2.8	3.0	3.0	3.0	2.9	**Inflation**
	1910	4.0		7.2	3.0	1.3	2.3	2.3	2.3	3.0	3.3	3.3	3.2	3.1	
	1920	0.8	–2.2		–0.9	–1.5	0.7	1.1	1.4	2.4	2.7	2.8	2.7	2.7	
	1930	2.4	1.7	5.7		–2.0	1.6	1.8	2.0	3.0	3.4	3.3	3.2	3.1	
	1940	2.5	2.0	4.1	2.6		5.4	3.8	3.4	4.3	4.5	4.2	4.0	3.7	
	1950	1.0	0.3	1.1	–1.1	–4.7		2.2	2.4	4.0	4.3	4.0	3.8	3.5	
	1960	0.8	0.2	0.7	–0.8	–2.5	–0.3		2.5	4.9	5.0	4.5	4.1	3.7	
	1970	0.9	0.3	0.9	–0.3	–1.3	0.5	1.3		7.4	6.2	5.1	4.5	3.9	
	1980	0.6	0.2	0.6	–0.4	–1.2	0.0	0.2	–1.0		5.1	4.0	3.5	3.1	
	1990	1.0	0.6	1.0	0.2	–0.3	0.9	1.3	1.3	3.6		2.9	2.7	2.5	
	2000	1.1	0.7	1.1	0.5	0.1	1.1	1.5	1.5	2.8	1.9		2.5	2.3	
	2010	1.0	0.7	1.0	0.4	0.1	1.0	1.2	1.2	1.9	1.1	0.2		2.2	
	2022	0.7	0.4	0.7	0.2	–0.1	0.5	0.7	0.5	0.9	0.1	–0.8	–1.6		

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Data sources

Argentina

The data series for Argentina start on 31 December 1959, with 1960 as the first year of returns, except for bonds, where the first year of returns is 1992.

For equities, during 1960–2006 we use the Buenos Aires Stock Exchange General price index supplemented by annual dividend yields to create a return index. We switch to the S&P Argentina BMI return indices from 2007.

For bonds we use the Buenos Aires Stock Exchange Bond index from1992–2002, switching to the JPMorgan EMBI Global Argentina index from 2003.

For bills we use the average deposit rate.

For inflation we use the official CPI from INDEC except for the years from 2007–16 when, to replace the widely-discredited official CPI, we use the index created by Cavallo & Bertolotto (sourced from InflacionVerdadera.com).

The US dollar exchange rates reflect the many changes in currency redenomination: starting with peso moneda nacional, then peso ley, peso argentino, austral to the current peso.

Australia

The equity data prior to 1958 is based on the Sydney Stock Exchange Commercial and Industrial price index. Until the 2015 Yearbook, we used the yield series provided by Lamberton (1958a,b) to convert this to a total return index. Lamberton's yield series was, however, equally weighted and, from the 2016 Yearbook, we switched to using the adjustment factors proposed by Wheatley and Quach (2013) in order to convert Lamberton's yields into market value-weighted yields. We are grateful to Simon Wheatley for these factors and also for pointing out that in previous years our underlying equity price index for this period (kindly provided by Officer, 1989) was based on June not December year-ends. In the 2016 Yearbook, we reverted to year-end values.

Over the period 1958–74, we switch to an accumulation index of 50 shares from the Australian Graduate School of Management (AGSM) and over 1975–79 to the AGSM value-weighted accumulation index followed by the Australia All-Ordinary index.

Bond returns are based on the yields on New South Wales government securities from 1900–14. For the period 1915–49, the yields were on Commonwealth Government Securities of at least five years maturity. During 1950–84, the basis is 10-year Commonwealth Government Bonds. From 1986 onward, once data became available, we switch to the FTSE Australia Government Bond 10+ year index.

For 1900–28, the short-term rate of interest is taken as the 3-month time deposit rate. From 1929 onward, we use the Treasury bill rate. Inflation is based on the retail price index over 1900–48 and thereafter on the consumer price index. The switch in 1966 from Australian pounds to Australian dollars has been incorporated in the exchange rate index history.

Austria

We are grateful to Michael Halling (2013) who constructed early indexes for Austria using original archive sources from the Vienna Stock Exchange (VSE). For equities, we use Halling's index from 1900 to 1925. After the dissolution of the Habsburg Empire in 1918, this index consists purely of Austrian companies. For 1926-67, we use the WIFO index (Handler, 1981), with World War II WIFO values calculated by Prokop (1993). From 1968, we use the Wiener Börse index. For 1926–39, we use VSE dividend yields; we assume no dividends were paid from 1940 to 1949. For 1950–93, yields were provided by Wolfgang Aussenegg (2005). From 1994 on, we use the yield on the VSE's ATX Prime Index.

For bonds, we use Halling's bond index from 1900–52. This tracks long-dated and perpetual Austrian bonds until the Anschluss in 1938, then the German bond into which they were converted, moving back into an Austrian bond in 1949. For 1953–59, we use returns provided by Aussenegg (2005). From 1960, we use Christoph Schneider's (2006) series. Starting in 1998, we switch to the Citi GBI Austria 15+ years total returns index.

For bills, we use the interest rate on private bills for 1900–14 and 1920–31; the discount rate for 1915–19 and 1932–59; Austrian Treasury bills for 1960–90; and the 3-month interbank VIBOR rate after 1991. Inflation rates are from Jobst and Scheiber (2014) for 1900–25; Butschek (2011) for 1926–44; and the Statistics Austria Consumer price index from 1945 using the LHKI 45 series.

Exchange rates are from the Financial Times, except for the World War II period. Our series reflects the switch into German RM in 1938 and conversion into new schillings after the war. We use market rates ("black" market) for the German RM for 1938–44 and for the schilling for 1945–52 (from Carmen Reinhart's website, used in Reinhart and Rogoff, 2009). All of the statistics, charts and tables for Austria exclude the hyperinflationary years 1921–22 from the three premium series, i.e. the two equity premium series and the maturity premium.

Belgium

The equity series is based on work by Annaert et al (2011, 2012, 2015) with their comprehensive price and return series used from 1900 covering shares of all Belgian companies quoted on the Brussels Stock Exchange followed by the S&P Belgium BMI index from 2012. We are very grateful to Jan Annaert and his colleagues for making their data available to us and also for providing us with total market capitalization data for Belgium.

Up to 1956, bond returns are based on estimated prices for 4% government bonds. During the 1944–45 closure, we take the last available value from 1944 as the year-end level. Over 1957–67 the index is for bonds with a five to 20-year maturity, and from 1968 for bonds with maturity over five years. From 1986, we use the JP Morgan index of Belgian government bonds with five or more years to maturity, switching from 1991 onward, once data became available, to the FTSE Belgium Government Bond 10+ year index.

Short-term interest rates are represented over the period 1900–26 by the central bank discount rate, followed during 1927–56 by the commercial bill rate. From 1957 onward, we use the return on Treasury bills.

Inflation is estimated for 1900–13 using the consumer price index, and for 1914 we take the French inflation rate. Over 1915–20 and 1941–46, we interpolate the Belgian consumer price index from Mitchell (2007). From 1921, inflation is measured using the Institut National de Statistique's consumer price index.

Brazil

The data series for Brazil start on 31 December 1950, with 1951 as the first year of returns, except for bonds, where the first year of returns is 1995. We are grateful to Antonio Zoratto Sanvicente for his guidance on Brazilian stock market returns.

For equities, during 1951–67 we use the index published in Conjuntura Econômica, the monthly newsletter of Fundação Getulio Vargas (FGV). We switch to the Bovespa returns index for the period during 1968–94, with data from the B3 Exchange (B3 S.A. - Brasil, Bolsa, Balcão). Capital gains are calculated using the published dividend yields. From 1995 onward, we switch to the broader S&P Brazil BMI returns and capital gains indexes.

Brazil has issued sovereign bonds for well over a century. However, we have been unable to find reliable bond returns data during the prolonged period of high inflation that extended from 1974 to 1995. Our bond series thus starts in 1995. We fully recognize that starting this series after a period of hyperinflation will flatter Brazil's long-run bond returns.

For bonds, from 1995 to 1999, in the absence of data for local currency government bonds, we use the USD return on the Brazil 30-year global bond, converted to local currency. For 2000–13, returns are derived from the yields on 10-year local currency government bonds. For 2014–15, we use the return on the S&P Brazil Government Bond 5–10-year index, switching from 2016 onward to the FTSE Brazilian Government Bond 10+ year index.

For bills, we use the Brazil central Bank discount rate sourced from Banco Central do Brasil from 1955 to 1994, and 3-month Brazilian Treasury bill yields thereafter.

For inflation, we use data obtained from Estatisticas Historicas Do Brasil (EHdB). For 1955–79, we use the general price index (IGP) calculated by a private economic think tank called Foundation Getulio Vargas (FGV), switching in 1980 to the official CPI calculated

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by IBGE (Brazilian Institute of Geography and Statistics), using the broadest of their indexes, IPCA, which is used by Banco Central do Brasil for inflation-targeting.

The Brazilian real to the US dollar exchange rates are the WM/Reuters Benchmark rates on the last trading day of each year.

Canada

Our main data source for Canada is the study by Panjer and Tan (2002). This study provides data from 1926 onward. Before that, we use other sources, most notably the equity returns series produced by Moore (2012).

For 1900–25, we use Moore's data on total returns based on prices for all equity securities from both the Toronto and Montreal stock exchanges collected every fourth Friday from the end of January 1900. Up to the 2009 Yearbook, we had used Switzer's (2000) equally weighted Montreal index for 1900–14, followed from 1915 by the series from Urquhart and Buckley (1965). Moore has not yet published a companion capital gains series, so we infer capital gains from his return figures plus information on dividend yields.

For 1900–23, yields are interpolated from the Canadian yield premium relative to the S&P. Houston (1900–14) provides dividends for 1900 and hence the Canadian yield premium relative to the 1900 S&P, and Panjer and Tan (2002) estimate the Canadian yield relative to the 1924 S&P. We use Panjer and Tan's data from 1926 onward. For the period 1947–56, returns are for the TSE corporates and, from 1957, the TSE 300 total return index.

The bond index for 1900–23 is based on a 4% coupon bond. For 1924–36, we use the Government of Canada long bond index from Panjer and Tan (2002). Starting in 1936, the index is the Cansim index of bonds with a maturity of over ten years, switching from 1988 onward, once data became available, to the FTSE Canada Government Bond 10+ year index.

For 1900–33, the short-term rate is represented by US Treasury bills or equivalent. From 1934 onward, the short-term rate is based on Canadian Treasury bills.

Inflation is measured using the Canadian wholesale price index for 1900–10. For 1911–23, we switch to the Canadian consumer price index, and thereafter consumer price inflation is taken from Cansim.

Chile

The data series for Chile start on 31 December 1959, with 1960 as the first year of returns, except for bonds, where the first year of returns is 1993.

For equities, we use the Santiago Stock Exchange IGPA general price index supplemented with annual dividend yields (and assuming a constant real increase in dividends over the years 1967–84 when yields were not available) to create a return index for the years 1960–87. The IGPA return index is then used until the end of 2006, followed by a switch to the S&P Chile BMI return indices from the start of 2007. We are grateful to Daniele Girardi and Samuel Bowles (2018) for providing dividend data.

For bonds, returns from 1993 to 2004 are derived from the yields on Chilean Government bonds with a maturity of ten years, switching in 2005 to the ICE BofA US dollar Chile Sovereign index and then to the FTSE Chile Government 10+ year bond index.

For bills, we use the official discount rate from 1960, switching in 1990 to the 30–89 days rate from the Central Bank of Chile.

For inflation, we use the official IPC inflation except for the years 1971–78 where we use the CPI–C variant chosen by Wagner and Diaz (2008).

The Chilean peso was introduced in September 1975, replacing the earlier escudo at a rate of 1 peso for 1,000 escudos.

China

China, like Russia, does not have a continuous investment history because of the long interval when markets were closed after the 1949 communist victory in the civil war. After the establishment of the PRC, a few stocks were traded on newly opened exchanges – see Chen (2006a,b) – but these were closed in 1952, and all assets subsequently expropriated. It is likely that non-Mainland Chinese investors salvaged something, e.g. shareholders in firms with overseas assets in Hong Kong SAR, China, and Taiwan (Chinese Taipei). Similarly, Chinese bonds held overseas were traded in London and New York long after 1949. However, no interest was paid and, while the Chinese government eventually paid a small amount of compensation to UK (but not US) investors in 1987, British investors experienced a 99% loss of present value. Domestic investors in stocks and bonds did even worse, effectively losing everything. In our world index series, we assume a total loss by 1949. China is re-included in the world indexes from start-1993.

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Because of this catastrophic break, we are unable to provide our standard set of investment return statistics. Nevertheless, it is important to include China in our world indexes to avoid survivorship bias. Excluding markets where investors lost everything would lead us to overstate the returns from global equities and the equity risk premium. Our asset returns for China cover two periods, 1900–49 and 1993–2019. For 1900–49, equity returns are from the Yale series compiled by Wenzhong Fan (2004). Fan's data stops at the end of 1940, and the Shanghai Stock Exchange closed in December 1941 when the Japanese seized the international settlement in Shanghai.

The Shanghai Stock Exchange was reopened by local brokers for periods during World War II and during 1946–49. We have no data over this hyperinflationary period, so we hold end-1940 prices constant in nominal terms (so real prices fell rapidly). We then assume a total loss in 1949. Bond returns are for 5% gold bonds (actually backed by customs or salt revenues, depending on the issue; see Goetzmann, Ukhov and Zhu, 2007). We again assume a total loss in 1949. Bill returns from 1900–14 are the yields on newly issued bonds, less one percentage point. For 1915–49, we use the interbank silver rate, provided to us by Dan Li (see Ho and Li, 2014). Inflation rates for 1900–13 are from Wang (1992) based on rice prices; for 1914–26, we used inflation rates for urban wholesale prices of consumption goods from Wang (2008); from 1927, we use the Shanghai CPI.

We restart our Chinese asset returns at end-1992, when reliable indexes first appeared that monitored the returns on Chinese stocks available to global investors. Until the 2019 Yearbook, we used the MSCI China for equities. We still use this index for 1993–94, but now switch into the broader S&P China BMI thereafter. This led to a large increase in our equity returns for China (see Chapter 3 of the 2019 Yearbook for more details). For bonds, we use the Citi ESBI China index starting in 1996. We switch to the FTSE Global Government China 10+ year index from 2005 onward. Since we have no bond returns before 1996, we use bill returns for 1993–95. For bills, we use the Chinese Central Bank rate for 1993–2001, followed by 3-month Chinese Treasury bills thereafter. Inflation is the Chinese consumer prices index, while exchange rates come from the Financial Times.

Denmark

Over the period 1900–14, we use Parum's (2001) equally weighted index of equity returns, which covers some 40–50 constituents each year. For 1915–2001, we use the data compiled in Parum (1999, 2002), switching from 2002 to the Copenhagen KAX Index.

Danish bond returns are estimated from prices and yields on government consol bonds until 1964 (from Danmarks Statistik, 1969), followed by the 4% 2017 bond. For 1987–92, we use the JP Morgan index of Danish government bonds with ten or more years to maturity, switching from 1993 onward to the FTSE Denmark Government Bond 10+ year index.

Short-term interest rates are represented by the central bank discount rate until 1975, and thereafter by the return on Treasury bills.

Finland

For Finnish equities, we use data from Poutvaara (1996) for 1900–12 followed by Vaihekoski (2021) for the years 1913–81. We then use the Berglund, Wahlroos and Grandell (1983) WI index for the years 1982–90 followed by the Helsinki Stock Exchange HEX index from 1991. We are very grateful to Peter Nyberg and Mika Vaihekoski for also providing us with total market capitalization data for Finland. [Note that until the 2021 Yearbook, we used data from Nyberg and Vaihekoski (2014) for the years 1913–69, followed by Berglund, Wahlroos and Grandell (1983)].

Bond returns are based on the yields and prices of the Finnish government's long-term foreign bonds, quoted in Paris for 1900–14 and in London during 1915–29, as given by Arola (2006). For the period 1930–95, bond returns are taken from Nyberg and Vaihekoski (2011) constructed from 5-year government bonds. From 1996 onward, once data became available, we switch to the FTSE Finland Government Bond 10+ year index.

For 1900–77, the short-term rate of interest is taken as the Bank of Finland deposit rate, the repo rate for 1978–86 and, from 1999, the 3-month HELIBOR and EURIBOR rates.

Inflation is based on the cost-of-living index (1900–19) and consumer price index (1920 onward).

France

The primary studies that we use for France are Arbulu (1997), Laforest (1958) then Laforest and Sallee (1977), for the first half of the 20th century, followed by Gallais-Hamonno and Arbulu (1995) for the period commencing in 1950. Equity returns up to 1918 are from Arbulu (1997), and we then switch to the index series compiled by the Institut National de la Statistique et des Etudes Economiques (INSEE). The INSEE equity index is a weighted average of price relatives with about 300 constituents. For

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the period 1962–67, we use the cap-weighted Paris 50 index of the largest stocks followed by the cap-weighted CAC General index of some 240 shares for 1968–90.

From 1991, we use the SBF-250 index which, in March 2011, was expanded and renamed the CAC All-Tradable index. We are very grateful to David Le Bris, Georges Gallais-Hamonno, and Jacques Friggit for providing and/or pointing us toward useful sources of data on total market capitalizations for France.

The bond series for France, also compiled by INSEE, is based on consol yields. Over the period from 1914–18, we interpolate, assuming constant nominal returns. We switch in 1950 to the Gallais-Hamonno and Arbulu (1995) series, which is the INSEE General Bonds Index, with coupons reinvested monthly as received. From 1985 onward, once data are available, we switch to the FTSE France Government Bond 10+ year index.

The short-term interest rate for France is based on the central bank discount rate until 1930. The rate is measured by the return on Treasury bills starting in 1931.

To measure consumer price inflation, we use the consumption price index compiled by INSEE and taken from Laforest (1958), Gallais-Hamonno and Arbulu (1995), and directly since 1981.

The reader is also referred to Gallais-Hamonno (2007) and Friggit (2007).

Germany

We use data from Gielen (1994) and Bittlingmayer (1998), plus Ronge's (2002) reconstruction of the DAX 30 index, for 1900–53. For the period August 1914 – October 1918, Ronge uses Gielen's over-the-counter index. For 1954–97, we use Stehle and Schmidt's (2015) dataset, which amends some of Stehle's (1997) earlier work. We use returns ex-tax credit, as the latter was available only to local investors (Stehle estimates that the credit added an average of 1.4% per year to equity returns over 1977–2000). When CDAX moved in 1998 to full coverage of the German market, we switch to CDAX. We are grateful to Gregor Gielen and Ulrich Ronge for providing us with market capitalization data for Germany.

For 1900–23, German bond returns are based on the price of 3% perpetuals, which essentially lost all value during the 1922–23 hyperinflation. For 1924–35, the bond index is based on mortgage bonds and, for 1936–51, it is based on 4.5% conversion to 1943, 4.5% western zone for 1946–47, and 5% tax-free bonds from 1948 onward. We allow for the partial default that accompanied the 1948 switch from Reich marks to Deutsche marks. We use the REX performance index from 1968–85. For 1986–94, we use the JP Morgan index of German government bonds with seven or more years to maturity, switching from 1995 onward, once data became available, to the FTSE Germany Government Bond 10+ year index.

The short-term rate of interest is represented by the discount rate on private bills through 1945. We assume rates of 2% during 1946–50 (although the switch from Reich marks to Deutsche marks in 1948 involved a loss of 90% of face value), 3% for 1951–53, and use Treasury bills beginning in 1954.

Inflation is from Gielen (1994), using consumer price level data from the Imperial Statistical Office (Bittlingmayer, 1998). Inflation rates in 1922 and 1923 were inferred from exchange rates against the dollar. From 1993, we use the CPI from the Federal Statistical Office.

We omit the 1922–23 hyperinflationary period for every series except real equity returns and the real exchange rate.

Greece

For equities, the Bank of Greece calculated separate industrial and financial price indices on behalf of the Athens Stock Exchange. There are annual averages published for 1952 and 1953 with monthly averages starting in January 1954, supplemented from November 1979 with a composite index (calculated as the average of the industrial and financial index values).

We have created a similar composite index back to January 1954 followed by the Athex composite price index for the years 1989–99. We use annual dividend yields. We assume a constant real increase in dividends over the years 1968–77 when annual dividend yields were not available. Beginning in 2000 we switch to the S&P Greece BMI return index. We thank Charikleia Kaffe for her work on earlier Greek data

For 1993–2002 and 2013–17 returns are derived from the yields on 10-year local currency government bonds. For 2003–12 and from 2018 we use the FTSE Greek Government Bond Index 10+ years.

For bills, we use the interest rate on savings deposits for 1954–60 and the rate on 13-week Greek Treasury bills from 1961.

For inflation, we use the Athens Cost–of–Living index for 1954–58 followed by the official Greek CPI from 1959.

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Hong Kong SAR

The data series for Hong Kong SAR start on 31 December 1962, with 1963 as the first year of returns, except for bonds, where the first year of returns is 1994.

Equity returns are based on the Far Eastern Economic Review index from 1963–64, the Hang Seng index from 1965–89, and the S&P Hong Kong BMI index from 1990 onward. For the period until end-1989, returns are calculated using the published dividend yields. From 1990 onward, we use the published returns and capital gains on the S&P Hong Kong BMI index.

The HKD sovereign Treasury bond market in Hong Kong SAR dates from 1991, with the issue of 2-year notes, followed by 3-year notes in 1993, 5-year notes in 1994, 7-year notes in 1995, and 10-year bonds in 1996. Our bond series therefore starts in 1994, with returns initially based on bonds with five or more years to maturity. For 1994–2001, bond returns are computed from yields. For 2002–08, we use the IBoxx ABF Hong Kong Government 7–10-year index; from 2009–15, we employ the IBoxx ABF Hong Kong Government 10+ year index; and from 2016 onward, we switch to the FTSE Hong Kong Government Bond Index 10+ years.

The Treasury bill market in Hong Kong SAR dates back to mid-1991. Before then, there was no separate monetary authority or central bank, no lender of last resort, and no government bill or bond market. Bill returns from 1963–91 are therefore taken as the interest rates on bank deposits. From June 1991 onward, they are the yields on 3-month Hong Kong Treasury bills.

Inflation is measured by the RPI index from 1962–63, the General Consumer Price index from 1964–74, and the Composite Consumer Price index thereafter. The Hong Kong dollar to the US dollar exchange rates are the noon New York rates on the last trading day of each year.

India

All the data series for India start on 31 December 1952, with 1953 as the first year of returns.

For equities, we use annual data for the RBI (Reserve Bank of India) Ordinary Share price Index and dividend yield from 1953–87, sourcing our data from Rao and Bhole (1991). The RBI index is calculated on a portfolio consisting of stocks from different stock exchanges, different industries and different performance groupings to reflect the average performance of the market. The index is sometimes referred to as the RBI All-India Index

For 1988–2005, we use the S&P/IFCG India return index series, while from 2006 onward, we use the S&P BSE All Cap returns series, which currently contains over 850 stocks.

For bonds, we calculate returns from bond yields published by the Reserve Bank of India over the period from 1953–94 and by Kanji Pitamber & Co from 1995–2003. The 3% loan due in 1966–1968 is used from 1953–54, the 3% conversion loan of 1945-46 callable after 1986 from 1955–59, the 5.5% loan maturing in 1999 and 2000 from 1960–85, and the yield on bonds with approximately 10 years to maturity from 1985–2003. From 1994 onward, we use the ICE Bank of America 10+ Year India Government returns index.

For bills, we use the Reserve bank of India discount rate from 1953–92, and the yield on 91-day Indian Treasury bills from 1993 onward. Inflation is measured by the Reserve bank of India MB Col 1W All-India index from 1953 to 2010, and by the CPI Rural and Urban index from 2011 onward. The India rupee to the dollar exchange rates are the noon New York rates on the last trading day of each year.

Ireland

For equities, Whelan (1999) used Irish Central Statistical Office (CSO) data from 1934, and British data before that. We therefore created a new, market capitalization-weighted index of Irish equity prices for 1900–33 from original archive stock price and dividend sources; this index has now been adopted by Whelan (2003). For 1934–83, we use the Irish CSO Price Index of Ordinary Stocks and Shares. Until 1987, we incorporate our estimates of UK dividend yields. From 1988 onward, we use the Irish Stock Exchange Equity (ISEQ) total return index.

The bond series for Ireland uses UK returns for 1900–78. For 1979–98, we use Whelan's (1999) return on a 20-year representative Irish gilt, as estimated by Raida Stockbrokers, turning thereafter to the FTSE Ireland Government Bond 10+ year index.

Short-term Irish interest rates again use UK Treasury bills for 1900–69. From 1970 onward, we use Irish Treasury bills.

Up to the date of political independence from Britain, inflation is measured using Bowley's (1937) cost of living index for 1900–13 and the working-class cost of living index for 1914–22. For 1923–52, we use Meghen's (1970) Irish cost of living index and, from 1953, the Irish consumer price index.

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Italy

Panetta and Violi (1999) compiled the data for Italy. The equity data for 1900–07 are from the Official List and supplementary sources, and this is extended through 1911 with data from Aleotti (1990). For 1912–77, the share price and dividend series are based on the Bank of Italy index, which covers at least three-quarters of the total market capitalization of the Italian equity market. Thereafter, the Bank of Italy's index is calculated from the bank's monthly share price database, which covers all listed shares. For 1999–2002, we use the Milan BCI performance index followed by the FTSE Italia All-Share index from 2003.

The government bond returns over 1900–44 are from Bianchi (1979). For the period 1945–83, the index of total bond returns is based on a Treasury bond index with a coverage of over half, and often over three-quarters, of the value of all Treasury bonds in issue.

Thereafter, the data are sourced from Panetta and Violi's (1999) study. From 1988, we use the JP Morgan index of Italian government bonds with constant maturity of ten years, switching in 1994, once data became available, to the FTSE Italy Government Bond 10+ year index.

The short-term bank deposit rate to 1940 is from Biscaini-Cotula and Ciocca (1982). Panetta and Violi estimate the values for the period 1941–46 and, for 1947–61, the figures are from the Bank of Italy's Bollettino Economico. After that, the source is the Bank of Italy's Bollettino Statistico.

Japan

For 1900–14, we use the Laspeyres price index for the Tokyo Stock Exchange (TSE), as published in Fujino and Akiyama (1977). Thereafter, share prices are represented by the Japan National Bank index for 1915–32; the Oriental Economist Index during 1933–45; the TSE Volume-Weighted Index during 1946–49; and the Nikkei-225 from May 1949 to 1951. For 1952–70, we use the Japan Securities Research Institute total return index. From the start of 1971, we use total returns from Hamao and Ibbotson (1989). Returns continue from 1995 with the TSE TOPIX index. We are very grateful to Yasushi Hamao and Tetsuji Okazaki for providing us with market capitalization data for Japan; see Hamao and Okazaki (2007).

Until 1957, the Japanese government bond returns are estimated from yield data. No yield information is available for the end of 1947, and the yield for 1946 is used instead. The data for 1948–57 represent the yields on newly issued bonds. For 1957–68, the bonds are those issued by Nippon Telephone and Telegraph. We then use government bond data from the Bank of Japan, and in 1971 we switch to the government bond index of Hamao and Ibbotson (1989), followed from 1995 onward by the FTSE Japan Government Bond 10+ year index.

The short-term riskless rate is available from 1900. It is based on call money rates to 1959 and on Treasury bills thereafter.

Inflation is measured by the wholesale price index for 1900, the retail price index for 1901–46 and the consumer price index from 1947 onward.

Malaysia

All the data series for Malaysia start on 31 December 1969, with 1970 as the first year of returns.

For equities, we use the Kuala Lumpur Stock Exchange (KLSE) Industrials Index for 1970–73, the KLSE Composite index for 1974–83 and the KLSE EMAS (All-share) index for 1984–95. Returns are calculated using the published dividend yields, except for 1970–73, when no yields are available, where we estimate dividends using the end-1973 yield and the assumption that real dividend growth over this period was the same as for the average country for which we have data. From 1996 onward, we use the published returns and capital gains on the FTSE Bursa Malaysia EMAS (All-share) index.

For 1970–93, bond returns are calculated from 10-year bond yields. For 1994–2004, we use DataStream's Malaysian Government securities Long-term index. From 2005 to date, we use the FTSE Malaysian Government Bond index 10 or more year sector. Bill returns are the yields on 3-month Malaysian Treasury bills. Inflation is taken from the CPI index published by the Malaysian Department of Statistics. The Malaysian Ringgit to the dollar exchange rates are the noon New York rates on the last trading day of each year.

Mexico

The data series for Mexico start on 31 December 1968, with 1969 as the first year of returns, except for bonds, where the first year of returns is 1995.

For equities, we use indexes compiled by the Mexican Stock Exchange. For 1969–71, we use the General Index and from 1972–88, the Mexican Stock Exchange IPC index (Indice de Precios y Cotizaciones). Returns are calculated using the published dividend yields. In 1989, we

switch to the (by then) broader S&P Mexico IFCG returns and capital gains indexes, switching again in 2008 into the S&P BMI returns and capital gains indexes, which replaced the S&P IFCG.

Mexico has issued sovereign bonds for well over a century. However, we have been unable to find reliable bond returns data extending through the prolonged periods of high inflation, and periodic economic crises, such as the Mexican peso crisis. Our bond series thus starts in 1995. We fully recognize that starting this series after periods of crisis and hyperinflation will flatter Mexico's long-run bond returns.

For 1995–2000, bond returns are calculated from 10-year bond yields. For 2001–04, we use returns on the S&P Mexican Government Bond 7–10-year index, switching from 2005 onward to the FTSE Mexican Government Bond 10+ years index.

For bills, we use 3-month deposit rates from 1969–77, sourced from Banco de Mexico and thereafter, 3-month Treasury bill yields, sourced from the International Monetary Fund (IMF). For inflation, we use the INPC CPI index data published by INEGI, the Mexican National Institute of Statistics and Geography. The Mexican peso to the US dollar exchange rates are the noon New York rates on the last trading day of each year.

Netherlands

Returns are based on the study by Eichholtz, Koedijk, and Otten (2000). Equity returns over 1900–18 are based on the Central Bureau of Statistics (CBS) general index of share prices, and historical yield data. For the period 1919–51, returns are based on the 50-stock, CBS weighted arithmetic index. The exchange was closed from August 1944 to April 1946, so the end-year index levels are represented by the intra-year values that are closest to the turn of the year. During 1952–80, returns are based on the CBS All Share index, with dividends estimated by the Dutch central bank. For 1981 onward, we use the CBS total return index, which went live in 1989 with retrospective estimation of the impact of income reinvestment, changing to the Amsterdam AMS All Share index from 2004.

During 1900–14, Dutch bond returns are represented by 2.5% and 3% consols. During 1915–73, the Eichholtz-Koedijk-Otten bond index is based on a series of 3.5% bonds. From 1974 onward, we use the JP Morgan index of Netherlands government bonds with seven or more years to maturity, switching in 1985 to the FTSE Netherlands Government Bond 10+ year index.

For the riskless rate, during 1900–40, we use the discount rate on 3-month private bills. The rate is assumed unchanged when data were unavailable during August 1914 – December 1918, and from mid-May 1940 to the end of that year. From 1941 to date, we use the rate on Dutch Treasury bills.

Inflation is measured using the consumer price index. No data were available between August 1944 and June 1945, and the index was interpolated for end-1944.

New Zealand

Chay, Marsden, and Stubbs (1995) assembled data for equities and bonds starting from 1931, later extended forwards by Lally and Marsden (2004a,b). For the years 1900–28, we have created a new market-cap weighted equity total return index from original archive share price and dividend sources from the Wellington Stock Exchange. We then continue using the previously assembled sources, starting with the Department of Statistics index for the years 1929–69, the Reserve Bank of New Zealand index for 1970–78, the Datex index for 1979–86 and the New Zealand Stock Exchange gross index from 1987.

Bond returns are based on the prices of New Zealand government securities traded in London for 1900–30, followed for 1931–84 by those based on yields on government bonds with a typical average maturity of ten years constructed by Chay et al.

From 1985 onward, we use the Reserve Bank of New Zealand 10-year government bond yield and coupons to produce a total return bond index. From 1993, we use the FTSE New Zealand Government Bond 10+ year index.

For 1900–30, the short-term rate of interest is taken as the return on UK Treasury bills followed by the central bank deposit rate from 1931–54, the yield on the shortest-maturity government notes from 1955–77 and the yield on 3-month Treasury bills from 1978 onward.

Inflation uses the consumer price index from the long-term data series of Statistics New Zealand.

The switch in 1967 from New Zealand pounds to New Zealand dollars has been incorporated in the exchange rate index history.

Norway

Equity returns over 1900–17 are derived from annual share prices and dividend yields from Statistisk Aarbok and Kierulf's Handbook. The index is equally weighted and contains an

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average of 33 shares, excluding only those for which there was incomplete information. For the period 1918–69, we use an all-share index including industrial, banking, and whaling/shipping shares calculated by Statistics Norway.

From 1970 onward, we use the Oslo Stock Exchange indexes. We first use the Industrial index, switching in 1983 to the General index and then, from 1996, to the All Share index. We are very grateful to Thore Johnsen for providing us with market capitalization data for Norway. The reader is also referred to the financial market history data compiled by Klovland (2004a,b).

For 1900–92, we use Norwegian government bond returns. After 1993, the index is the Datastream government bond index with a maturity of ten years. For the riskless rate, during 1900–14, we use the central bank discount rate, followed by sight deposits from 1915–71 and by money market rates until 1983. From 1984 to date, we use the rate on Norwegian Treasury bills. Inflation is measured using the consumer price index published by Statistics Norway.

Portugal

The data for Portuguese equities come from a 3-year study by José da Costa and Maria Eugénia Mata; see da Costa, Mata, and Justino (2012). They have created an all-share weekly index for the Lisbon stock exchange starting from 3 January 1900 (here used as the end-1899 value) and ending on 5 January 1988. Since then, the standard BVL general total return index is used. Following the Carnation Revolution, there are no prices after 24 April 1974 until the stock exchange re-opened on 4 January 1978 with many fewer quoted equities (da Costa and Mata, 2011). Upon re-opening, the pre-closure equity market is represented by the values of new quoted equities, the market value of government bonds issued for formerly quoted equities and additional compensation for expropriations.

Bond returns are based on the prices and yields of local Portuguese government long-term bonds. For the years 1900–33, we use the 3% bond issued in 1880; for 1934–35, we use the 6.5% bond issued in 1930; for 1936-42, we use the 5.5% bond issued in 1933; and for 1943–90 we use the 4% bond issued in 1940.

Between 1991and 1998, the only bonds available had a reset coupon with a typical maturity of seven years. From 1999, we switch to the FTSE Portugal Government Bond 10+ year index.

For 1900–75, the short-term rate of interest is taken as the Bank of Portugal discount rate and, since 1976, by the yield on 3-month Treasury bills.

Inflation is taken from Mata and Valerio (2011) until 2008 and the national consumer price index since 2009.

Russia

Because of the 70-year break, we are unable to provide our standard set of investment return statistics. Nevertheless, the inclusion of Russia (and China) in our world indexes is important to avoid survivorship bias. Russia, in particular, had large equity and bond markets in 1900, the starting point of our database. Russian equities made up some 6% of total world equity value, while at the outbreak of World War I, Russia's bond market was the largest in the world (see Ukhov, 2003, and Borodkin and Perelman, 2011). Excluding such a large country, where equities and bonds became valueless, would cause us to overstate the returns from global equities and hence the equity risk premium.

Our asset returns for Russia cover two periods, first from 1900 to 1917, and then from 1995 to 2018. The main pre-World War I exchange, the St Petersburg Stock Exchange, closed during World War I from July 1914. It briefly re-opened in early 1917, closed again in February, and stayed closed until the early 1990s. There was no single, clear re-opening date, but markets slowly evolved. The impetus was the mass privatization program of the early 1990s, when Russians received free vouchers they could exchange for shares. By 1994, there were over 60 officially registered bond and stock exchanges in Russia, most with low turnover, often operating from domestic apartments. It took until summer 1995 for the first centralized exchange, the Russian Trading System (RTS), to emerge in the form of a dealership market. We restart our Russian asset returns in 1995, when reliable stock market returns indexes first appeared.

Our composite indexes fully reflect Russian asset returns. The indexes assume that shareholders and domestic bondholders in Russia suffered a total loss in 1917. Russia then re-enters the indexes at start-1995.

For the earlier period from 1900–17, our equity return series is the St Petersburg Stock Exchange index constructed by Peter Radchenko (see Goetzmann, Cabolis and Radchenko, 2013) as part of Yale's Russian Capital Markets Project. Bond returns until1907 are for the 5% bond issued in 1822, and thereafter the 5% bond issued in 1906. Bill

returns are the Russian Central Bank refinancing rate; inflation rates for 1900–13 are from Flandreau and Zumer (2004), while inflation rates from 1914–17 are retail price inflation for the USSR territory as published in Gatrell (2005). Useful background is provided by Oosterlinck and Szafarz (2004).

Until the 2019 Yearbook, we used the MSCI Russia index for Russian equities. We still use the MSCI Russia for 1994–96, but have now switched to the broader MSCI Russia Investable index from the end of 1996. We then switch again into the still broader S&P Russia BMI from the beginning of 2007. For bonds, we use the JP Morgan Russian Federation EMBI total returns index, switching in 2013 to the Citi Russian GBI of bonds with ten or more years to maturity. For bills, we use Russian 3-month Treasury bills, while we use the Russian consumer prices index for inflation. Exchange rates come from the Financial Times.

Singapore

The data series for Singapore start on 31 December 1965, with 1966 as the first year of returns, except for bonds, where the first year of returns is 1988.

Equity returns are based on the Straits Times index from 1966–74, and the Singapore Stock Exchange All–Share index thereafter. FTSE took over the index computation in 2008, and it is now known as the FTSE ST All-share index. It tracks the performance of companies listed on SGX that are within the top 98% (by market capitalization). For the period until end-1999, returns are calculated using the published dividend yields, except for 1966–71, when no yields are available, where we estimate dividends using the end-1972 yield and the assumption that real dividend growth over this period was the same as for the average country for which we have data. From 2000 onward, we use the published returns and capital gains on the FTSE ST All-share index.

The government bond market in Singapore was established in 1987, with the first 5-year notes issued by the Government of Singapore in May 1987. The annual bond return series thus starts in 1988, and is based initially on 5-year yields, then 7-year yields from 1992 when the first 7-year bonds were issued. From 1995–2002, the returns on the United Overseas Bank's Singapore Government Bond Long-term index are used, followed by the FTSE Singapore Treasury 10 or more Years Maturity index from 2003 onward.

Bill returns during 1966–76 are the yields on 3-month Malaysian Treasury bills, then from 1977 to November 1987, they are the bank deposit rates in Singapore, while, after December 1987, they are the yields on 3-month Singapore Treasury bills, following the opening of the government securities market in 1987. Inflation is taken from the CPI index published by the Singapore National Statistics Office. The Singapore dollar to the US dollar exchange rates are the noon New York rates on the last trading day of each year.

South Africa

Returns for stocks, bonds, bills, and inflation since 1925 are presented in Firer and McLeod (1999) who, in turn, draw on the earlier work of Schumann and Scheurkogel (1948) that goes back to 1910. These studies provide indexes for industrial and commercial companies. South African mining and financial companies are of particular importance, especially early last century. We therefore create a market-capitalization-weighted index of mining and financial shares for 1900–59 based on London price quotations. We blend our mining and financial indexes with the Firer and McLeod industrial index, as described in Firer and Staunton (2002). For 1960–78, we use the Rand Daily Mail Industrial Index and, from 1979, the Johannesburg Stock Exchange (JSE) Actuaries Equity Index.

Up to 1924, bond returns are based on prices estimated from the yields on 4% government bonds. Subsequently, we use the bond returns from Firer and McLeod, based first on market yields together with a notional 20-year bond prior to 1980, followed by the JSE Actuaries Fixed Interest Index to 1985, then the JSE Actuaries All Bond Index and, from 1999, the JP Morgan index of South African government bonds with ten or more years to maturity. In 2017, we switch to the Citigroup World Government Bond Index 10+ years.

Before 1925, short-term interest rates are represented by UK Treasury bills. Subsequently, we use the bill returns from Firer and McLeod, based on 3-month fixed deposits over 1925–59, bankers' acceptances during 1960–66, and thereafter negotiable certificates of deposits. Inflation is measured prior to 1925 using the consumer price index and thereafter using the official price index from Central Statistical Services.

The switch in 1961 from British pounds to South African rand has been incorporated in the exchange rate index history.

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South Korea

The data series for South Korea start on 31 December 1962, with 1963 as the first year of returns.

Equity returns throughout are based on the Korea Composite Stock price index (KOSPI) and its precursors computed by the Korea Stock Exchange. For 1963–71, this involved using the 12-stock Korea Stock Exchange composite index; from 1972–74, the index contained 50 stocks and, from 1975 onward, it became an all-share index. KOSPI today is all common stocks traded on Stock Market Division (previously Korea Stock Exchange) of the Korea Exchange. It is a capital gains only index, so total returns are computed using the dividend yield.

For 1963–73, bond returns are calculated from 5-year bond yields using data from the Bank of Korea. The National Housing Bond is used beginning in 1974, switching to Treasury bonds in 1996. For 2001–05, we use the HanKyung-KIS-Reuters Korean Government 9–10 Year index, switching in 2006 to the FTSE Korean Government Bond Index 10+ Year Sector index.

For bill returns, we use the Bank of Korea Discount Rate from 1963–86, the 1-year government bond yield from 1987–2001, and the HanKyung-KIS-Reuters Korean Treasury 3–6 Months index thereafter.

Inflation is taken as the CPI index for Seoul for 1963–64 and the Korean CPI index thereafter, using data from the Korean Statistical Information Service. The Korean won to the US dollar exchange rates are the noon New York rates on the last trading day of each year.

Spain

For 1900–18, we use the equity index in Valbuena (2000), which is sourced from Bolsa de Madrid. For 1919–36, we use a total returns index from Valbuena (2000) that rectifies some problems in the Sandez and Benavides (2000) index. Trading was suspended during the Civil War from July 1936 to April 1939, and the Madrid exchange remained closed through February 1940. Over the closure we assume a zero change in nominal stock prices. We assume zero dividends during 1936–40. During 1941–85, we use the González and Suárez (1994) data, subsequently linking this to the Bolsa de Madrid total return index.

The bond series for 1900–57 is based on the price of Spanish 4% traded in London through 1913 and in Madrid thereafter, with prices kept unaltered during the Civil War. A private bond index is used for 1958–78. For 1979–87, we use a government bond index of all bonds with two years or more to maturity. From 1988 onward, we use the JP Morgan index of Spanish government bonds with constant maturity of ten years, switching in 1995, once data became available, to the FTSE Spain Government Bond 10+ year index.

The short-term interest rate over 1900–73 is the central bank discount rate. From 1974, we use the return on Treasury bills.

Inflation during 1900–14 is measured using the wholesale price index from Mitchell (2007). For 1915–35, we use the consumer price index from Mitchell (2007); see also Vandellós (1936). During 1936–40, we revert to the wholesale price index from Mitchell. For 1941–85, we use the Spanish consumer price index from González and Suárez (1994) and thereafter from the Instituto Nacional de Estadistica.

Sweden

Data on stocks, bonds, bills and inflation from 1919–99 are from Frennberg and Hansson (1992a,b, 2000). We have now adopted the comprehensive capitalization-weighted returns index published in Edvinsson and Waldenström (2014) for the period from 1900–18. We are grateful to Daniel Waldenström for providing us with his data, together with Swedish equity market capitalization data. In early versions of this Yearbook, we had used the share price index published in the journal Affarsvarlden for the entire period until 1918; we have now ceased doing so, and this has shrunk our estimates of Swedish equity returns. The reader is referred to the historical studies of Edvinsson and Waldenström (2010, 2014).

The bond series for 1900–18 was collected from local stockbroker price lists by Waldenström (2014). For 1919–49, the returns are for perpetuals, and after that the series measures the return on a portfolio of bonds with an average maturity of ten years. From 1991, we use the FTSE Sweden Government Bond 10+ year index.

The short-term interest rate from 1900 is represented by the official discount rate of the Swedish Riksbank. Frennberg and Hansson (1992b) switch in 1980 to the return on short-term money market instruments, and from 1982 to Treasury bills.

Inflation is represented by the Myrdal-Bouvin (1933) consumer price index before 1914, the cost of living index between 1914 and 1954, and the consumer price index from 1955.

Switzerland

We use the series spliced together by Wydler (1989, 2001) and extra data provided by Wälchli and Steiner (2002). We created an equally weighted index of Swiss equity prices for 1900–10; this used the series of annual prices and dividend yields collected from Neue Zurcher Zeitung, with an average of 66 year-end stock prices over the period.

Over 1911–25, we use the index of 21 industrial shares from Statistiches Jahrbuch. The Swiss exchanges were closed during September 1914 to December 1915, so that, for end-1914 and end-1915, we use the index at the date closest to the year-end. For 1926–59, Rätzer (1983) estimates total returns. For 1960–83, Huber (1985) computes the returns from index levels and dividends on the SBC index. Over 1984–98, we use the Pictet return index, and then the Swiss All Share index.

For Swiss bond returns over 1900–25, we use data from Tartler (2007). This was a change in 2011, since we previously had estimated bond returns from the short rate. The 1926–59 interval employs Rätzer's (1983) estimates based on redemption yields for new Swiss bond issues. The 1960–80 period is represented by Huber's (1985) bond index based on actual trading prices. From 1981, we use the Datastream 10-year Swiss government bond index. Starting in 1990, we switch to the Citi GBI 10+ years total returns index, then in 2018, we switch to the SBI Domestic Government Bond 10+ years index.

During 1900–55, short-term rates are represented by the central bank discount rate and, for 1956–79, by the return on 3-month time deposits. From 1980 onward, we use the return on Treasury bills.

Nominal returns are adjusted for inflation using movements in the Swiss consumer prices index.

Taiwan (Chinese Taipei)

The data series for Taiwan (Chinese Taipei) start on 31 December 1966, with 1967 as the first year of returns, except for bonds, where the first year of returns is 1994.

Equity returns are based on the Taiwan Stock Exchange Capitalization Weighted Stock index (TAIEX) calculated by the Taiwan Stock Exchange (TWSE) which measures the performance of all listed stocks on TWSE. For the period up till end-2002, returns are calculated using the published dividend yields, except for 1966–71, when no yields are available, where we estimate dividends using the end-1972 yield and the assumption that dividends over this period grew in line with inflation. From 2003 onward, we use the published returns and capital gains on the TAIEX index.

The issue of government bonds in Taiwan (Chinese Taipei) dates back to 1949, with the issue of 4% Patriotic Bonds. In 1959, the government issued bonds with maturities of 12–30 months. There were further bond issues in the 1960s and 1970s, but these were predominantly of short duration. There was no organized market trading in government bonds, although the Bank of Taiwan stood ready to buy them back at par at any time if returned by individual (but not institutional) holders. Organized bond trading began only in 1994, with the establishment of the Gre Tai Securities Market (now the Taipei Exchange). Our bond series therefore starts in 1995. For 1995–2000, returns are based on bond yields. For 2001–05, we use the ICE Bank of America Taiwan Government index; for 2006–15, we employ the FTSE Taiwan Government Bond Index 10–20-year Sector index; and from 2016 onward, we switch to the FTSE Taiwan Government Bond Index 10+ years index.

The bills index is based on the interest rate on bank deposits from 1961–81 and the yield on Treasury bills from 1982 on. Inflation is measured by the CPI index from National Statistics, Taiwan (Chinese Taipei). The Taiwan new dollar to the US dollar exchange rates are market (not official) exchange rates from 1966–83, and noon New York rates on the last trading day of each year from 1984 onward.

Thailand

The data series for Thailand start on 31 December 1975, with 1976 as the first year of returns, except for bonds, where the first year of returns is 1980.

Equity returns are based on the (Stock Exchange of Thailand (SET) index, which is calculated from the prices of all stocks listed on the main board of the SET. For the period until end-2001, returns are calculated using the published SET index dividend yields. From 2002 onward, we use the published returns and capital gains on the SET index.

Bond returns for Thailand start in 1980, and for 1980–2000 they are computed from bond yields on the benchmark 10-year bond sourced from the Bank of Thailand. For 2001–07, we use the returns on the IBoxx ABF Thailand 10+ Years index and then, from 2008 onward, we use the FTSE Thai Government Bond Index 10+ years index.

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Bill returns are Treasury bill yields from 1976–89, then the Bank of Thailand discount rate from 1990–96 and finally Treasury bill rates from 1997 onward, sourced from IMF International Financial Statistics.

Inflation is measured by the Thai Consumer Price index. The Thai Baht to the US dollar exchange rates are the noon New York rates on the last trading day of each year.

United Kingdom

For the UK, it was clear that there was a need for a long and consistently compiled equity return series. We therefore created a new index. For the period starting in 1955, we use the fully representative record of equity prices maintained by London Business School. This database covers several thousand shares and is described in Dimson and Marsh (1983). The London Share Price Database (the LSPD) provides reliable measures of stock market returns, which cover most of the second half of the 20th century as well as the 21st century (see Dimson and Marsh, 2001).

The period from 1899–1954 presented a different challenge. Here, we painstakingly collected share prices from old issues of the Financial Times (FT) from 1899 onward. This enabled us to calculate an index of the returns from the top 100 companies from 1900–54. The Index resembles the FTSE 100 in its method of construction and is free of survivorship bias. Our value-weighted equity index contains the 100 companies that, before the start of each year, have the largest market capitalization. For the entire period covered by our study, we follow the same criteria for index membership: inclusion of UK companies with ordinary or deferred shares, and omission of companies with non-UK registration/head office. We exclude preference shares.

The first stage was to identify a list of eligible shares. To avoid any upward returns bias, this had to be a set of firms that existed at each point in time, and which had not been screened for subsequent survival. Our definition of the companies eligible for inclusion was based on those with stock prices published in the FT for 1899–1954, and in the Stock Exchange Daily Official List (SEDOL) for 1955 onward.

For the earlier period, we constructed a cross-section of all shares with prices quoted in the FT on the last trading day of 1899, 1909, 1918, 1927, 1936, and 1945. Despite omission from the end-1899 and end-1909 FTs, the banking and insurance sectors were included in our index series, based on SEDOL prices. The reason for doing this is that the banking and insurance sectors appeared regularly, although not daily, in the FT. Note also that smaller mining shares were excluded in 1899 and 1909. The number of shares in our pre-1955 cross-section rose from 247 in 1899 (when SEDOL contained 783 shares) to 604 in 1954 (when SEDOL contained 3,789 shares). Compared to the full list of companies in SEDOL, our sample covers a minority by number, but a substantial majority by value of all quoted companies.

United States

The broadest index of early US stock market returns is the one presented in Wilson and Jones (2002), which we use for this study. Our dataset commences with the Wilson-Jones index data over 1900–25. For 1926–61, we use the University of Chicago's Center for Research in Security Prices (CRSP) capitalization-weighted index of all New York Stock Exchange stocks. For 1962 onward, we use the CRSP capitalization-weighted index which includes stocks quoted on all major exchanges including the NYSE, the American Stock Exchange (now NYSE AMEX Equities), and Nasdaq.

Until the 2015 Yearbook, we used the Wilshire 5000 index from 1971 onward, but in the 2016 Yearbook we switched to CRSP for the entire period since 1926, as CRSP has more comprehensive coverage than even the Wilshire 5000. We continue to use the Wilshire 5000 for the most recent three months as CRSP is published with a delay. All indexes include reinvested dividends.

The government bond series for 1900–17 is based on 4% government bonds, then Liberty 3.5% bonds to 1922 followed by Treasury 4.25% bonds to 1926. After that, bond returns are based on Ibbotson Associates' long bond index, as distributed by Morningstar Inc.

The bill index uses commercial bills during 1900–18. From 1919 onward, the series is based on US Treasury bills.

Inflation is taken from Jones and Wilson (2006) during 1900–13 and, from 1914, the series is based on the consumer price index.

The composite indexes

There are five composite indexes for the world, world ex-USA, Europe, developed markets and emerging markets. These are aggregates of the investment returns for the individual markets. These indexes are all in common currency (here taken as US dollars), so that, for each period, we take each market's local-currency return and convert it to US dollars.

To avoid survivorship bias, all relevant countries are fully included in the composite indexes once data becomes available. Two markets register a total loss – Russia in 1917 and China in 1949. They then re-enter the world indexes after their markets reopened in the 1990s. For the indexes that include Germany, we also record a total loss on German bonds during the hyperinflationary period of 1922–23.

The above procedure results in an index free of survivorship-bias, and expressed in US dollars. To convert this to real terms, we then adjust by the US inflation rate. This gives rise to a global index return denominated in real terms, from the point of view of a US investor.

For consistency, we use US dollars throughout, taking the perspective of a US international investor. However, all the composite indexes can be designated in any desired common currency. They can be converted from our US dollar denominated indexes to any other currency by using the real exchange rates described in Chapter 3 and reported earlier in this chapter for each country.

Since the composite indexes are aggregates of the investment returns for the individual markets, the data sources have already been described earlier in this section. For the composite equity indexes, we also draw from a supplementary database of equity returns for 55 additional countries. For a list of these countries and their start dates, see **Figure 1** in Chapter 1. The equity returns for these countries come from a wide variety of sources including S&P, FTSE, MSCI and numerous local stock exchanges.

For the composite equity indexes, countries are weighted by their start-year market capitalizations, free-float adjusted from 2001. We draw on a wide variety of sources for country capitalizations prior to 1959. These include Goldsmith (1985), Hannah (2007), Moore (2012), Musacchio (2010), Neymarck (1903, 1911), Rajan and Zingales (2003) and numerous country sources.

For 1959–79, we use capitalizations taken from Morgan Stanley Capital International where available. For 1980–92, we use data from the International Finance Corporation (IFC), part of the World Bank Group, drawing on the IFC Emerging Markets Factbooks. Then, from 1993 to date, we use the weightings for the FTSE All-World series for the 49 country constituents, estimating equivalent weightings for the remaining 41 countries which are not members of the index.

Clearly, equity market weightings are inappropriate for the composite bond indexes. However, some form of weighting scheme is required, otherwise tiny countries will receive the same weight as the USA. As explained in Chapter 1, we have chosen to weight our composite bond indexes by the size of each country's economy, i.e. by its Gross Domestic Product (GDP), converted to USD at market exchange rates. In recent years, we use GDP data taken from the IMF economic outlook. For earlier years, we use a variety of sources, including Maddison (1995), Mitchell (2007) and Barro (2010).

Since our composite indexes are all denominated in US dollars and are from the perspective of a US-based global investor, the short-term risk-free rate is taken as the return on US Treasury bills. The inflation rate is as for the USA.

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ISO Codes

Throughout the Yearbook, countries are identified by their ISO 3166 alpha-3 country codes. The full list of ISO codes for the DMS 90, together with the corresponding country name are provided below.

ARE	United Arab Emirates	KOR	South Korea
ARG	Argentina	KWT	Kuwait
AUS	Australia	LBN	Lebanon
AUT	Austria	LKA	Sri Lanka
BEL	Belgium	LTU	Lithuania
BGD	Bangladesh	LUX	Luxembourg
BGR	Bulgaria	LVA	Latvia
BHR	Bahrain	MAR	Morocco
BIH	Bosnia and Herzegovina	MEX	Mexico
BRA	Brazil	MLT	Malta
BWA	Bostswana	MUS	Mauritius
CAN	Canada	MYS	Malaysia
CHE	Switzerland	NAM	Namibia
CHL	Chile	NGA	Nigeria
CHN	China	NLD	The Netherlands
CIV	Cote d'Ivoire	NOR	Norway
COL	Colombia	NZL	New Zealand
CYP	Cyprus	OMN	Oman
CZE	Czech Republic	PAK	Pakistan
DEU	Germany	PAN	Panama
DNK	Denmark	PER	Peru
ECU	Ecuador	PHL	The Philippines
EGY	Egypt	POL	Poland
ESP	Spain	PRT	Portugal
EST	Estonia	QAT	Qatar
FIN	Finland	ROU	Romania
FRA	France	RUS	Russia
GBR	United Kingdom	SAU	Saudi Arabia
GHA	Ghana	SGP	Singapore
GRC	Greece	SRB	Serbia
HKG	Hong Kong SAR	SVK	Slovak Republic
HRV	Croatia	SVN	Slovenia
HUN	Hungary	SWE	Sweden
IDN	Indonesia	THA	Thailand
IND	India	TTO	Trinidad and Tobago
IRL	Ireland	TUN	Tunisia
IRN	Iran	TUR	Turkey
ISL	Iceland	TWN	Taiwan (Chinese Taipei)
ISR	Israel	UKR	Ukraine
ITA	Italy	USA	United States of America
JAM	Jamaica	VEN	Venezuela
JOR	Jordan	VNM	Vietnam
JPN	Japan	ZAF	South Africa
KAZ	Kazakhstan	ZMB	Zambia
KEN	Kenya	ZWE	Zimbabwe

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Princeton University Press

Imprint

Publisher
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ISBN 978-3-033-09081-1

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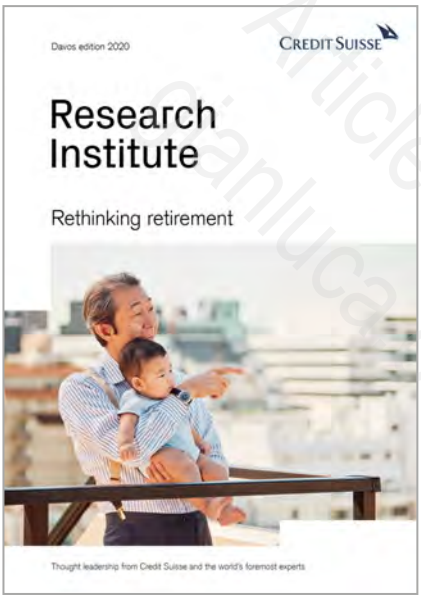

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