Summary Edition

Global Investment Returns Yearbook 2024

Leveraging deep history to navigate the future

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UBS

Summary Edition

Extracts from the UBS Global Investment Returns Yearbook 2024

Important information

This report contains extracts from the full 290-page UBS Global Investment Returns Yearbook 2024, which is available in hardcopy upon request – for details, see page 52.

Summary Edition coverage

This Summary Edition contains four extracts from the full UBS Global Investment Returns Yearbook 2024. The first extract explains the Yearbook's purpose – learning from financial history and using it to shed light on issues facing investors today. It describes the DMS Database, which lies at its core and covers all the main asset categories in 35 markets. It outlines the evolution of equity markets since 1900, and the industrial transformation that accompanied this.

The second extract presents evidence on the risks from investing in equities and bonds and the magnitude of drawdowns and protracted losses. It highlights the extremes of performance – good as well as bad – experienced globally since 1900. The third extract reproduces in full the Yearbook's new focus chapter on corporate bonds and the credit premium. The fourth extract summarizes the content of past yearbooks. Finally, there are a selected number of sample "country pages" from the detailed statistical section of the full Yearbook.

The text and charts are extracted directly from the full Yearbook. The table and chart numbers in the Summary Edition are not therefore consecutive but reflect the numbering in the full report.

Coverage of the full Yearbook

In the full hardcopy 290-page Yearbook, renowned financial historians Professor Paul Marsh and Dr. Mike Staunton from London Business School and Professor Elroy Dimson from Cambridge University assess the returns and risks from investing in equities, bonds, cash, currencies and factors in 35 countries and in five different composite indexes since 1900. The Yearbook has 13 chapters.

Chapter 1 explains the Yearbook's purpose and coverage. It provides historical perspective on the evolution of equity and bond markets since 1900, and the accompanying industrial transformation.

Chapter 2 explains why it is essential to take a long-run perspective when seeking to understand risk and return. It provides detailed statistics on the long-run returns on stocks, bonds and bills in the 35 Yearbook markets. It shows the long-run relative performance of emerging and developed markets.

Chapter 3 documents inflation since 1900. It shows that higher inflation has been associated with lower returns from stocks and bonds. It analyzes the impact of interest rate hiking and easing cycles on stocks, bonds, bills, currencies and risk premiums.

Chapter 4 focuses on currencies, long-run exchange rate changes, purchasing power parity, long-run common-currency returns and the case for hedging.

Chapter 5 looks at risk. It examines extreme periods of history, equity and bond drawdowns, and time-to-recovery. It provides evidence on the power of diversifying across stocks, countries and asset classes. It presents worldwide data on the historical equity risk premium and the bond maturity premium.

Chapter 6 moves from historical to prospective returns. It shows how returns vary with the real interest rate and estimates the prospective equity premium. It provides estimates of expected stock and bond returns for the next generation, comparing these with returns over recent decades.

Chapter 7 presents evidence on factor investing around the world. It documents the historical premiums from size, value, income, momentum, volatility and multifactor models.

Chapter 8 addresses prospective factor premiums. It reviews the evidence and theoretical basis for premiums and discusses whether they will persist.

Chapter 9 focuses on corporate bonds and the credit premium. It shows that, over the long run, US and UK corporate bonds have offered an appreciable credit premium over long-run government bonds of around 1% per year. The premium from high-yield bonds is some two percentage points higher than this.

Chapter 10 summarizes the content of past Yearbooks and how the research can be accessed.

Chapter 11 presents a detailed historical statistical analysis of the performance of each of the 35 Yearbook countries and five composite indexes, providing three pages of charts, tables and statistics for each country and index.

Chapters 12 documents the data sources, while Chapter 13 provides references.

Table of Contents

Extracted from: UBS Global Investment Returns Yearbook 2024

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See page 52 for copyright and acknowledgement instructions, guidance on how to gain access to the underlying data, and for more extensive contact details.

Editorial

We are delighted to present the Global Investment Returns Yearbook. The 2024 edition is brought to you by UBS for the first time, while reflecting the continuity of the long-standing collaboration between its primary authors and Credit Suisse. By bringing our two banks together, we have created an organization that is stronger than ever before, even better positioned to deliver leading expertise and insights – such as those you'll find in this report – to even more clients. We're especially pleased to be co-sponsoring a report that carries deep relevance for all clients of the firm, across both Global Wealth Management and the Investment Bank.

Over the years, the body of work assembled by Professor Paul Marsh and Dr. Mike Staunton of London Business School and Professor Elroy Dimson of Cambridge University on the Yearbook project has established the study as the definitive source for the analysis of the long-term performance of global financial assets. We're proud to add this influential annual study, in this its 25th year of publication, to UBS's portfolio of respected and long-running flagship reports.

The geopolitical and economic developments of recent years have acted as a key reminder of a few of the Yearbook's basic long-term learnings, not least the laws of risk and reward, and the importance of diversification and asset allocation. The re-emergence of inflation and associated central bank monetary response has meant an historical perspective has been crucial to navigate the investment landscape successfully. While inflation has begun easing more recently, the focus on the topic persists, and thus associated content is added to the core body of the Yearbook.

The concentration of the equity market, both geographically and at the individual company level, makes for an interesting backdrop against which to consider long-term trends and less popular investment themes. The 2024 edition again spells out some of the basic tenets of financial asset performance that warrant revisiting amid today's evolving market environment.

New to this year's study is a deep dive into the role corporate bonds can play in an investor's diversified portfolio. The backdrop of the material bond correction of 2022 makes this focus highly topical. To achieve this, the authors bring to the table unique long-term data to conduct their analysis on corporate bonds since the 1860s from both the US and UK.

We trust you will find this year's edition of the Global Investment Returns Yearbook thought provoking and that it helps you navigate through the investment challenges and opportunities that 2024 presents.

Mark Haefele
Chief Investment Officer,
UBS Global Wealth Management

Daniel Dowd
Head of Global Research & Evidence Lab,
UBS Investment Bank

Executive summary

With the depth and breadth of the financial database that underpins it, the UBS Global Investment Returns Yearbook is widely recognized as the unrivalled authority on long-term investment returns. We present a historical record of the real returns from equities, bonds, cash and currencies for 35 markets, spanning developed and emerging markets and stretching back to 1900.

In its 25th year of publication and in partnership with UBS for the first time, we'd point newer readers of the Yearbook to Chapter 10 as a potential starting point. This chapter makes clear how the body of work presented here has built over the last quarter century to provide a rich framework for addressing contemporary issues through the lens of financial history. This year is no exception, with our focus chapter (Chapter 9) presenting long-run evidence on corporate bonds and the credit premium since the 1860s from both the US and UK.

Many investors and analysts have typically relied on the template of US financial market history to provide parameters for valuation and return projections. However, our global body of work makes for a more informed investment discussion, revealing the US to be the exception and not the rule where historical returns are concerned. Amid the wealth of historical data and analysis the Yearbook provides, we would particularly highlight four aspects in this edition for their topicality.

First, the current concentration of markets is worth placing in context. Characteristics of that exceptional US trend noted above persist, at least for now, underpinned by the industrial transformation that accompanied this. Chapter 1 demonstrates how that transformation has led the US to dominate total equity market value to an extent not seen since the early 1970s. In part, that geographical market concentration is a function of underperformance elsewhere. Somewhat counterintuitively, over the long run investors have under-performed by investing in markets with high past GDP growth, compared to lower-growth markets. History warns against excess enthusiasm for investment in high past growth markets – which were often developing countries.

Second, while something of a truism, a long-term perspective matters, and with it an appreciation of the laws of risk and return. The long-run history of returns laid out in Chapter 2 shows how equities have outperformed bonds and bills in every country since 1900, reflecting such basic principles. After four decades, beginning in the 1980s, of bonds providing equity-like returns, it was tempting to have forgotten this basic tenet. Chapter 5 focuses on historical drawdowns, and surely 2022's dramatic pullback for a 60:40 equity-bond portfolio provides reason enough to regularly re-visit the history books.

Third, given the dominance of current debate on inflation and rate cycle considerations, the Yearbook is further enhanced by embedding and updating substantial portions of last year's focus chapter on inflation (Chapter 3). While equities have enjoyed excellent long-run returns, they are not and never have been the hedge against inflation that many observers have suggested. Rather, stocks should be seen as excellent inflation beaters due to the equity risk premium. With central banks potentially poised to begin rate cutting cycles, we demonstrate the majority of long-run asset returns are earned during easing cycles.

Fourth, this year's focus chapter (Chapter 9) looks at corporate bonds and the credit premium. Consistent with the long-run ethos of enhancements to the Yearbook, the work adds a long-term perspective on an additional major asset class with an outstanding value of some USD 44 trillion, almost half the value of global equities. The return to a higher interest rate environment has led many investors to reconsider the merits of corporate bond allocations. An assessment of the long run shows IG corporate bonds have offered a significant credit risk premium over equivalent government bonds of around one percentage point, whilst the premium from high-yield (or junk) bonds is some two percentage points higher than this.

In conclusion, we draw the reader's attention to Chapter 6, where we examine the components of long-term returns and how they can be used to project future risk premiums. We conclude with projections of the returns on stocks and bonds that the next generation can expect. These expectations remain lower than the previous generations have enjoyed but also around 200bps higher than could have been expected two years ago. With that in mind, we are reminded of what Charlie Munger said: "There is no better teacher than history in determining the future. There are answers worth billions of dollars in a 30-dollar history book."

Tim Ramskill
Global Head of Product Management, Global Research & Evidence Lab, UBS Investment Bank

Introduction and historical perspective

The following is an extract from Chapter 1 of the UBS Global Investment Returns Yearbook 2024.

This extract explains the purpose of the Yearbook – learning from financial history and using it to shed light on issues facing investors today. It describes the coverage of the Yearbook and its underlying database. It provides historical perspective on the evolution of equity markets since 1900, and the industrial transformation that accompanied this. That transformation has led the US to dominate total equity market value to an extent not seen since the early 1970s.

Introduction

Bill Gates, talking about his favorite author, the Czech-Canadian scientist Vaclav Smil, said that his "greatest strength isn't forecasting the future, it's documenting the past. There's great value in that – you can't see what's coming next if you don't understand what's come before."

Gates' words sum up the value of the UBS Global Investment Returns Yearbook. The Yearbook documents long-run returns on stocks, bonds, bills, currencies and other assets since 1900. Its purpose is not to make forecasts, but instead to inform investors about long-run performance, to interpret it, analyze it, learn from it, and help illuminate current concerns. As Charlie Munger said, "There is no better teacher than history in determining the future. There are answers worth billions of dollars in a 30-dollar history book."

Are we nearly there?

For the last two years, financial markets have focused on inflation and its implications for interest rate policy. Just as children ask during a long car journey, investors are saying, "Are we nearly there?" Is inflation under control, when will rate hikes be replaced by cuts, and are markets returning to normal?

From the turn of the millennium until 2021, nominal interest rates dropped to all-time lows, real interest rates fell by 5 percentage points and inflation was historically low. This was fueled by massive monetary support from central banks during and after the Global Financial Crisis. These developments boosted asset prices, but investors were left in a low interest rate, low-return world.

This ended abruptly in 2022. Inflation spiked in 2021-22, central banks sought to cure this with interest rate hikes, and real interest rates rose appreciably. Stock and bond prices fell sharply, with bonds having their worst year on record in the US, UK, Switzerland and developed markets. The consequent increase in yields implied higher expected returns on bonds, while higher yields and increased real interest rates meant higher expected returns from stocks. Markets had transitioned to a higher expected return world.

How can the Yearbook help illuminate these events? First, it provides extensive evidence on the impact of inflation, hiking cycles and real interest rates on asset returns. Many finance professionals are too young to remember similar episodes from the past, and for them, the Yearbook can act as their memory and guide their expectations. Second, the Yearbook provides pointers to the "Are we nearly there?" question by showing how key variables such as inflation, bond yields and real interest rates compare with their long-run averages. Third, it assists asset allocation by showing what returns we might expect over the long run, including evidence on the equity premium, bond maturity and credit premiums and factor premiums.

Perhaps most importantly, the Yearbook shows that "Are we nearly there?" is the wrong question. Financial history shows that, while there are long-run averages, there is no such thing as "normal". The market's journey never ends.

What's new and old in the Yearbook?

Each year, the Yearbook contains a focus chapter covering new research. This year, the topic is corporate bonds and the credit premium (see Chapter 9). We document the long-run evidence on corporate bond yields, defaults and returns; review the evidence on the magnitude of the credit premium; and examine factor premiums and anomalies. This year, we have also added a new Chapter 3 on inflation, which builds on updated research from earlier years' focus chapters.

2024 marks the Yearbook's Silver Jubilee – it was first published at the start of 2000 under its then-title the Millennium Book. Since then, we have built up a large body of long-run research on financial markets through successive focus chapters. For new readers, we provide a summary of this research and how it can be accessed in a new chapter 10 entitled, "The Yearbook: Past coverage".

Each year, we update all the Yearbook statistics and findings. Regular readers can therefore be reassured that the 2024 Yearbook continues to provide fully revised data on long-run returns, risk and projected returns and factor premiums.

The Yearbook database

The core of the UBS Global Investment Returns Yearbook is the long-run DMS database (Dimson, Marsh, and Staunton, 2024). This provides annual returns on stocks, bonds, bills, inflation and currencies for 35 markets. We believe the unrivalled breadth and quality of its underlying data make the Yearbook the global authority on long-run asset performance. The Yearbook updates and greatly extends the key findings from our book "Triumph of the Optimists".

Of the 35 markets covered, 23 (the DMS 23) have 124-year histories from 1900 to 2023. The remaining 12 markets have start dates in the second half of the 20th century, with either close to or more than 50 years of data. Together with the DMS 23, these make up the DMS 35. We

feature these 35 individual markets in Chapter 11, where we present detailed information and historical performance statistics, and list our data sources.

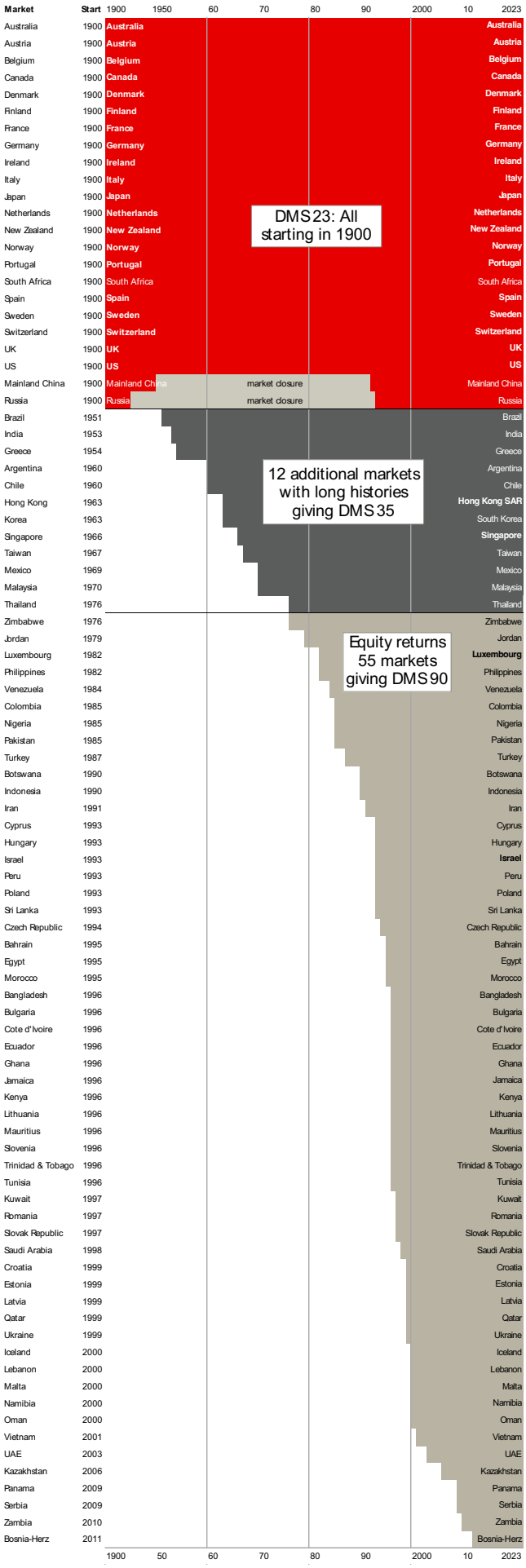
In addition, we monitor 55 additional markets for which we have equity returns data for periods ranging from 13 to 48 years. We also have inflation, currency and market capitalization data, but not yet bond or bill returns. These 55 countries, taken together with the DMS 35, provide a total of 90 developed and emerging markets (the DMS 90), which we use for constructing our long-run equity indexes.

Figure 1 shows the consolidated list 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 2023 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 for China and Russia. Both had long market closures following total losses to investors after their communist revolutions. They resume when their markets reopened in the early 1990s.

The middle panel shows the 12 additional markets for which we have long histories: seven in Asia, four in Latin America and one in Europe. Unlike the DMS 23, these markets do not start in 1900, but in the second half of the 20th century. All 12 were emerging markets (EMs) at their start dates. However, both Hong Kong SAR and Singapore have now long been regarded

Figure 1: Markets in the DMS dataset, 1900–2023



Source: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2024. Not to be reproduced without express written permission from the authors

as developed markets (DMs). In Figure 1, we show markets 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 12 markets in the middle panel 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 total returns data back to the origins of these exchanges. However, we have assembled 64 years of data for Argentina since 1960, 73 years of data for Brazil since 1951, 64 years of data for Chile since 1960, 70 years for Greece since 1954, 61 years for Hong Kong SAR since 1963, 71 years for India since 1953, 55 years for Mexico since 1969 and 58 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 54 years of data for Malaysia since 1970, 61 years of data for South Korea since 1963, 57 years for Taiwan from 1967 and 48 years for Thailand from 1976.

The bottom panel of Figure 1 shows the 55 additional markets. Just two of these are deemed developed today; i.e., Luxembourg, which opened its exchange in 1928 but 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-US, 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 124-year history starting in 1900.

Together, at the start of 2024, the DMS 35 markets made up 98.0% of the investable equity universe for a global investor, based on free-float market capitalizations. Our 90-market world equity index spans the entire investable universe. We are not aware of any other world index that covers as many as 90 markets.

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 124-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). Despite this, when incorporating Russia and China into our composite indexes, we assume that shareholders and bondholders in both countries suffered total losses in 1917 and 1949, respectively. 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 124 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 shows the relative sizes of equity markets at the end of 1899 (left panel) and how this had changed by start-2024 (right panel). Today, the US market dominates its closest rival and accounts for a staggering 60.5% of total world equity market value. Japan (6.2%) is in second place, the UK (3.7%) in third position, while Mainland China is ranked fourth (2.8%). France, Canada, Switzerland, Australia, Germany and India each represent 2-3% of the global market, followed by Taiwan with 1.7% and South Korea with a 1.4% weighting.

In Figure 2, 12 of the DMS 35 markets – all those accounting for 1.4% 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 8.0%. The remaining area of the right-hand donut chart labeled "Not in DMS 35" shows that the 35 Yearbook markets now cover all but 2.0% of total world market capitalization. The remaining 2.0% 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 markets 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 US (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.

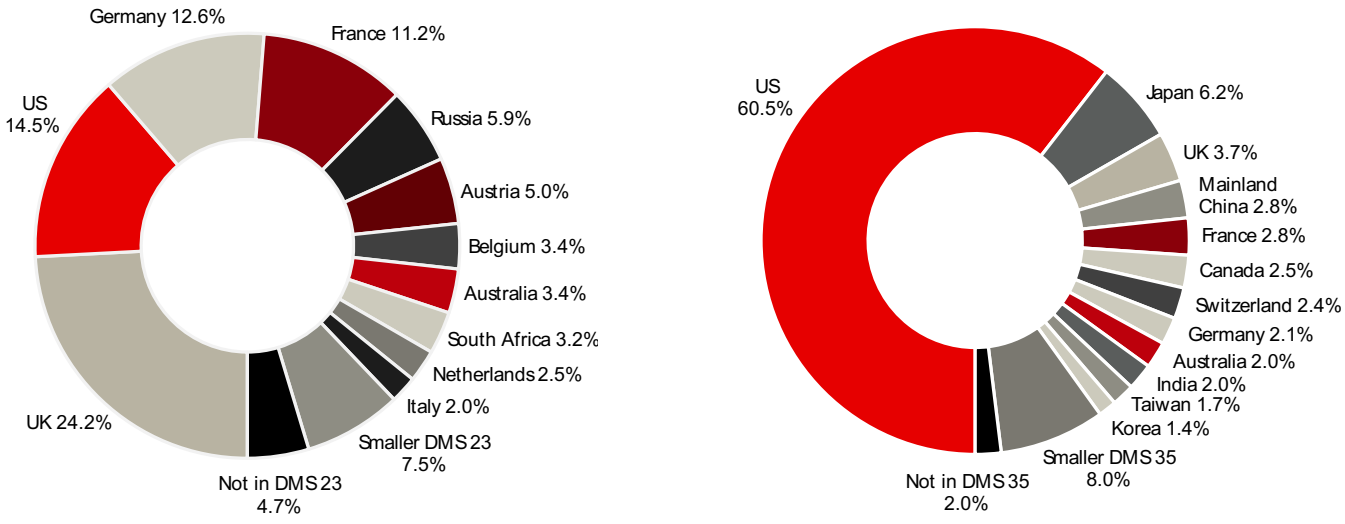
In total, the DMS database covered over 95% of the global equity market in 1900. The countries representing the missing 4.7% labeled as "Not in DMS 23" have been captured in later years by the 12 additional markets and the full DMS 90 database. However, we do not have returns data for these markets back 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 124 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 0.05% and 0.25% 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. Russia was a large market in 1900, accounting for some 6% of world capitalization. Austria-Hungary was also large in 1900 (5% of world capitalization) and, while investors didn't

Figure 2: Relative sizes of world stock markets, end-1899 (left) versus start-2024 (right)



Sources: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2024; data for the right-hand chart from FTSE Russell All-World Index Series Monthly Review, December 2023. Not to be reproduced without express written permission from the authors.

experience total losses, in real terms, 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 into this by showing the evolution of equity market weightings for the entire world equity market over the last 124 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 272 of the full, hardcopy Yearbook.

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 US. Subsequently, Japan's weighting has fallen to just 6%, reflecting its poor relative stock-market performance. The US has regained its dominance and today comprises an astonishing 60.5% of total world capitalization.

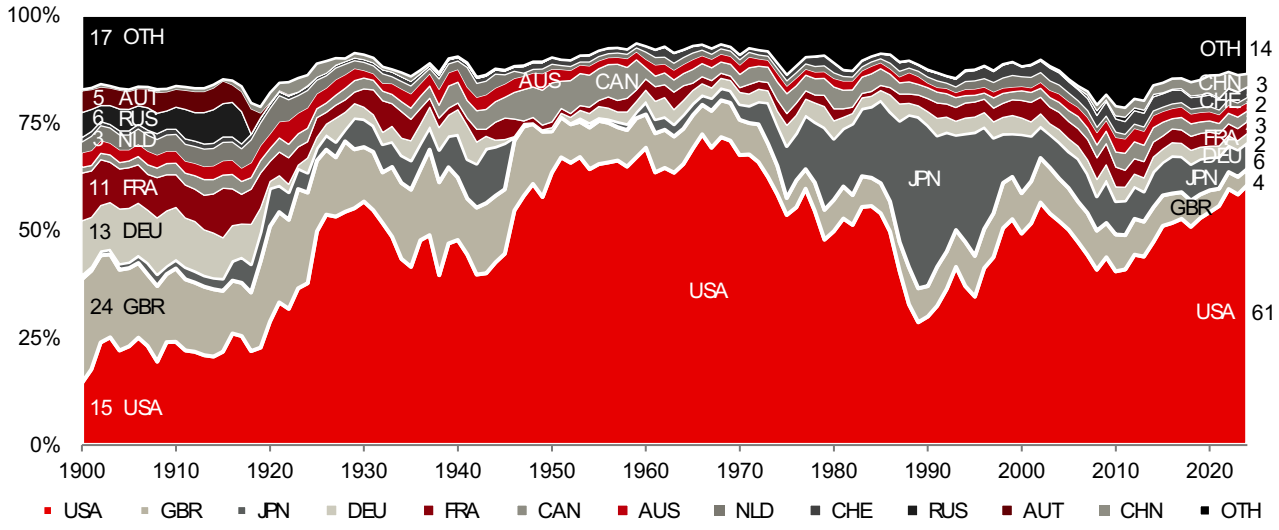
The US is by far the world's best-documented capital market. Prior to assembly of the DMS database, the evidence cited on long-run asset returns was almost invariably taken from US markets and was typically treated as being universally applicable. Yet organized trading in marketable securities began 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 60.5%. 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 remainder of Chapter 1

The remainder of chapter 1 in the full Yearbook deals with the emergence of markets over time – emerging versus developed markets – and the transition between them, followed by a section on the evolution of government bond markets since 1900 and a discussion of the weighting of bond indices. It then concludes with a discussion of the industrial transformation that has taken place since 1900 which we reproduce below.

Figure 3: The evolution of equity markets over time from end-1899 to start-2024



Sources: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2024 and FTSE Russell All-World Index Series weights (recent years). Not to be reproduced without express written permission from the authors.

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; many died young as a result.

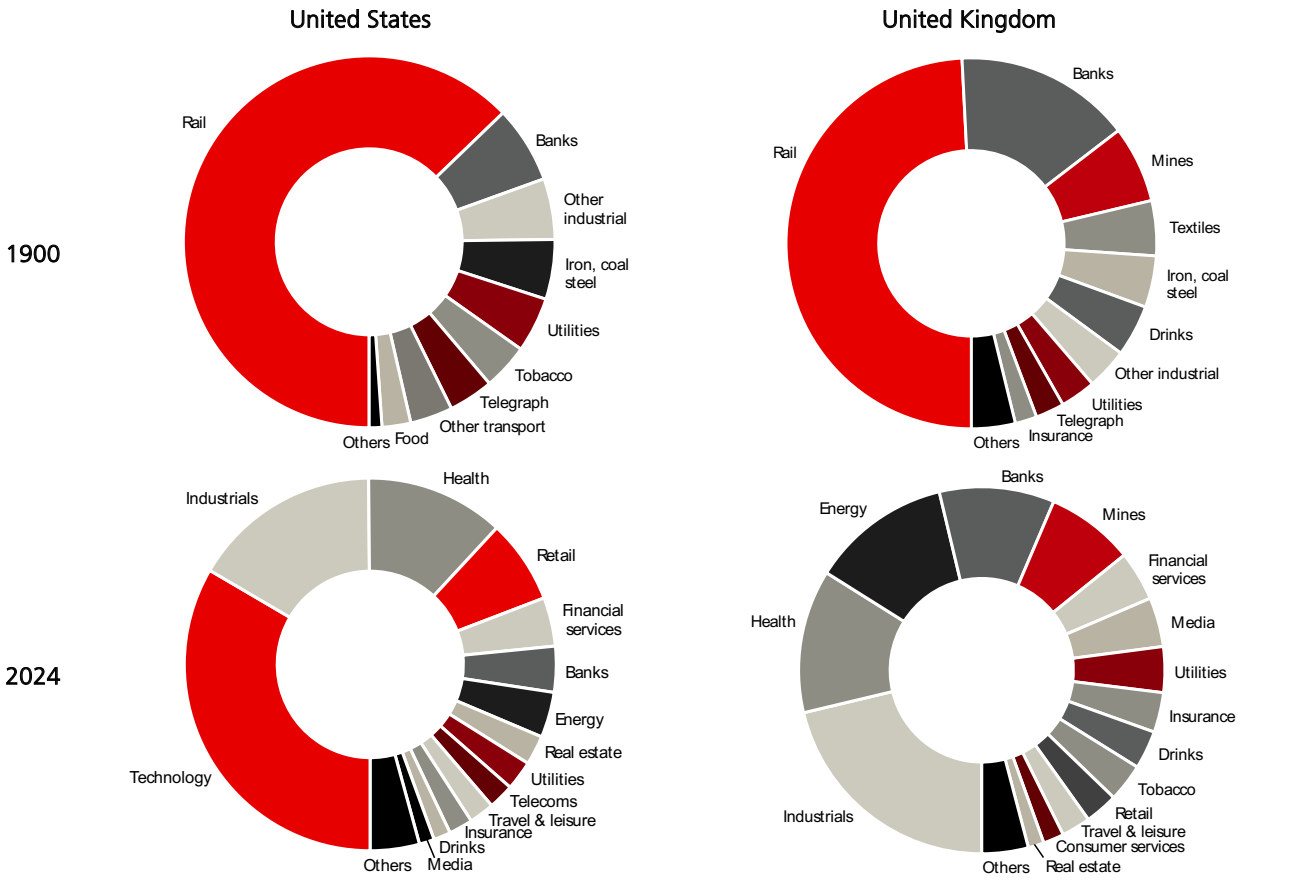
Mankind has enjoyed a wave of transformative innovation dating from the Industrial Revolution, continuing through the Golden Age of Invention in the late 19th century, through to today's information revolution. This has given rise to entire new industries: electricity and power generation, automobiles, telecommunications, aerospace, airlines, pharmaceuticals and biotechnology, oil, gas and alternative energy, 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 decline. There have been profound changes in what is produced, how it is made, and how 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 US and UK. The upper two charts show industry weightings for the start of 1900, while the lower two show them for the start of 2024. 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. 124 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, some 80% of their value was in industries that are small or extinct today; 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 2024 are also apparent. The banking and insurance industries continue to be important. Similarly, such industries as food, beverages (including alcohol), tobacco, and utilities

Figure 9: Industry weightings in the US (left) and the UK (right), start-1900 compared with start-2024



Sources: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2024; Cowles, 1938, FTSE Russell All-World Index Series Monthly Review, December 2023.

were present in 1900 and continue to be represented today. 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 2024. 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 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 US and 44% for the UK. The largest industries in 2024 are technology (in the US, but not the UK), the catch-all group of industrials, healthcare, energy, banking, mining (for the UK, but not the US), insurance, other financials and retail. Of these, energy (except coal), technology and healthcare (including pharmaceuticals and biotechnology) 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, which could equally be classified as a technology stock. 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 have been the ultimate declining industry in the US in the period since 1900. Yet, over the last 124 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 generated superior returns.

Concluding remarks

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

The Yearbook covers 35 markets and five composite indexes. Twenty-three of the countries and all five indexes span the 124-year period since 1900. We also utilize supplementary data on equity returns for a further 55 countries, so that our total coverage spans 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.

Investment risk

The following is an extract from Chapter 5 of the UBS Global Investment Returns Yearbook 2024

Previous chapters of the full Yearbook provide detailed information on the historical returns from stocks, bonds, bills, inflation and currencies for the 35 Yearbook countries since 1900. In this extract, we turn to risk. Against the backdrop of 2022's largest drawdown for a 60:40 stock-bond portfolio since the 1980s, this extract presents evidence on 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.

Risk matters

Investment in equities has proved rewarding over the long run but has been accompanied by correspondingly greater risks. Bonds similarly outperformed 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 the risk of 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 30 is a histogram displaying the range of realized annual returns in the US stock market 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 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 8.4%. The worst performance over a single year was in 1931; the best in 1933.

Figure 31 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 7.1%. The worst performance was in 1974; the best in 1975. For both countries, stock-market returns typically averaged around 0%–20% in real terms. They were below –20% in only 11 out of 124 years in the US (Figure 30), and in only seven out of 124 years in the UK (Figure 31). As we reported in Table 1 of Chapter 2, for many countries, the distribution of real equity returns was wider than in the US or UK. In brief, equity returns are volatile.

Figure 32 shows a similar chart for real returns on long-term US government bonds using the same shading scheme. In an average year, the real return on US government bonds was 2.2%. The worst performance was in 2022; 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 2.4% with the worst performance again being in 2022 and the best in 1921. The distribution of annual real bond returns was narrower than for real equity returns in both the US and UK. In fact, the dispersion of real bond returns was less than that of real equity returns in every market within the DMS 35, except for Austria.

Figure 30: US equity real returns (%), 1900–2023

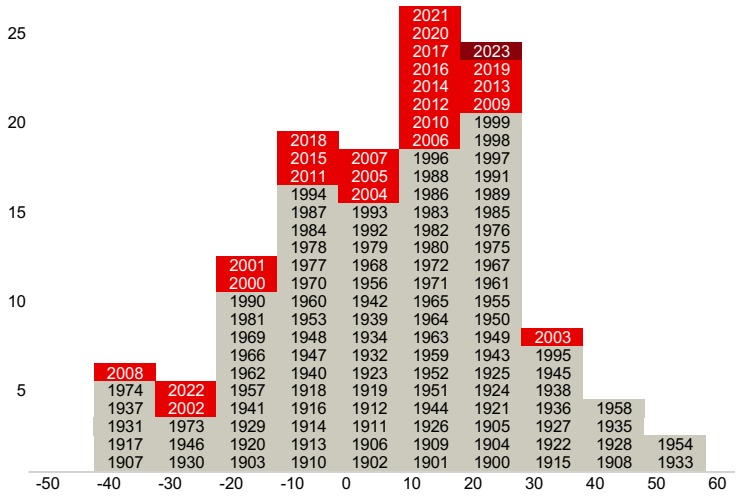


Figure 31: UK equity real returns (%), 1900–2023

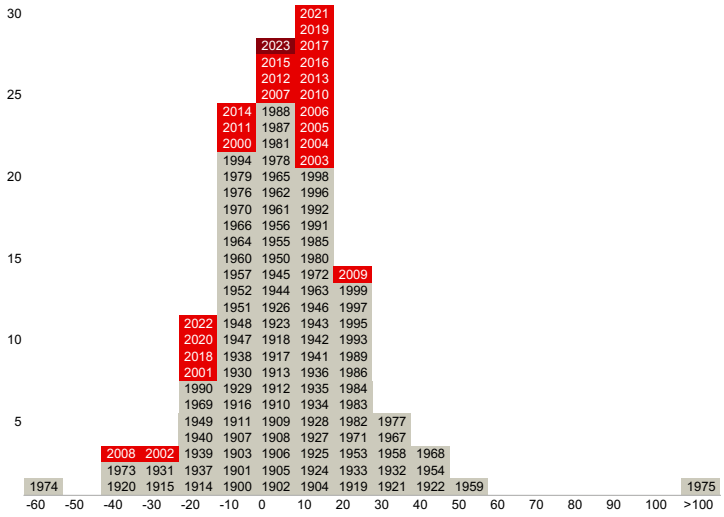
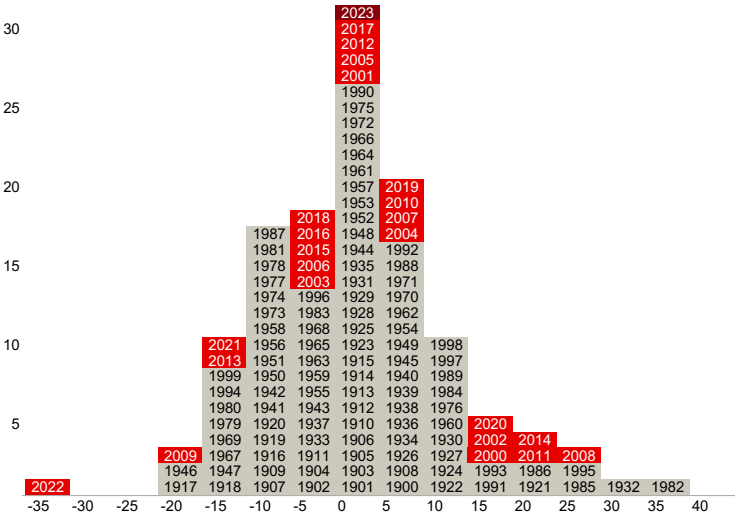


Figure 32: US government bond real returns (%), 1900–2023



Source Figures 30–32: Elroy Dimson, Paul Marsh, and Mike Staunton, DMS Database 2024.

Extremes of equity market history

It is informative to examine the extreme returns represented by the "tails" in Figures 30 and 31. Equities are risky, and so we start by looking at their downside risk.

The bad times

The upper panel of Table 8 shows 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 index. 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 losses in Russia and China following their communist revolutions.

The six worst episodes for global equity investors were 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. In World War II and its aftermath, Japanese and German equities were decimated, with real rates of return of –96% and –88%, 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 US, 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 equity returns were –70% (UK), –52% (US), –49% (Japan) and –47% (World). 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 equity returns were even lower at –47% (US), –44% (UK), –53% (Japan) and –65% (Germany).

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.

Table 8: Real equity returns (%) in the bad times, 1900–2023

Period (calendar years)		US	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	–56	–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	–61	–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 2024. 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 24-year life, the 21st century already has the dubious honor of hosting four bear markets, two of which ranked among the four worst 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% over 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% (US), –91% to +155% (Germany) and –86% to +121% (Japan). Five-year real returns extend from –58% to +185% (world), –46% to +235% (US), –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, 1900–2023

Period (calendar years)		US	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	214	269	4373	1565	383
1980–89:	Expansionary 80s	176	357	297	220	431	247
1990–99:	Nineties/tech boom	276	198	218	154	–42	114
			Periods with the highest returns				
1 year	(%)	56	100	66	155	121	68
	Dates	1933	1975	1954	1949	1952	1933
2 years	(%)	92	107	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 2024. Not to be reproduced without express written permission from the authors.

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 33 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. The world bond index lost 45% of its real value 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. An extreme case was Germany 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.

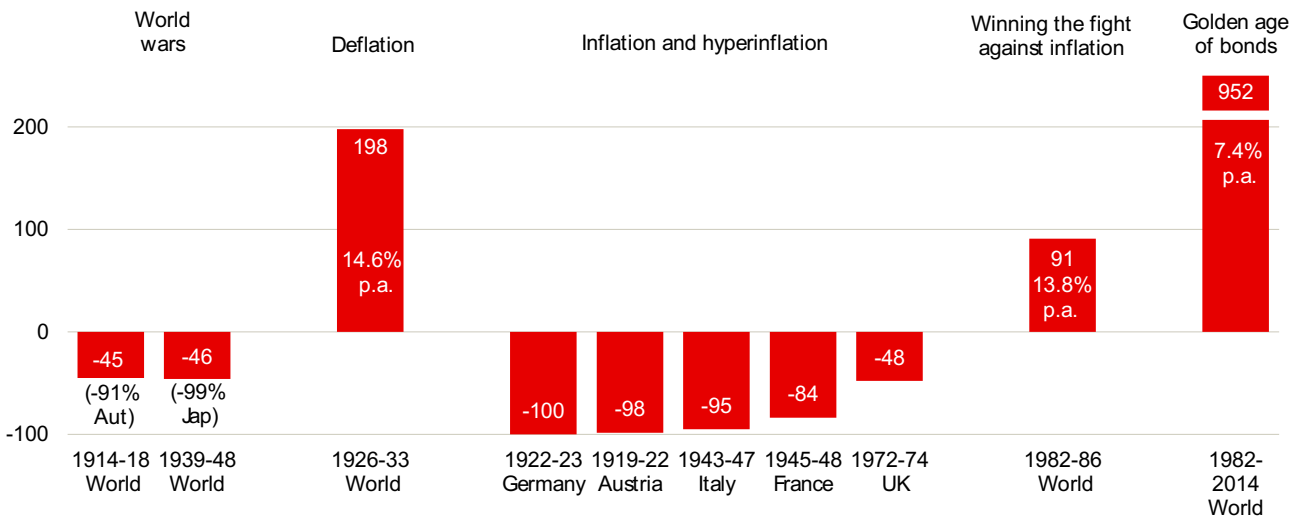
From the late 1970s, governments tackled inflation using short-term interest rates as a policy instrument. This initially hurt bond returns, but, by 1982, inflation, inflationary expectations and the reward demanded for inflation risk were all declining, giving a strong boost to bond prices.

Figure 33 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 30 years. From 1982 to 2014, the world bond index provided a real return of 7.4% per annum. There were 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 124-year histories. It was 7.3% in the US and 7.5% in the UK. Switzerland, which has enjoyed impressive bond returns 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%).

These high returns partly reflect the higher real interest rates since 1982 (see Chapter 2). However, over this period, bonds outperformed 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 fightback 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 33: Real returns on bonds (%) during extreme periods, 1900–2023



Sources: Elroy Dimson, Paul Marsh and Mike Staunton, DMS Database 2024. Not to be reproduced without express written permission from the authors.

The lengthy period of strong bond returns contrasts sharply with the 124-year record reported in Chapter 2. Since 1900, the average annualized real bond return across the 21 countries was just 0.6% 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 were thus admirable performers for almost four decades starting in the early 1980s. They produced equity-like performance, but with much lower volatility in an apparent violation of the law of risk and return. However, these high returns arose from factors that could not continue indefinitely. From 2015 onward, the annualized return on the world bond index has been –1.7%, with poor returns in 2021, followed by a dire performance in 2022. Future real bond returns are clearly likely to be far lower than during the golden age of bonds.

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.

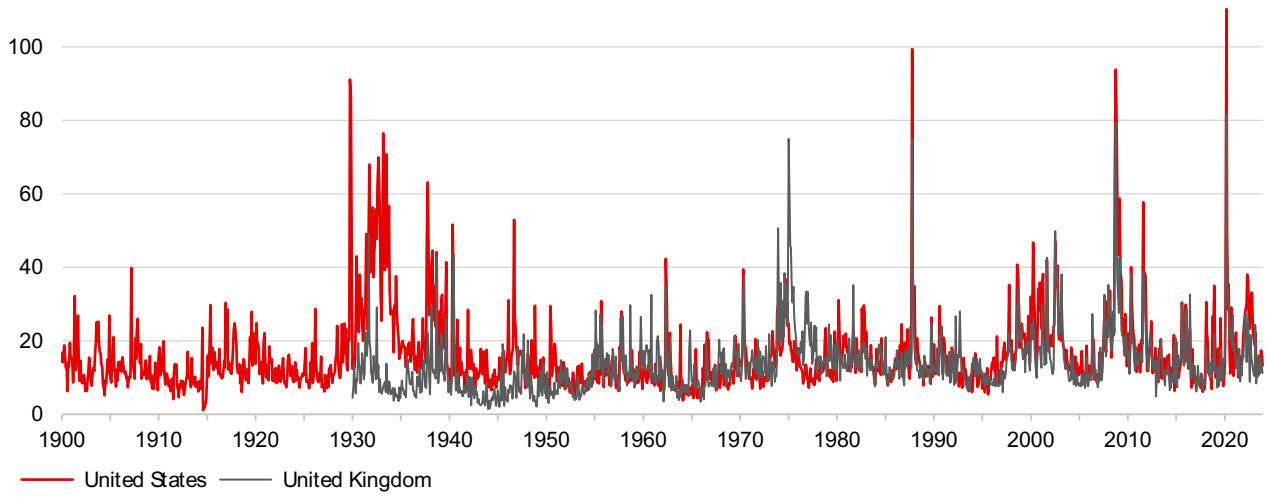
We estimate stock market volatility for each month, using daily index return data for the US and for the UK. Our data runs from start-1900 for the US and from start-1930 for the UK. It finishes at end-2023.

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 US, 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 US since 1900 and for the UK since 1930 are plotted in Figure 34. 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 6.

Figure 34: Annualized standard deviations of US and UK daily equity returns, monthly observations 1900–2023



Source: Elroy Dimson, Paul Marsh, and Mike Staunton, DMS Database 2024. Not to be reproduced without express written permission from the authors.

Figure 35: Real drawdown: US equities and bonds, 1900–2023

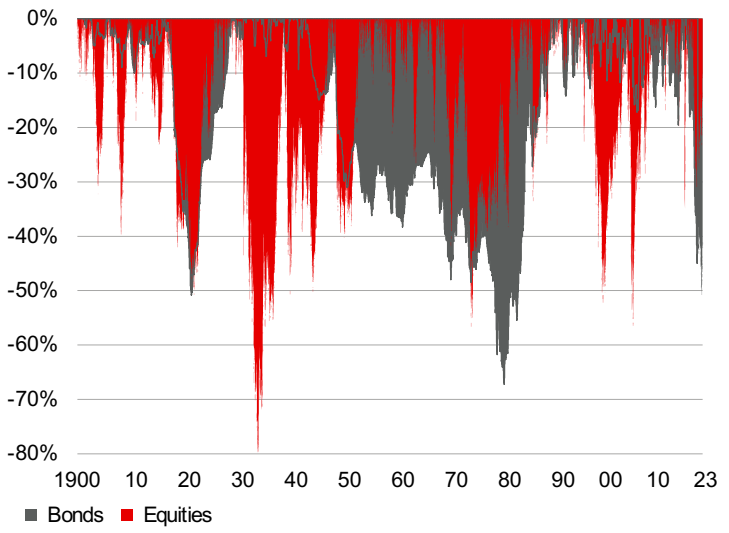


Figure 36: Post-crash recoveries in the US equity market

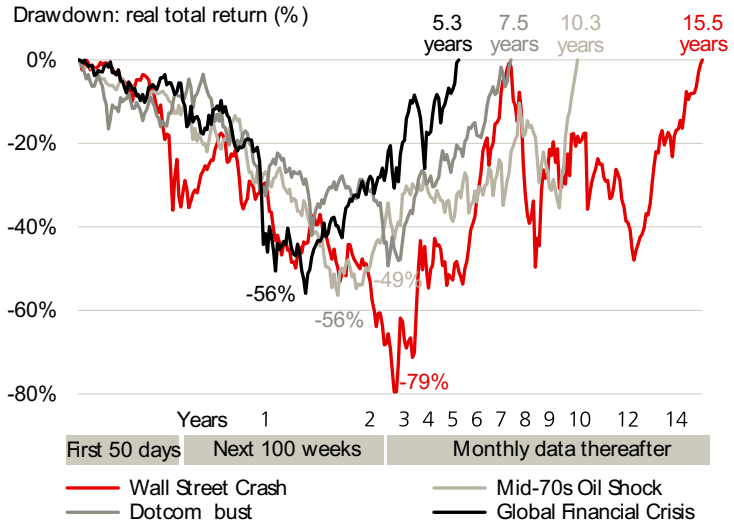
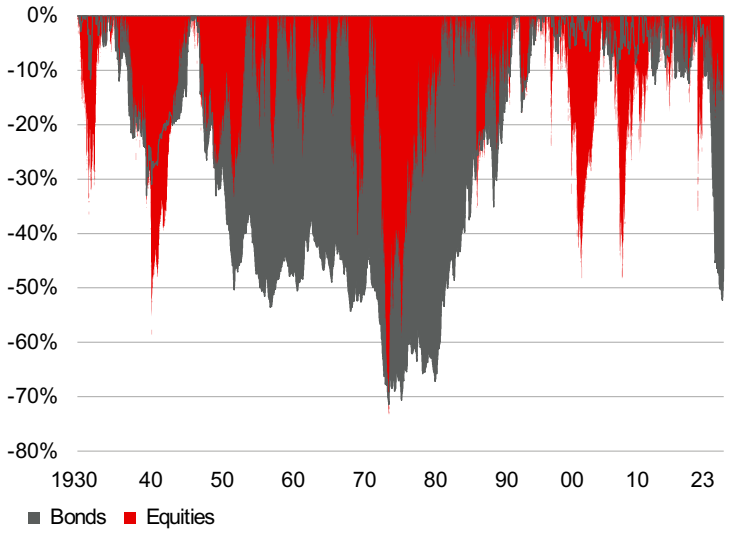


Figure 37: Real drawdown: UK equities and bonds, 1930–2023



Source Figures 35–37: Elroy Dimson, Paul Marsh, and Mike Staunton, DMS Database 2024.

Fear of the downside

Investors are concerned about buying assets and then experiencing a dramatic fall in their value. To examine the prevalence of this historically, we can 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.

The crucial issues are the depth of the drawdown and the time to recovery. To investigate this, we compute the cumulative percentage decline in real, inflation-adjusted value (including reinvested income) 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 and deep drawdowns for bonds.

Equity drawdowns

We look first at drawdowns for US equities, using daily data since 1900. Figure 35 shows that US equities 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. Recovery eventually 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.

The next large drawdown was from January 1973 until October 1974, when US stocks fell by 48% in nominal terms and 56% in real terms. It took only 26 months to recover the nominal high; but in real terms, equities were underwater for over ten years.

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 took four years to recover.

The next big drawdown in Figure 35 – shown as a hairline thin red line because of its brevity – began in February 2020 when US stocks fell 35% in real terms due to the COVID-19 pandemic. Their rapid recovery within five months was remarkable. However, from November 2021, US stocks fell

again, and were 31% down by October 2022. Since then, they have recovered strongly, with the S&P 500 hitting new highs in nominal terms. However, at the time of writing, US stocks have not yet recovered in real terms (which is what matters) from this last drawdown. At the end of 2023, they were still 10% below the real terms all-time high that was achieved on 8 November 2021.

Figure 36 on the previous page focuses on the four great bear markets since 1900, plotting their drawdown and recovery times. After the 1973–74, 2000–02 and 2007–09 meltdowns, 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.

The UK equity drawdown experience, shown in Figure 37 on the previous page, was similar. Our daily data for the UK starts in 1930. Compared to the US, UK equities suffered greater extremes of poor performance. After October 1936, the approach and arrival of war led to a decline of 59% in real terms by June 1940, although recovery was complete by October 1945.

Before the oil crisis, the equity market hit a high in August 1972, but UK equities entered 1975 down from that peak by 74% in real terms, and recovery took until February 1983. The technology crash which began in March 2000 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 was less swift and, by the end of 2021, UK equities remained in drawdown, albeit by less than 2%, only to plunge again in the bear market of 2022.

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 35 and 37 on the previous page, we plot in dark gray 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 have been three major bear periods. After 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. In real terms, this drawdown lasted for over 50 years. The third big drawdown began in July 2020, proving the second deepest on record with a real loss of 51%. At end-2023, real bond returns were still 42% below their 2020 peak. A full recovery is likely to take many 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. In October 1946, bonds began to slide again in real terms, having lost 74% of their value by December 1974. UK government bonds were underwater, in real terms, for 47 years until end-1993. The third major bear market started in May 2020 and real bond returns fell by 52%. At end-2023, real bond returns remained 46% below their previous peak with recovery still many years away.

Clearly, deep and prolonged bond drawdowns are not just a distant memory. They are also a feature of the very recent past and of the present. Bonds are not "safe" assets and their real value can be destroyed by inflation.

The remainder of Chapter 5

The remainder of chapter 5 in the full Yearbook shows the longest period of negative real equity and bond returns for each market since 1900. It also discusses the power of diversification across stocks, markets and asset classes at reducing, but not eliminating, risk. Finally, it quantifies the historical equity risk premium in each country as well as the maturity risk premium on sovereign bonds. This historical record of premiums helps to guide projections of future investment performance.

Corporate bonds and the credit premium

This extract from the UBS Global Investment Returns Yearbook 2024 reproduces the whole of Chapter 10 on Corporate bonds and the credit premium, the new focus topic for this year.

Corporate bonds are a major asset class with an outstanding value of some USD 44 trillion, almost half that of the value of global equities. The return to a higher interest rate environment has led many investors to re-consider their merits. This new chapter is thus timely in presenting long run evidence on corporate bonds since the 1860s from both the US and UK. Even very high-quality corporate bonds have offered a significant credit risk premium. The premium from high-yield (or junk) bonds is appreciably higher. Yield spreads of corporate over government bonds incorporate this premium but are not a measure of the expected premium because they also encapsulate expected default losses. This chapter reports on default and recovery rates over the long haul and reviews the determinants of yield spreads and default rates. Finally, it examines whether factors can help boost corporate bond returns and provide positive premia.

Introduction

Traditionally, bonds have been seen as boring, relative to stocks. In choosing the name James Bond, Ian Fleming said, "I wanted the simplest, dullest, plainest-sounding name I could find."

Yet bonds are far from boring. They have a long and colorful history. The first sovereign bond was issued by the city state of Venice in 1171 in an unusual situation related in Goetzmann's (2016) book, *Money Changes Everything*. The first negotiable corporate bond was issued by the Dutch East India Company in 1623.

Bond finance has for several centuries helped shape the world. Government bonds have funded national spending on education, health and defense, have financed wars and even defined the boundaries of nations – the US used bond sales to finance the purchase of Louisiana. Corporate bonds have funded transformative infrastructure from 19th century railroads to alternative energy today. They have provided an essential source of funds for corporations and financial institutions.

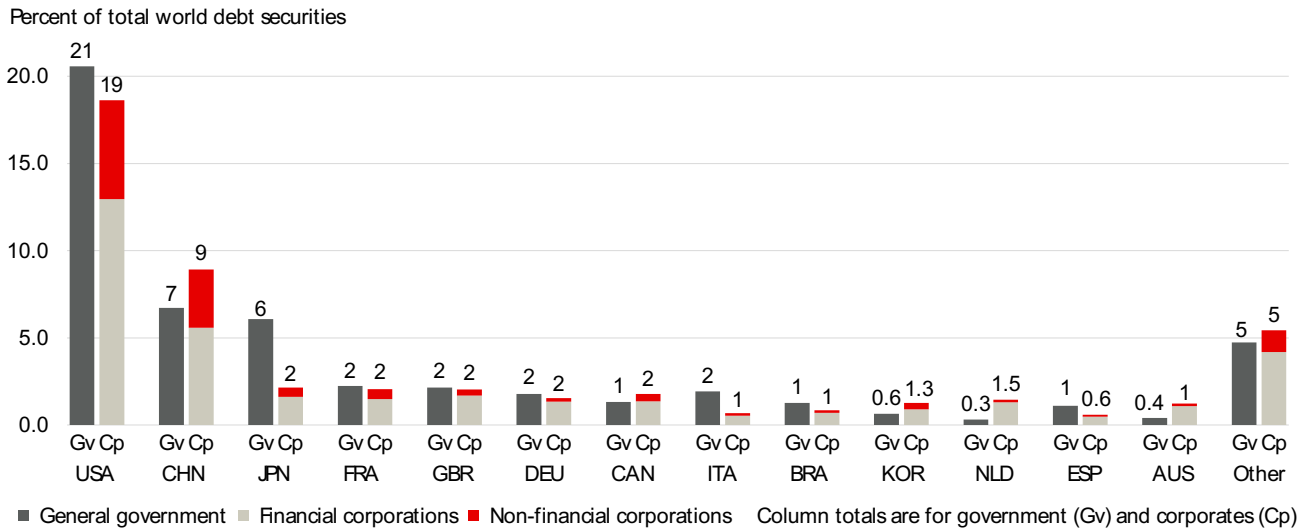
As we explain on the next page, debt securities worldwide have a value of some USD 136 trillion compared with around USD 100 trillion for global equities. The debt total comprises some USD 70 trillion in government debt and USD 66 trillion of debt securities issued by corporations. Of this amount, corporate bonds account for around USD 45 trillion, the remainder being other corporate issues. Corporate bonds – the focus of this chapter – are thus an important asset class for investors.

The rise in interest rates has made bonds especially topical. The 2023 Yearbook reported that sovereign bonds in the US, UK, Switzerland and the DMS Developed Markets index suffered their worst performance on record in 2022. The resulting higher yields led many to hail 2023 as the "year of the bond". But rates moved higher and by end-October, world bond returns were negative. For many, this reinforced their views on bond attractiveness and a strong year-end rally provided short-term vindication with US 20-year sovereign bonds ending 2023 with a real return of 1%.

Bond advocates point out that, within the bond market, corporate bonds offer higher yields. These reflect, in part, the risk of downgrades and default. Companies issued large amounts of low coupon bonds during the recent era of low interest rates. Refinancing these at far higher rates is causing some stress. The UBS Credit research team estimates that default rates on high-yield US corporate bonds will stay around 3.0-3.5% in 2024, the same as 2023 levels, but higher than 0.7% in 2021 and 1.5% in 2022. A key question for corporate bond investors is whether yields adequately reflect the probability of distress.

The Yearbook studiously eschews forecasts of short-run returns. Its purpose is instead to inform investors about long-run past performance and to allow them to draw lessons for the present. In the rest of this chapter, we document the very long-run evidence on corporate bond yields, defaults and returns; review the evidence on the magnitude of the credit premium; assess whether corporate bonds are truly a separate asset class; and examine whether corporate bond returns can be boosted by taking advantage of factor premiums and anomalies. We start in Figure 74 with an overview of the worldwide bond markets.

Figure 74: Debt securities around the world, end-June 2023



Source: Elroy Dimson, Paul Marsh, and Mike Staunton using data from the Bank for International Settlements (BIS). Not to be reproduced without express written permission of the authors.

The global fixed income market

Figure 74 shows the distribution of debt securities around the world. The data, which is from the Bank for International Settlements (BIS), covers both domestic and international debt securities. For each country, the left-hand bar shows general government bonds and the percentage of total world debt securities that they represent. The right-hand bar shows debt securities issued by corporations, with the bottom of each bar showing financial issuers and the top showing all other issuers. The chart includes all countries with more than 1% of world debt securities. The total for all other countries is shown under "Other".

Clearly, the US debt market is the largest in the world accounting for 39% of world value. It is also the deepest and most liquid. Figure 74 shows that the value of US government bonds exceeds that of corporate securities, but not by much. China is in second place with 16% of world value, followed by Japan (8%), France (4%) and the UK (4%).

The "general government" category in Figure 74 includes not only sovereign bonds and bills, but bonds issued by state and local government as well as government agencies. Similarly, bonds issued by corporations include not just corporate bonds, but mortgage- and asset-backed securities and money market securities such as commercial paper. Figure 75 shows the proportion of each category within the US debt market.

The grey-shaded areas in Figure 75 show general government securities; the red-shaded areas show corporate debt securities. Within the latter, mortgage-backed securities (MBS) are the biggest category. The US is the epicenter of the world's MBS (and asset-backed securities) markets. This explains the preponderance in the US of corporate debt securities issued by financial corporations (see Figure 74). However, while MBS account for over 22% of US debt securities, they make up just 12% of the global bond market.

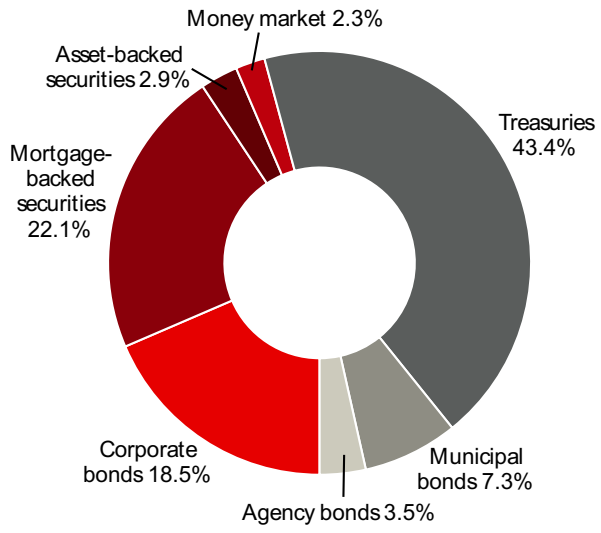
Figure 75 shows that corporate bonds comprise 18.5% of the US debt market, with a value of USD 10.6 trillion. We estimate that the world value of corporate bonds is some USD 45 trillion (based on combining BIS, International Capital Market Association (ICMA) and Securities Industry and Financial Markets Association (SIFMA) data).

ICMA data shows that for corporate bonds, financial issuers dominate, accounting for 50% of outstanding bonds (29% in the US). Other sectors that are well-represented are industrials, consumer discretionary, utilities, energy, healthcare and technology. The prevalence of financial issuers is a relatively recent development. Giesecke, Longstaff, Schaefer and Strebulaev (2011) report that financials made up 0% of issuers in 1870, 1.2% in 1900 and 1.8% in 1969.

Credit ratings are a standard requirement for a public bond issue. Figure 76 shows the distribution of Standard & Poor's (S&P) credit ratings based on the broad S&P categorizations, with the final bar combining CCC, CC, C and D. Of the three main rating agencies, the letter designations used by Moody's differ from those utilized by S&P and Fitch. However, they map onto each other with the Moody's equivalent of the categories in Figure 76 being Aaa, Aa, A, Baa, Ba, B and Caa and below.

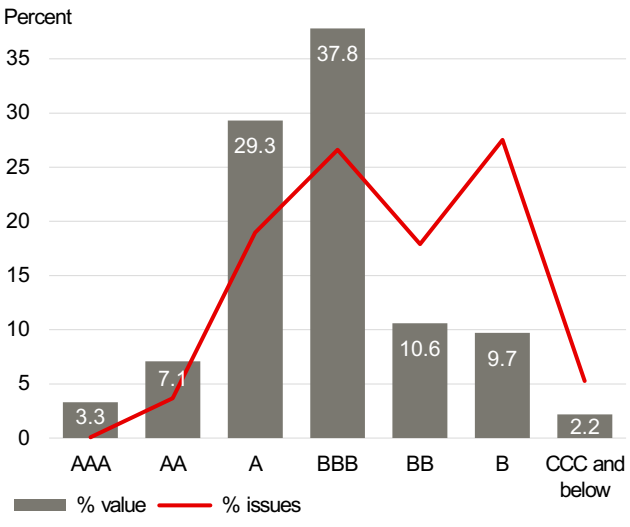
High-grade bonds are defined as those with a Triple-A or Double-A rating. Figure 76 shows that

Figure 75: US debt market by type of security, 2022



Source: Securities Industry and Financial Markets Association (SIFMA) (2023)

Figure 76: Distribution of S&P ratings, 2023



Source: S&P Global Ratings (2023)

fewer than 4% of bonds are high-grade, or just over 10% by value. Investment-grade (hereafter, IG) bonds are those with a rating of BBB (Moody's Baa) or above. Around half of corporate bonds fall into this category, representing 78% of corporate bond value. High-yield (hereafter, HY) bonds (also referred to as "non-investment grade" or "junk" bonds) are those rated BB (Ba) or lower. While just over half of all bonds fall into this category, they represent just 22% of overall value. Clearly, these issues are individually much smaller than IG bonds.

For most of the 20th century, up to the late 1970s, almost all corporate bond issues were IG. Junk bonds existed, but were primarily fallen angels, that is, formerly IG issues where the company had fallen on hard times. The market for new issue junk bonds was pioneered in the late 1970s and 1980s by investment bankers mainly to finance M&A and leveraged buyouts.

Corporate bonds are far from homogenous. They differ in many ways including their coupon, maturity and duration; whether they are secured against the company's assets; their seniority; if they are callable or have a sinking fund; and their type of covenants, which can range from "covenant heavy" to "cov-lite". Bonds may also be floating rate or convertible, although we focus here on fixed rate, non-convertible bonds. The rating agencies take all these attributes into consideration as they affect both the risk of default and the likely recovery in default – both of which impact ratings.

Corporate bonds are more complex than equities in other ways. Each company usually has just one stock, but a large company can have more than 100 bonds outstanding. Also, bonds mature, so a company's outstanding bonds change over time.

Yield spreads on corporate bonds

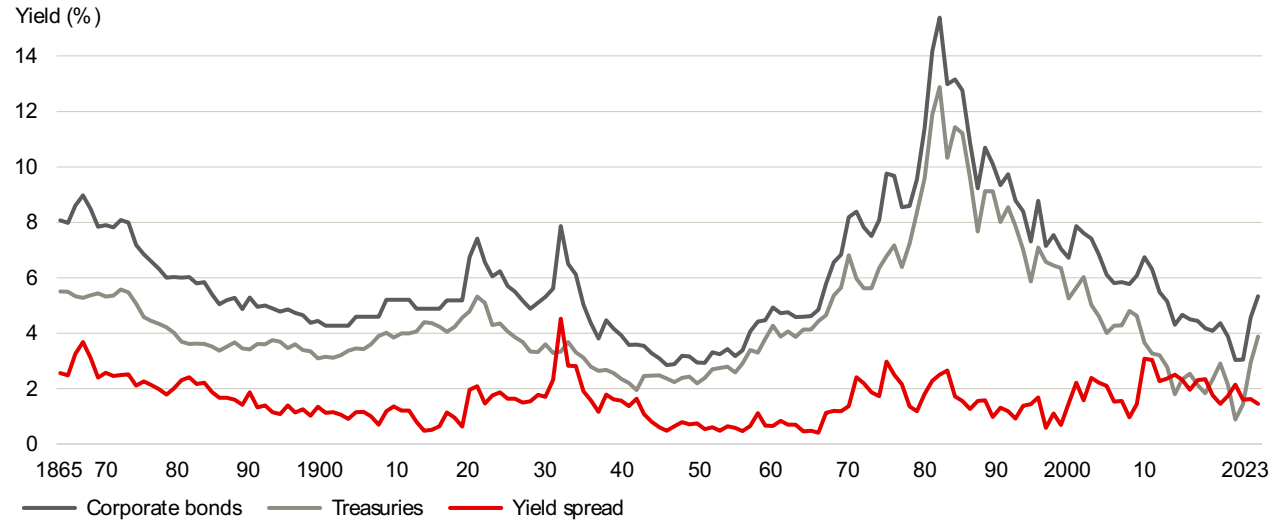
Corporations typically need to pay a higher interest rate than the government when they issue bonds, because of their higher risk. When these bonds are traded in the secondary market, they trade at a higher yield than equivalent sovereign bonds. This difference is known as the yield spread. By equivalent, we mean matched by maturity (or, better, duration) and adjusted for any embedded options such as the right to repay early at par.

The lower the quality/rating of the bond, the higher the yield spread. Since the inception of Moody's ratings in 1919, the average yield spread on Aaa corporate bonds has been 0.7%, while for Baa bonds, it has been 1.9%.

The yield spread is clearly not a measure of the extra return an investor will earn. For corporate bonds, the yield can appear misleadingly high as it assumes that the cash flows from the bond – the coupon and repayments – will be paid in full and on time. Corporate bonds are subject to credit risk, which refers to the probability of, and potential loss arising from, a credit event. The latter includes defaulting on scheduled payments, filing for bankruptcy, restructuring or a change in rating.

The credit spread would be positive even if investors expected the same return from corporate and sovereign bonds. This is because the expected cash flows from a corporate bond are lower due to the possibility of credit events. Part of the spread thus reflects expected default losses. The spread will also reflect a premium for credit risk which we discuss more fully below. It may also reflect an illiquidity premium, as corporate bonds are less liquid than sovereigns. There may also be other factors impacting the spread such as taxation.

Figure 77: Yield spreads on corporate bonds in the US, 1865-2023



Source: Giesecke, Longstaff, Schaefer and Strebulaev (2011), updated to 2023 by Dimson, Marsh and Staunton. Not to be reproduced without express written permission of the authors.

Figure 77 shows the credit spread in the US since 1865. The data is from Giesecke, Longstaff, Schaefer and Strebulaev (2011) (hereafter GLSS). We have updated their data to end-2023. The higher, darker gray line in Figure 77 shows the yield on IG corporate bonds. The lighter gray line shows the yield on broadly equivalent maturity US Treasuries. The red line shows the yield spread.

Over the 158 years spanned by Figure 77, the credit spread has averaged 1.58% with a standard deviation of 0.73%. The lowest spread was 0.42% in 1965, while the highest was 4.53% in 1931. We compute that the yield spread was on average 0.39% higher during US recessions.

GLSS explored the determinants of changes in the credit spread by looking at macroeconomic and financial variables and changes in the default rate. The financial variables all had the predicted sign and were statistically significant. Spreads narrowed in periods when the stock market rallied; widened during periods of greater stock market volatility, consistent with a risk premium interpretation; and were lower when the riskless rate increased.

Puzzlingly, none of the four macroeconomic variables – change in GDP, industrial production growth, consumption growth and inflation – were significantly related to changes in credit spreads. GLSS conjectured that the relevant macroeconomic information might already be impounded in the financial variables. More puzzling, however, they found that the change in the credit spread was not significantly related to changes in the default rate. This suggests that credit spreads are driven more by financial factors such as changes in the credit or illiquidity risk premium than by fundamentals.

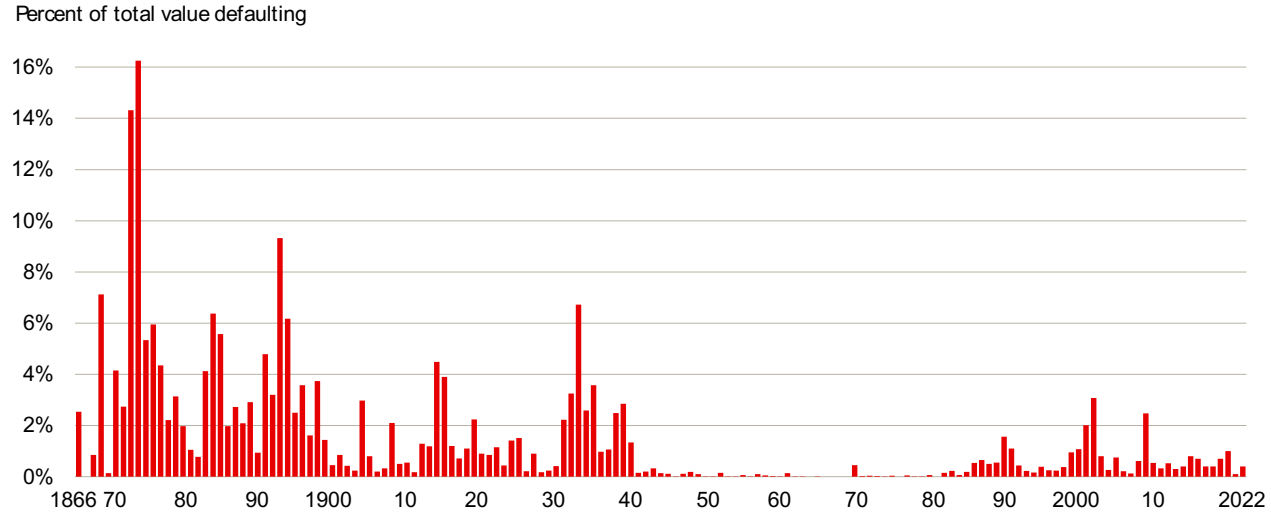
Default rates on corporate bonds

The most important contribution of the GLSS paper was the assembly and documentation of long-run default rates on non-financial US corporate bonds since 1866. A default is deemed to occur when a company or any subsidiary enters financial distress for the first time, where distress includes such events as missed coupon payments, defaults, bondholder committee meetings, receivership, bankruptcy, reorganization, etc..

GLSS compute the default rate as the percentage by value (at par) of bonds entering financial distress. This differs from Moody's or Standard & Poor's (2023) which focus more on the percentage of issuers. This matters as smaller issuers are more likely to default. Value-weighted default rates more closely represent the experience of an investor who held a value- (as opposed to an equally-) weighted portfolio of all corporate bonds.

Figure 78 shows that annual default rates since 1866 have clearly fallen over time. The average default rate was 4.0% in the late 19th century, 1.3% from 1900–1945, and just 0.3% from the end of WWII until 2008. From 1946 until the early 1980s, the average was an almost negligible 0.05%. This is curious as although this was a period of strong economic growth, there were seven recessions. Perhaps rising inflation proved a cushion against defaults and/or corporate borrowing was extremely conservative. GLSS argue that the latter was influenced by a pro-creditor bankruptcy regime over this period which imposed substantial penalties on debtors and managers. GLSS report an overall average for the full period since 1866 of 1.52% (falling slightly to 1.44% when we include Moody's data for 2009–22).

Figure 78: Percentage of total value of US non-financial corporate bonds defaulting, 1866-2022



Source: Giesecke, Longstaff, Schaefer and Strebulaev (2011), updated to 2022 by Dimson, Marsh and Staunton using Moody's data. Not to be reproduced without express written permission of the authors.

Default rates cluster in time, with a serial correlation of 0.63. The worst cluster occurred in the 1870s, when the massive boom in railroad construction of the 1860s was followed by a decade of defaults. From 1873–75, defaults totaled 36%. This was much worse than during the Great Depression when the worst three-year default total was 13%, placing it only fourth worst among all three-year periods on record.

Not surprisingly, given the clustering of default rates over time, GLSS find that the default rate is forecastable by its one-year lagged value. Other statistically significant variables are the prior year's stock market return (higher values predict lower defaults), change in stock market volatility (increases predict higher defaults) and GDP growth (higher values predict lower defaults). Variables that had no significant forecasting power were the prior year's change in the riskless rate, consumption growth, industrial production growth, inflation and changes in the credit spread.

The failure of the change in the credit spread to predict the default rate is surprising. As noted above, it is possible that the time variation in credit spreads is driven predominantly by changes in credit and liquidity risk premia, and only marginally by changes in the probability of default.

Default, recovery and loss

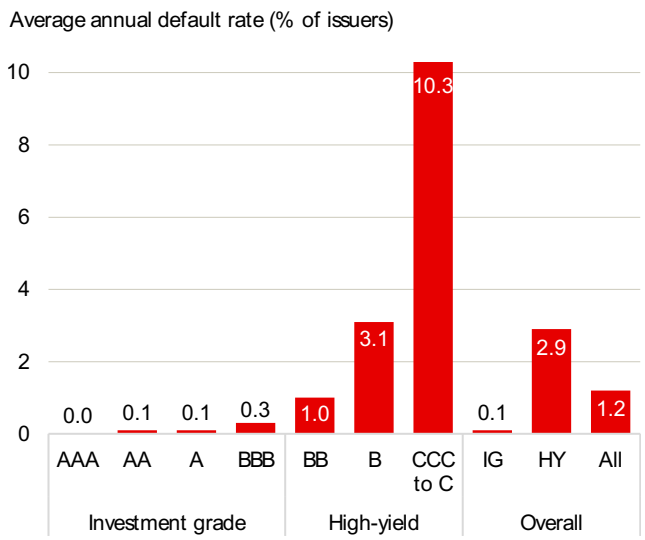
Figure 79 provides further insights into global corporate bond defaults. It shows the average annual default rate (as a percentage of issuers) from different credit ratings, over the 103 years from 1920 to 2022. It shows that default rates are very low for IG bonds, ranging from zero (to one decimal place) for AAA bonds through to 0.3% for BBB bonds. The average annual default rate across all IG bonds was just 0.1%. Default rates for HY bonds were far higher, ranging from 1.0% for BB bonds up to 10.3% for bonds rated CCC or below. The average annual default rate across all HY bonds was 2.9%. Across all corporate bonds, the annual average default rate was 1.2%.

Default rates overstate the loss to bondholders, as in almost all cases, there is some recovery of value. The recovery amount is defined as the amount recovered from a bond when the borrower is unable to settle the full outstanding amount. The recovery rate is the recovery amount expressed as a percentage of the bond's full par value. More senior bonds typically offer a higher recovery rate as they have a greater claim to assets compared with bonds ranked lower down the pecking order.

GLSS assume a 50% recovery rate as an average across corporate bonds and over time. They cite Hickman (1960) who found an average recovery rate of 63% over 1900–44 and Moody's which reported an average of 41% for 1982–2008. However, recovery rates, like default rates, vary over time and with debt seniority. They also vary depending on how they are measured.

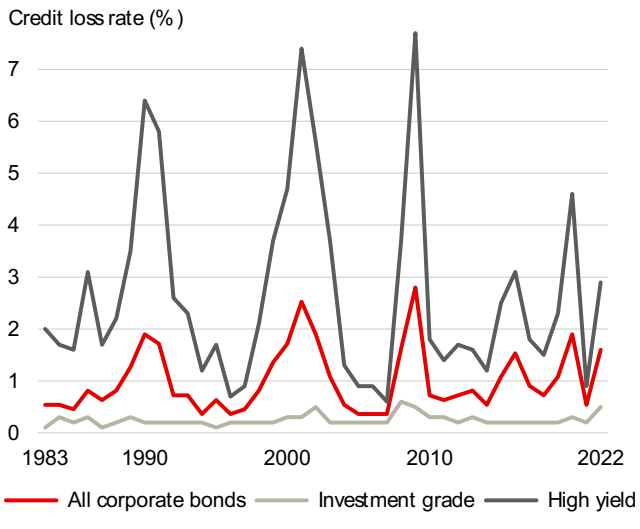
Rating agencies typically measure recovery rates either by the trading prices of defaulted debt at the emergence from default or as the ultimate amount recovered. The former is possible as most defaulted debt continues to trade during financial distress or bankruptcy proceedings. Ultimate recovery rates reflect the actual value that creditors realize at the resolution of default. This is discounted back to present value at the default

Figure 79: Global defaults by bond rating, 1920–2022



Source: Moody's Investors Service (2023)

Figure 80: Credit loss rates, 1983–2022



Source: Moody's Investors Service (2023)

date to take account of the delay in receiving payment after what are often protracted proceedings. Moody's (2023) reports that the average value-weighted ultimate recovery rates from 1983–2022 were 56% and 39% for first and second lien bonds; 34% and 27% for senior unsecured and senior subordinated bonds; and 28% and 14% for subordinated and junior subordinated bonds.

Default rates are negatively correlated with recovery rates (see Altman, Brady, Resti, and Sironi (2005)) so calculating expected loss from the average values of the two variables could lead to underestimation. Fortunately, the rating agencies compute credit loss rates directly taking the sum across issuers of the default amount times (1 – recovery rate).

Figure 80 shows Moody's data on credit loss rates over the 40 years from 1983 to 2022. Over this period, losses were much higher during recessions and equity bear markets, most obviously for HY bonds. The average annual loss rate for all corporate bonds was 1.0%. For HY bonds it was 2.7%, while for IG bonds, it was just 0.2%.

The credit premium

Much of the performance of fixed income portfolios can be attributable to two variables: a maturity premium that describes the incremental return expected from investing at the long end of the maturity spectrum compared with Treasury bills, and a credit premium that relates to the additional return expected from taking on default risk relative to government bonds, which are generally assumed to be default free. We discussed the maturity premium in Chapter 6.

Investors typically hold diversified portfolios of corporate bonds. This allows them to eliminate most of the idiosyncratic risk associated with credit risk. They would still require a credit spread above that on government bonds to compensate for expected default losses, but why would they expect a risk premium as well? As we have seen, defaults are correlated, clustering in bad times, especially recessions and bear markets. Hence in addition to idiosyncratic risk, corporate bonds have market risk (i.e., positive betas) which cannot be diversified away. Because of this, risk averse investors also require a premium for credit risk.

Both bond premiums – the maturity premium and the credit premium – like the equity risk premium, relate to the extra return that investors require for taking on additional risk. They are therefore forward-looking concepts, but their likely future magnitude is typically inferred from historical data. It is frequently assumed that, if the measurement interval is long enough, the historical premium will be an unbiased estimate of the future premium.

In estimating the historical credit premium from the difference between the long-run returns on government and corporate bonds, both should have similar maturities – or better, durations. Best of all, we should focus on effective-duration-adjusted-returns which adjust for any embedded options, such as the option to repay early at par. If not, the credit premium estimate will be contaminated by the maturity premium. If the government bonds have a longer duration, their return will be elevated by their larger maturity premium, and the credit premium will be underestimated. Conversely, if the corporate bonds have the longer duration, they will be boosted by the maturity premium, and the credit premium will be overstated.

Given the range of credit ratings with their differences in default risk and recovery rates, there can be no single "credit premium". Normally, the credit premium is estimated separately for IG and for HY bonds. However, in principle, it could be estimated at a more detailed level, for example, for each separate credit rating.

How large is the credit premium?

GLSS provide a ballpark estimate of the credit premium by deducting historical default losses from credit spreads. Over 1866–2008, the average credit spread and default rate were 1.53% and 1.52%. They assumed a recovery rate of 50% implying a historical credit premium across all corporate bonds of around 0.8%. However, their credit spreads, default rates and assumed recovery rate do not all correspond to the same set of bonds. Credit quality, loss rate and maturity mismatches as well as other factors may have impacted their estimate.

A more direct way to compute the historical credit premium is to compare the returns achieved on corporate and government bonds, as in Ibbotson and Sinquefield (1976) and successive updates of their research in the Stocks, Bonds, Bills and Inflation (SBBI) Yearbooks (see Ibbotson (2023)). The SBBI credit premium has been widely used by practitioners and in academic research.

The SBBI data starts in 1926, but in past editions of this Yearbook, we have extended the data back to 1900. Figure 81 shows the extended series for corporate and government bond returns from 1900–2023. One dollar invested at the start of 1900 in long-dated US Treasuries would have grown to USD 248 by end-2023, an annualized

return of 4.55%. A corresponding investment in long-term US corporate bonds would have grown to USD 629, providing an annualized return of 5.34%. Thus, after 124 years, the terminal wealth from investing in corporate bonds was two and a half times greater than from US Treasuries.

The year-by-year excess returns of corporate bonds over US Treasuries range from a low of –17.1% in 2008 to a high of +17.9% in 2009. The arithmetic mean was 0.69%, with a standard deviation of 4.2%. The annualized credit risk premium over the 124 years since 1900 was 0.76%. Using only the original SBBI data from 1926–2023, it was 0.56%.

Problems with the SBBI data

There are three issues with the interpretation of the Ibbotson SBBI credit risk premium. These relate to credit quality, the estimation of corporate bond returns, and mismatched durations.

First, Hallerbach and Houweling (2013) point out that the corporate bonds used in the SBBI series are of very high quality. They argue that they are therefore likely to be rather insensitive to market-wide variations in credit risk. They describe this as a quality bias. However, this is not, in our view, a bias, but a question of correct interpretation. The SBBI credit premium is clearly documented as relating to high-grade bonds (Aaa and Aa). It should not be interpreted as relating to all corporate bonds or even to IG bonds. As noted above, there is no single "credit premium".

Second, the SBBI corporate bond returns from 1926–1968 were estimated from yields. This was also true of the GFD data used for our extension back to 1900. The documentation makes no mention of any adjustments for defaults or downgrades. Before 1969, the Ibbotson corporate bond series therefore overstates returns by ignoring defaults. Kizer, Grover and Hendershot (2019) and McQuarrie (2020) also report likely overestimation of the realized credit premium in the early decades of the SBBI series.

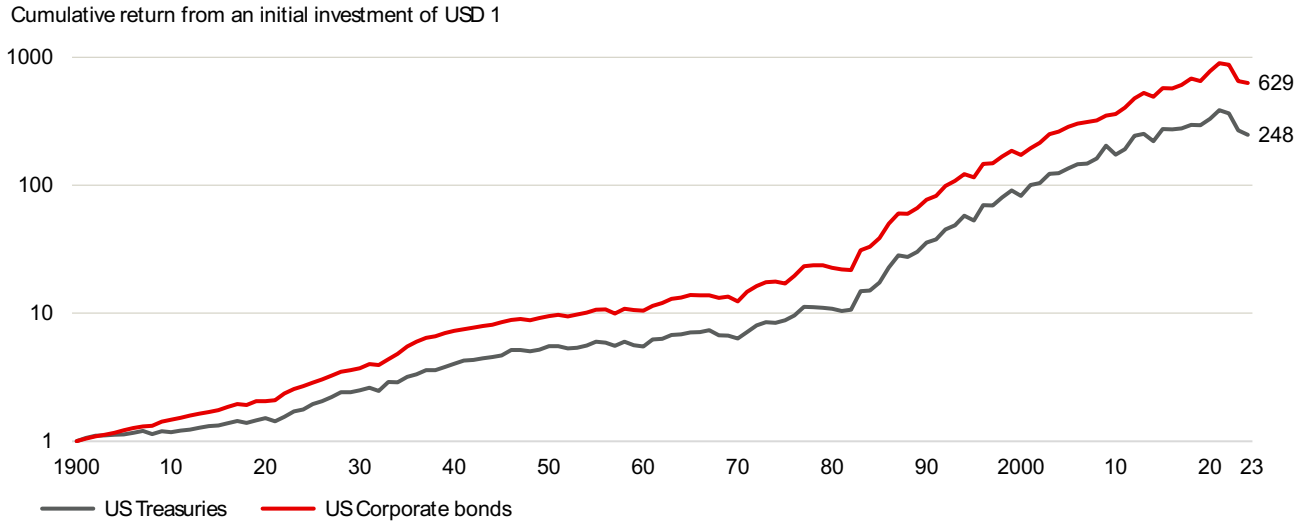
The bias, however, is likely to be small. The bonds were all high-grade, so Figure 79 suggests that the average default rate was around 0.15%. Assuming a recovery rate of 50% and bearing in mind this bias applied to 69 out of 124 years, annual returns were likely overstated by around 0.04%–0.05%.

The third issue, namely mismatched durations, is more serious. It was first identified by Hallerbach and Houweling (2013). They showed that the SBBI Treasuries had a significantly longer duration than the SBBI corporate bonds. The return differential is thus contaminated with a considerable maturity premium component, making the SBBI credit risk premium an underestimate.

Asvanunt and Richardson (2017) confirmed the duration mismatch and corrected it. Before July 1988, they used the SBBI data but corrected the credit premium for the duration mismatch by empirically estimating durations and calculating the duration-adjusted credit excess returns. They lose the first ten years of estimates as their procedure required ten years of prior data. From 1936 to July 1988, their estimate of the average annual credit premium was 1.80% – far higher than the 0.34% obtained from just subtracting SBBI government bond returns from corporate bond returns.

From August 1988 on, they use the Barclays (now Bloomberg) US Investment-Grade (IG) Index since over this period, it provides not just total returns, but also credit excess returns, i.e., the index return minus the return of a hypothetical Treasury

Figure 81: Comparative performance of US corporate bonds and US Treasuries, 1900–2023



Source: Ibbotson (2023) SBBI Yearbook assembled and published by Kroll, backdated from 1900–25 by Dimson, Marsh and Staunton using GFD data. Not to be reproduced without express written permission of the authors.

portfolio with the same duration. Combining the Bloomberg-Barclays estimates with the corrected SBBI data from 1936 to July 1988 resulted in an estimate of the annual credit premium from 1936–2014 of 1.37% for high-grade bonds. They also estimated the credit premium on high-yield bonds using the credit excess returns for the Bloomberg Barclays US Corporate High-Yield Index. From July 1988 to 2014, the average annual HY credit premium was 2.0% above that on the IG index.

Note that government bonds may not be the perfect benchmark for measuring the credit premium even when duration-matched and option-adjusted. Government bonds, especially US Treasuries, can enjoy a safe-asset convenience yield, and there can be "specialness" effects for the most liquid bonds (see Feldhütter and Lando (2008)). However, any upward bias in the credit premium from this is likely to be small.

Long-run evidence from the UK

Coyle and Turner (2013) provide evidence on UK corporate bonds since 1860. Historically, the UK was an important corporate bond market. In 1913, it was the second largest in the world, after the US (see Musacchio (2008), Coyle and Turner (2013) and GLSS (2011)). However, Coyle and Turner report that a century later, it ranked 36th in terms of its size relative to GDP.

The "great reversal" in UK corporate bonds began around 1970. Coyle and Turner concluded that the high UK inflation of the 1970s helped drive this. Other factors were the removal of impediments to UK bank lending, the rise of the Eurobond market and easier access to overseas bond markets.

Coyle and Turner's sample comprised nine bonds in 1860, peaking at 819 in 1967, and falling to 154 by 2002. It included all debentures issued by commercial companies – long-term bonds secured on the company's assets. These made up the vast bulk of the UK corporate bond market. Unsecured loans became popular in the 1950s and 1960s but were only a small proportion of the market.

Figure 82 shows the cumulative return on UK bonds since 1860. Corporate bond returns are from Coyle and Turner, updated to 2023 using the S&P UK Investment-grade 10+ Years index. UK government bond returns are from the DMS dataset from 1900, and before that, are the returns on Consols, which were perpetuals and the only choice available. As Klovland (1994) explains, "For many decades before WWI the price of Consols was the most important asset price in the world."

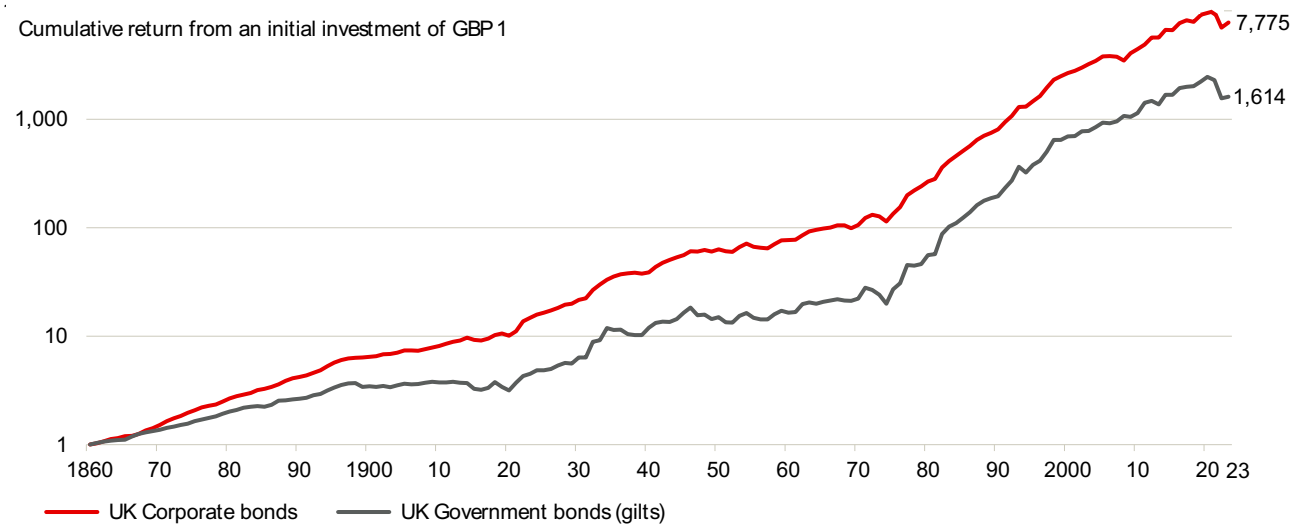
Figure 82 shows that GBP 1 invested at the end of 1860 in UK gilts would have grown to GBP 1,614 by end-2023, an annualized return of 4.64%. A corresponding investment in UK corporate bonds would have grown to GBP 7,775, an annualized return of 5.65%. Thus, after 163 years, the terminal wealth from investing in corporate bonds was almost five times greater than from UK gilts.

The year-by-year excess returns of UK corporate bonds over gilts range from –26% in 1982 to 19% in 2009. The arithmetic mean was 0.72% with a standard deviation of 6.6%. Over the 163 years since 1860, the annualized credit risk premium was 0.97%.

Interpreting the UK credit premium

Unlike the SBBI data discussed above, all of Coyle and Turner's returns were computed from bond prices and coupons, not from yields. Where there were defaults, the losses (if any) were factored in.

Figure 82: Comparative performance of UK corporate bonds and government bonds (gilts), 1860–2023



Source: UK Corporate bonds: Coyle and Turner (2013), 1860–2002, linked into the S&P UK Investment-grade Corporate Bond 10+ Years Index from 2003–23; UK Government bonds, Klovland (1994) from 1860–1899; DMS Dataset from 1900–2023. Not to be reproduced without express written permission of the authors.

However, remarkably, there were only 13 cases where bondholders lost capital, indicating that these UK bonds – which were all secured against corporate assets – were very high quality. The estimated credit premium should therefore be interpreted as the premium for high-grade bonds.

In common with the SBBI data, however, the duration of the UK corporate bonds was significantly below that of the comparative government bonds. The UK government bond series comprised perpetuals until 1955 and bonds with a 20-year maturity thereafter. In the 1860s and 1870s, Coyle (2013) reports that their corporate bonds were also mostly perpetual debentures issued by railroads. Even so, their duration would be lower than that on government perpetuals due to their higher coupons. From the 1880s, other industries began issuing bonds mostly with maturities of around 20 years. Coyle reports that from WWI until 1970, the average 'observed maturity' – the time bonds in his sample were listed on the market – was 13 years, falling thereafter, as bonds with shorter maturities were issued.

Turner and Coyle's corporate bond index is a 1+ Years index – it includes all bonds with maturities greater than or equal to one year. Thus, if the bonds in the index individually started life with 20-year maturities, the maturity of the portfolio would have been around half that length. It is clear, therefore, that the corporate bonds represented in Figure 82 had much lower duration than the government bonds. Furthermore, the duration gap increased over time. This means that the annualized credit premium of 0.95% is, like the SBBI series for the US, contaminated with an appreciable maturity premium component and hence understates the premium earned by investors.

A distinct asset class?

When a company borrows money, whether through a corporate bond or some other vehicle, it gains an option to default. If, when the bond/debt is due to mature, the company's assets are worth less than the amount due to be repaid, the company can exercise this option, handing over the assets to the debtholders and effectively making them the shareholders. This means that the lower the quality of a corporate bond, and hence the greater the likelihood of default, the more "equity-like" it is.

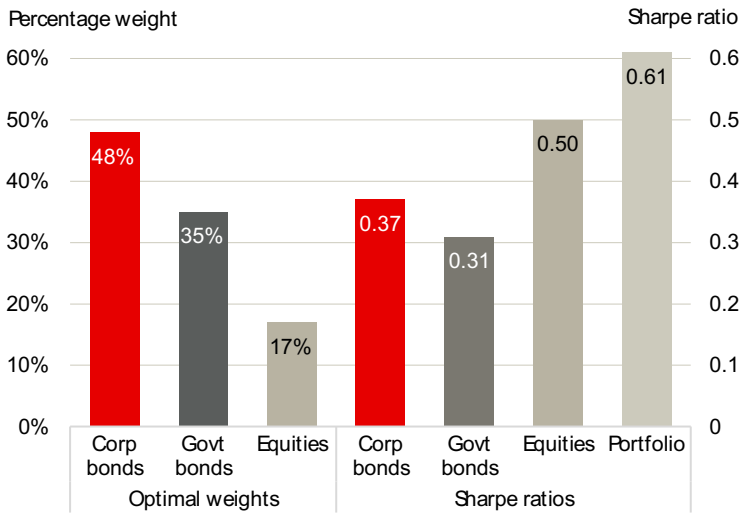
Within corporate bonds, IG bonds behave most like sovereign bonds, while HY bonds behave most like equity. This raises the question of whether corporate bonds are truly a separate asset class, and whether they have added value over some blend of equities and sovereign bonds. If they have not, then the credit premium could simply be the equity premium in disguise.

Asvanunt and Richardson (2017) investigate this using the series of credit excess returns described above, i.e., the spliced series using the corrected SBBI credit premiums until July 1988 and the Bloomberg-Barclays data thereafter. They regress these on the bond maturity excess returns (long bond returns relative to TBills) and equity excess returns (over TBills) over 1936–2014 and find a statistically significant alpha, suggesting a distinct role for credit.

They also examined the mean-variance ex-post, optimal credit risk premium exposure over this period. They calculated the in-sample optimal weights for a portfolio consisting of US corporate bonds, Treasuries and equities. The left-hand panel of Figure 83 shows the optimal weighting on credit was 48%, perhaps reflecting illiquidity premia. This compared with optimal weights of 35% for Treasuries and 17% for equities, confirming an important independent role for corporate bonds and credit. The right-hand panel shows that the Sharpe ratio for this ex-post optimal portfolio was 0.61, which is well above the Sharpe ratios of the three individual asset classes.

Ben Dor et. al. (2019) provide confirmatory evidence. They show that a credit portfolio significantly out-performed a comparable mix of Treasuries and equities between 1993 and 2019. Corporate bonds are indeed a distinct asset class.

Figure 83: Ex-post efficient frontier, 1936–2014



Source: Asvanunt and Richardson (2017)

Sovereign bonds and credit risk

Government bonds are often perceived as being default risk free. Countries that control their own monetary policy can print money and/or tax their inhabitants, rather than default. So, in most developed markets, investors can be confident that they will receive the interest payments promised and that the bond will be repaid. However, the purchasing power of those bond disbursements may, of course, be eroded if the country chooses inflation over default.

Some countries no longer manage their own monetary policy. Eurozone countries have handed control to the European Central Bank. In the 2012 Eurozone crisis, Greek government bonds suffered a write-down of USD 100 billion, the largest ever sovereign default.

Even the bonds of countries that do control their own monetary policy can experience default events. For more than a decade, the recurring topic of the debt ceiling has led the US perilously close to a technical default. In 2011, following such an episode, S&P downgraded the credit rating on US Treasuries from AAA to AA. Reaching back in history, Russia and China defaulted on their domestic debt after their communist revolutions. More recently, Russia defaulted again in 1998 after interest rates on ruble bonds hit 200%.

Historically, many countries have defaulted on their foreign currency debt. Meyer, Reinhart and Trebesch (2022) document that there have been 313 sovereign debt restructurings since 1815. Argentina holds the record with nine defaults. Since 1970, there have been more than 100 cases of government defaults on their foreign currency bonds (Brealey, Myers, Allen and Edmans (2022)).

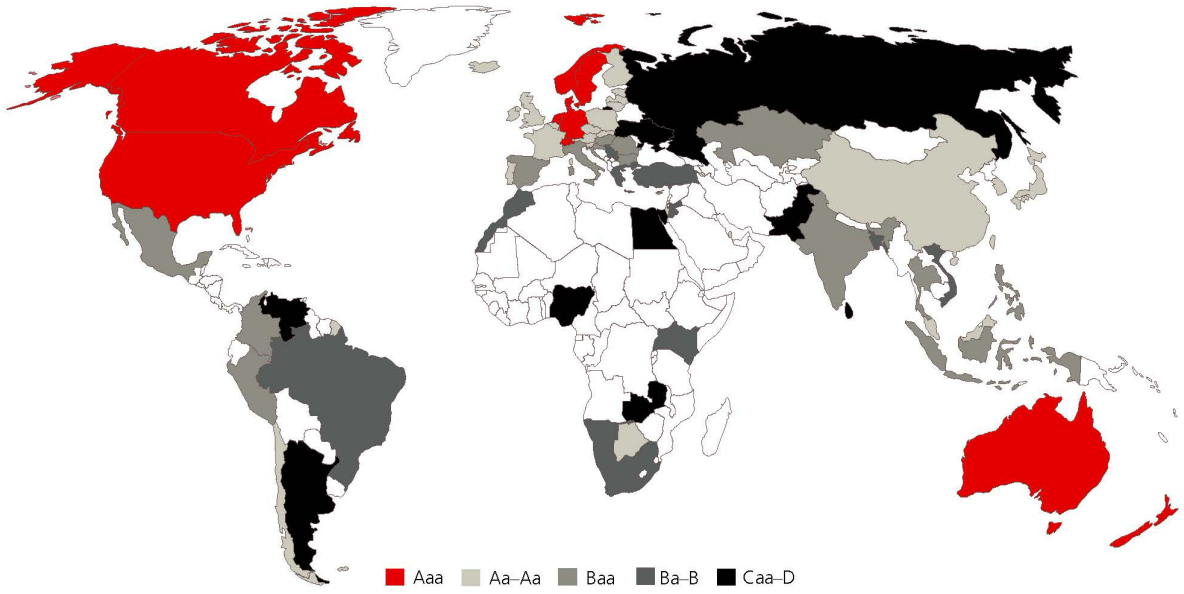
Clearly, sovereign bonds are not default-free, but have differing degrees of credit risk. This is reflected in the credit ratings assigned to countries by the major rating agencies. Figure 84 shows the current Moody's ratings for countries around the world. Of the DMS 35 markets, 11 had Triple A ratings, namely, Australia, Canada, Denmark, Germany, The Netherlands, New Zealand, Norway, Singapore, Sweden, Switzerland and the US. At the other end of the spectrum, five DMS 35 countries were rated below IG, namely Argentina, Brazil, Greece, Russia and South Africa. Russia defaulted on its foreign currency debt in 2022 after the start of its war on Ukraine.

Is sovereign credit risk rewarded?

In their article, "Sovereign bonds since Waterloo", Meyer, Reinhart and Trebesch (2022) (hereafter, MRT) examine the returns on foreign-currency sovereign bonds. Their extensive database spans bonds from 91 countries traded in London and New York and designated in British pounds or US dollars over more than 200 years from 1815–2016. 1815 saw the Battle of Waterloo and the defeat of Napoleon and his Spanish allies. Spain's former Latin American colonies gained their independence and raised finance in London. This marked the birth of "modern" sovereign debt markets.

MRT measured the actual returns bondholders received. They carefully analyzed the 313 defaults that took place, including missed payments, debt renegotiation terms and face value write-downs. Investors rarely suffered total losses. Restructuring

Figure 84: Moody's credit ratings for sovereign bonds around the world



Source: Moody's ratings, taken from World Government Bonds

was the norm. The mean loss was 44%, the median 39%, and the standard deviation 30% with losses ranging from below 20% to over 80%.

Figure 85 show the returns reported by MRT from investing in foreign sovereign bonds. The first panel shows the arithmetic mean annual real return over five subperiods and over all periods. The dates of the subperiods are shown at the foot of the figure. Note that MRT excluded 1974-94 because this period was dominated by syndicated bank lending and hardly any sovereign bonds were issued abroad. Over all five subperiods, the average annual real return was 6.9%. This is after taking account of defaults/recoveries which reduced investor returns by an average of just over 1%.

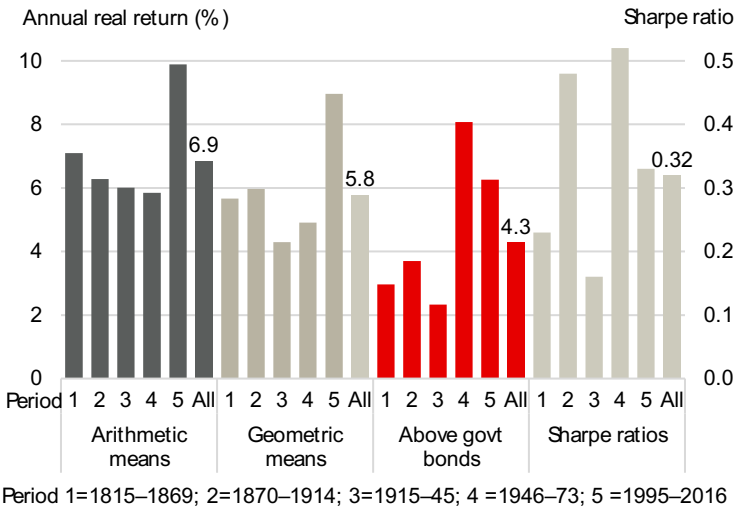
The second panel shows the geometric mean (i.e., annualized) real returns. Over all subperiods, the annualized real return was 5.8%. The third panel, depicted in red, shows the credit premium, labelled "above govt bond". It is measured as the average annual difference between the returns on foreign sovereign and domestic government bonds. For GBP-denominated foreign bonds listed in London, MRT deduct the GBP return on UK gilts, while for USD-denominated foreign bonds listed in New York, they deduct the return on US Treasuries. Across all periods, the average annual credit premium was 4.3%. The final panel of Figure 85 shows Sharpe ratios. Across all periods, the average Sharpe ratio was 0.32.

The historical annual credit risk premium of 4.3% seems very high. It exceeds the premium reported above for HY ("junk") corporate bonds. From the information MRT provide on bond maturities, there does not appear to be a duration mismatch. It is possible that the high ex post premium reflects a higher required return from foreign rather than domestic bonds due to greater credit risk – the lack of a "printing press" in foreign currencies makes default rather than inflation the main way of solving fiscal problems. Other contributing factors could be the lower liquidity of the foreign sovereign bonds, tax, and regulatory issues.

Even more surprisingly, returns are high even for countries that have defaulted multiple times over long periods, such as Argentina, Brazil, Ecuador, Greece, Mexico, Ukraine, and Venezuela. The long-run excess returns for these countries range from 4% to 12%. Indeed, only two out of the 91 countries in the MRT sample have negative excess returns, Bolivia and China.

These high returns help explain why sovereigns can borrow again despite a history of default and can often do so soon after a default. Central to the high returns are the high coupons offered. Some

Figure 85: Returns from foreign sovereign bonds, 1815-2016



Period 1=1815–1869; 2=1870–1914; 3=1915–45; 4 =1946–73; 5 =1995–2016

Source: Meyer, Reinhart and Trebesch (2022). Not to be reproduced without express written permission from the authors.

70% or 5.6 percentage points of the average yearly nominal return over the 200 years covered by MRT's research is due to coupon payments.

In summary, it is clear that while sovereign bonds have substantial default risk, the returns have been high enough to compensate for the credit risk. Their annual volatility of 15% is midway between the volatility of US Treasuries and US equities (see Chapter 2), while the arithmetic mean premium they have earned over bonds of 4.3% is not far below the historical equity premium relative to bonds of 6.7% in the US and 5.2% in the UK.

Boosting corporate bond returns

We have seen that passive investors in both corporate bonds and risky sovereign bonds can expect to earn a credit risk premium. The higher the credit risk, the greater the premium. Active investors may be able to do better than this by enhancing returns through bond selection skills or market timing. However, there may be other ways in which corporate bond investors can boost returns, through taking advantage of bond market factor exposures and anomalies.

Factor returns in corporate bonds

In chapters 7 and 8, we discussed equity factor returns. Many equity investors seek to enhance their returns by taking advantage of factor premiums uncovered by academic research. The best-known of these include size, value, carry, quality, low volatility and momentum.

Research into whether similar factors apply within the corporate bond market has recently gathered pace. This has been catalyzed by the availability of

the TRACE historical corporate bond returns database. There are now scores of papers on corporate bond factors.

These papers have explored an extensive "factor zoo" for corporate bonds – see, for example, Dickerson, Julliard and Mueller (2023). This parallels the equity factor zoo described in Chapter 8. However, with corporate bonds, there are even more factors to explore. First, all the firm-level factors found to apply to equities may also apply to the firm's bonds. Second, there may also be bond-level factors, for example, yield, duration, rating and age. To illustrate this, we look at three studies. The first focuses on bond-level factors, the second on firm-level factors and the third on both.

Three illustrative studies

The first study, by Houweling and Van Zundert (2017), focused on bond-level factors – but ones that mirrored those found to be important in equities. They examined size, based on the market value of the company's bonds; low-risk, defined as short-maturity bonds with a high credit rating; value, measured as bonds whose credit spread was high relative to a model-implied fair spread; and momentum, i.e., bonds with high past returns. They examined long-only portfolios focusing on excess returns over duration-matched Treasuries.

All four factors appeared statistically significant, even after transactions costs. A combined multi-factor portfolio performed even better, as it benefited from diversification due to low correlations between factors. They also showed that in a multi-asset context, allocating funds to corporate bond factors added value beyond assigning just to equity factors. However, this study covered just 20.5 years from 1994 to mid-2015, a very short period for estimating factor returns.

A second study by Bektic, Wenzler, Wegener, Schiereck and Spielmann (2019) took a different approach using firm-level, not bond-level, factors. They argued that both equity and corporate bonds are driven by the fundamentals of the same underlying company, so factors important in the equity market should also matter for corporate bonds. They examined size, value, profitability and investment using the definitions employed by Fama and French (2015) in their 5-factor model.

Their study covers US IG and HY bonds from 1996–2016, plus some European IG bonds after 2000. On the grounds that long-short portfolios of corporate bonds would be both impractical and costly, they focus on long only excess returns over duration-matched Treasuries.

Their results were disappointing. None of the factors were statistically significant in the US IG market. Results were stronger in the more equity-like HY market, with all factors significant. However, when returns were adjusted by the Fama-French factors plus two bond market factors, only profitability and investment remained significant even among HY bonds. A multi-factor model proved more successful, delivering an annual excess return of 2.33% in the US HY market and 0.23% for IG bonds.

A third study by Israel, Palhares and Richardson (2018) used a mixture of bond- and firm-level factors. It covered broadly the same period as the previous two studies, January 1997 to April 2015. It examined four factors: carry, defensive, momentum and value.

They measured carry by option adjusted spreads (defined above). Their defensive factor was designed to pick up the tendency of safer, low risk assets to offer higher returns. It was measured in three ways: (low) leverage of the issuer; (high) issuer profitability (as in Novy-Marx (2013)); or (low) bond duration. For momentum, they examined both bond and stock price momentum. Value was defined as spread relative to default risk, where the latter was either the estimated issuer default probability or a function of bond rating, duration and bond excess return volatility.

They found strong evidence of positive risk-adjusted returns to all four factors. Their conclusions held whether they focused on zero transactions cost, long-short portfolios or long-only portfolios after transactions costs. They sought to determine whether these factor returns were a reward for risk or due to mispricing. They found little evidence for the risk explanation, while mispricing seemed plausible for momentum, but inconclusive for the other three factors.

A cautionary tale in bond factor research

The studies above provide valuable contributions, but they do not define the field in the same way that the Fama-French 3- and 5-factor models (see chapter 7) do in the equity world. One model that assumed this mantle for corporate bonds was Bai, Bali and Wen's (BBW) (2019) 4-factor model. Their factors were the excess bond market return (the equivalent of Fama-French's market factor), plus downside risk, credit risk and liquidity risk.

The authors stated that their model "outperforms all models considered in the literature". They claimed that investors could expect to be rewarded for downside, credit, and liquidity risks. BBW was published in the Journal of Financial Economics, a

top-three refereed journal and seen as a breakthrough paper. It amassed several hundred citations. The BBW factors were adopted by many academics and practitioners as the standard benchmark for assessing corporate bond portfolio performance, akin to Fama and French.

Sadly, though, it was flawed. This discovery came thanks to Alex Dickerson, then a doctoral student at Warwick University in the UK. He discovered that the authors had lined up their variables incorrectly in time, with both lead and lag errors. BBW thus suffered from look-ahead bias and it is easy to predict returns with perfect foresight! BBW had also used data that truncated extreme returns, which unfairly favored their model. In a rare move, the paper was retracted. The error invalidated other papers by the same/overlapping authors and papers by other authors that used their factors.

These flaws are detailed in Dickerson, Mueller and Robotti (2023). When they revisited BBW using correct procedures and data, they showed that the BBW factors, with the marginal exception of liquidity, had no additional explanatory power over the broad corporate bond market factor. They examined several other factors and concluded that, "Overall, robust evidence for common factor pricing in corporate bonds remains elusive."

The replication crisis

BBW is an extreme example of the "replication crisis". This term was coined over a decade ago, but the concern – that the results of many studies cannot be reproduced – dates back much further. Most scientific fields are impacted, but medicine and psychology feature prominently.

Similar concerns have been raised in finance, notably by Harvey (2017). He warned of the dangers of data mining and selective reporting – trying multiple specifications but reporting only those that "worked". He argued that the pressure to publish, and the perception that journals published only positive results, were partly to blame. He cited research on equity factors as a prime suspect and warned that most factor effects reported would not be repeatable in future.

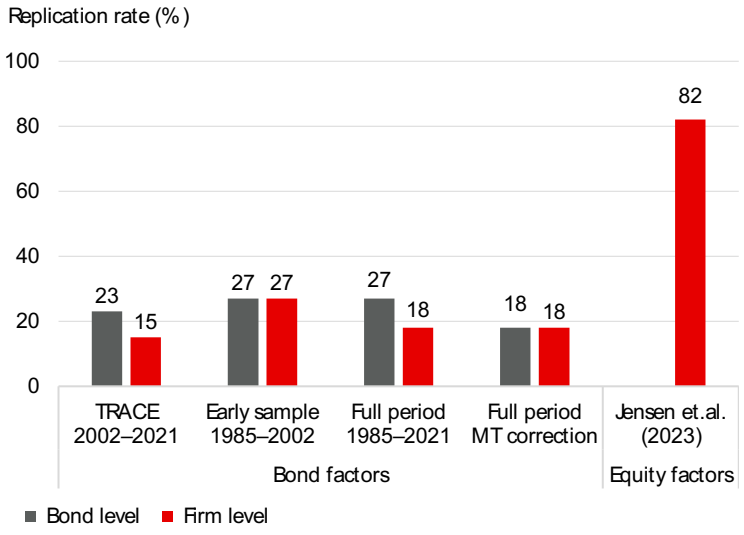
With corporate bond factors the problem is worse, since much research is not replicable even over the original research period, let alone out-of-sample in subsequent (future) or pre-sample (past) periods. Dick-Nielsen, Feldhütter, Pedersen and Stolborg (2023) (hereafter D-NFPS) show just how low replicability in this area has been and explain that the main reason for this is data errors.

Using cleaned-up data, D-NFPS replicate all the factors documented by previous researchers. The first pair of bars in Figure 86 shows the replication rates over the period since 2002, the start of the TRACE database used by so many bond factor researchers. Only 23% of the bond-level factors and just 15% of the firm-level factors that were considered statistically significant in previous studies show up as being significant in the D-NFPS replication. These are astonishingly low rates.

D-NFPS also looked at an earlier, out-of-sample database. Figure 86 shows higher, but still low replication rates of 27% from 1985–2002. Over the full period from 1985–2021 the replication rates were 27% for bond-level factors and 18% for firm-level factors. The final pair of bars correct for multiple testing (MT). This adjustment raises the bar on what is deemed significant, given that multiple factors are being tested and some would appear significant purely by chance. This correction lowers the replication rate to just 18%.

These replication rates compare poorly with the 82% found by Jensen et.al. (2023) for US equity factors (the final bar in the chart). Bond research, however, does not have the equivalent of CRSP, a common database used by all equity researchers, with high quality data. D-NFPS document some of the egregious errors in TRACE. They argue that non-replication is mainly due to data errors and the different and unsatisfactory ways researchers have dealt with them. The raw data have numerous outliers, especially for highly illiquid bonds. Some are real, and others erroneous. Their study devoted much effort to data checking and correction.

Figure 86: Replication rates for research on factor returns



Source: Dick-Nielsen, Feldhütter, Pedersen and Stolborg (2023) and Jensen, Kelly and Pedersen (2023)

Replicable corporate bond factors

The replicability issue appears concentrated in studies that use TRACE and fail to correct data errors. Many papers, including the three described earlier, use proprietary historical datasets such as those from Bank of America Merrill Lynch and Barclays. Since these originate from bond index construction, they should be relatively error-free.

Furthermore, D-NFPS did find that a minority of factors from prior studies were replicable and remained significant. They concluded that high return bonds have historically been those that are old, small market value, low duration, from a small firm and with high recent returns on the corresponding stock (equity momentum).

They also examined 153 firm-level factors considered by Jensen et.al. (2023) when they examined equity factor replicability. The results confirmed the importance of equity momentum and short-term reversal (the negative of short-term momentum). They also found bond returns were positively related to investment and debt issuance and negatively related to value. They conjecture that the opposite sign on the value factor in equity and corporate bond markets may be due to risk-shifting or financial distress in value-oriented firms.

Corporate bonds and the illiquidity premium

In contrast to equities, corporate bonds trade on an over-the-counter market where trading costs are higher and more variable. As we noted above, credit risk premiums may well include an illiquidity premium to compensate for this. The difficulty lies in disentangling the two premiums.

Confirmation of an illiquidity premium is provided by the fact that three factors that D-NFPS found to be replicable relate to illiquidity. First, bond issues with smaller market values are less liquid. Second, as bonds get older, and a higher fraction of their life has expired, Houweling, Mentrik and Vorst (2005) report that an increasing percentage of the bond's issued amount tends to get absorbed in investors' buy and hold portfolios. Thus the "older" the bond, the less trading takes place and the less liquid it becomes. Third, bonds issued by smaller firms are also likely to be less liquid.

D-NFPS found that all three measures of illiquidity were associated with higher corporate bond returns. In their earlier study, Houweling et.al. (2005) found that the premium between liquid and illiquid portfolios depended on the variable used to proxy for illiquidity but ranged from 0.13%–0.23%. It seems probable therefore that corporate bonds in general command an illiquidity premium, and that this varies with the liquidity of the bond.

Profiting from an illiquidity premium may nevertheless be challenging. After a comprehensive analysis based on 27,983 bonds issued by 5,310 firms, Richardson and Palhares (2019) conclude that they "are unable to find any empirical evidence of a liquidity premium in credit markets".

Can we rely on corporate bond factor research?

Caution is needed in interpreting bond factor research. First, there are issues of replicability and data errors. Second there is data mining, a problem endemic to factor research. Researchers data mine by trying more variables than they report, as well as multiple weighting and rebalancing schemes. They may even data mine the data cleansing method.

Corporate bond factor research is also quite new, with most studies focused on the 21st century, and only a few spanning more than 20 years. This compares with equity factor research where many factors are measured over almost a century (since 1926) and some over even longer intervals. Finally, most research is on the US market.

We have nevertheless seen that several factors have, at least historically, helped explain corporate bond returns. The key question is whether they will continue to do so in future. One concern is that for many factors, the theory for why they should exist or what they are rewarding appears weak. For some factors, like illiquidity, there is a rationale for why they should continue. Others appear to rest on behavioral arguments. However, behavior can change, especially as awareness of these factors and their popularity increases.

Anomalies including fallen angels

In addition to trying to enhance corporate bond returns through factor exposures, investors may also seek to take advantage of other anomalies.

Most mandates for IG corporate bond managers require them to sell bonds within a relatively short time-span if they get downgraded from IG to HY status (typically bonds being downgraded to BB). These bonds are commonly referred to as "fallen angels". The need for a substantial number of investors to divest within a limited window appears to have created price pressures that temporarily reduce prices below their fair values. Historically, it has been profitable to buy these fallen angels.

Ben Dor et. al. (2021) analyzed the fallen angels effect and report an extensive pattern of strong price reversals. Their results suggest that investors start selling in anticipation of the downgrade before it happens and continue to sell until around three months after. The price falls are then reversed and fallen angels outperform by a total of

6.6% in the two-years post downgrade. The greater the initial under-performance, the higher the subsequent returns. They conclude that this is due to price pressure rather than an overreaction to the information implied by the downgrade.

Ilmanen (2022) examines whether this has persisted. More than a decade earlier, he (Ilmanen (2011)) and others had reported on the fallen angels anomaly. One might have expected this to have increased investor awareness of the effect, and for this to have weakened the price pressure. However, more than ten years on, he reports that the fallen angels effect has continued with a similar excess return to his earlier findings.

Another anomaly highlighted by Ilmanen (2011, 2022) is the "front-end opportunity". He observes that the highest risk-adjusted returns have come from high-grade bonds at short maturities. However, the spread over Treasuries for such bonds is small, and exploiting this opportunity really requires leverage. Furthermore, it is not clear whether this is an anomaly or a manifestation of a low-risk factor – see the study by Houweling and Van Zundert (2017) described above.

How you might beat corporate bond indices

The returns pattern from fallen angels and the front-end opportunity highlight how it has been possible to beat passive index benchmarks in the corporate bond market. Benchmarks follow strict investment rules. Thus, an IG bond index will automatically sell bonds that cease to fall within its IG investment universe. This will include fallen angels, bonds whose maturity falls below the usual one-year threshold, and smaller bonds that no longer meet the minimum liquidity requirement. Based on the evidence documented above, this is likely to detract from index performance.

A corporate bond investor who is not fettered by the same constraints might therefore expect to beat the IG index with a buy-and-hold policy. Ng and Phelps (2011) quantify this by considering investors in the Barclays (now Bloomberg) US Corporate IG index from 1990–2009. They show they could have beaten the index by 0.38% per year simply by holding on to all the bonds that were initially constituents of the index, rather than following the index selling rules relating to fallen angels, remaining maturity and liquidity. They show this was not at the cost of higher risk.

The other way in which active investors can expect to beat their index benchmark is by taking on more credit risk than the benchmark through their active positions. This probably explains much of the reported outperformance of active corporate bond funds. However, higher returns from this strategy do come at the cost of higher risk, and on a risk-adjusted basis, performance may well be neutral.

Summary and concluding remarks

Corporate bonds are a major asset class with an outstanding value of some USD 44 trillion, almost half that of the value of global equities and almost two-thirds that of sovereign bonds. They are an important source of finance for companies.

Corporate bonds trade on higher yields than equivalent government bonds. However, because of losses from default, the yield spread is not a measure of the extra return investors can expect. The average US default rate since 1865 has been 1.5%. However, in almost all cases of default, there is some recovery of value. What matters, therefore, is the loss rate, which over the last 40 years has been around 1%. For HY bonds it was 2.7% while for IG bonds, it was just 0.2%.

Based on long-run evidence from 1900 for the US and 1860 for the UK, we have seen that IG corporate bonds have offered a significant credit risk premium over equivalent government bonds of around one percentage point. The premium from high-yield (or junk) bonds is some two percentage points higher than this. We also review long-run evidence since 1815 which shows that risky sovereign bonds are also subject to credit risk. They have enjoyed a long-run credit premium even higher than that on HY corporate bonds.

We review the evidence on whether the credit risk premium is distinct from the equity risk premium and the bond maturity premium. The conclusion is that corporate bonds are very much a separate asset class and cannot be replicated by a combination of government bonds and equities.

The evidence on corporate bond factors suggests that historically, several factors have helped explain corporate bond returns, including illiquidity, low risk, momentum, carry and value. The key issue is whether they will continue to do so in future. Corporate bond factor research is fairly new, with only a few studies spanning more than the last 20 or so years. Many studies have also been plagued with problems of data errors and replicability.

For passive investors, tracking a corporate bond index may not be the best policy. There is an underperformance gap between the returns from corporate bond indices and the yield spread less default losses. We have seen that this gap arises from the forced selling dictated by strict index rules. Investors who are not subject to the same constraints might expect to beat the index simply by buying and holding the index constituents.

The Yearbook: Past coverage

This extract from the UBS Global Investment Returns Yearbook 2024 reproduces the whole of Chapter 10 on The Yearbook: Past coverage

2024 marks the Yearbook's Silver Jubilee – it was first published at the start of 2000 under its then-title, *The Millennium Book*. Since then, we have built up a large body of long-run research on financial markets which has been published in successive focus chapters and elsewhere. We provide here a summary of this research plus references on how it can be accessed.

History

Our annual publication on long-term investment returns started out as *The Millennium Book.* Its publication in early 2000 coincided with the worldwide celebrations for the new millennium.

Previously, we had researched long-term investment returns in the UK, making comparisons with the US. By New Year 2000, we were able to assemble an annual dataset of stock, bond and bill returns covering 10 different countries and spanning 100 years. With 1,000 country-years of data, the book's 'millennial' title was descriptive of the new global dataset.

In 2001, Millenium Book II was born – an expanded volume that covered 15 markets. This was followed by a more substantial book published by Princeton University Press at the start of 2002 covering 16 markets. We entitled it *Triumph of the Optimists: 101 Years of Global Investment Returns*. The book reported on the large equity premium earned over the course of the 20th century – the optimists had triumphed. It warned that future equity returns were likely to be lower than those achieved in recent decades.

Initial focus

In our early work, a major motivation was to document long-run investor experience across countries, regions and over time from the end of the nineteenth century to the beginning of the twenty-first. Crucially, we analyzed total returns, including reinvested income. We showed that some historical indices overstated long-term performance because they were contaminated by survivorship bias and that long-term stock returns are in most countries seriously overestimated due to a focus on periods that with hindsight are known to have been successful.

In 2002, we re-titled our annual update of long-run returns *The Global Investment Returns Yearbook*. It extended our earlier research, and in this and subsequent Yearbooks we continued to analyze a variety of issues of relevance to investors that could be illuminated by an analysis of long-term stock market returns.

In this, the twenty-fifth Global Investment Returns Yearbook, we highlight research carried out in earlier years, emphasizing some of the special features that have played an important part since Credit Suisse – and now UBS – took over the Yearbook in 2009.

Looking to the long term

After the 2007–08 Global Financial Crisis (GFC), we published two new chapters in the 2009 Yearbook (Dimson, Marsh and Staunton (2009, 2009a). At that time, the GFC had shaken investors' confidence. We presented updated evidence on long-run returns and argued that stocks still offered superior long-term returns despite their volatility, and that investors should keep faith with stocks. However, we stressed that they should not harbor fantasies of an immediate return to either previous market levels or to previous high rates of return.

We showed how to derive long-run expectations for the returns on different asset classes, and how to estimate how long it might take for equity markets to recover to previous highs. For making projections, we showed how to combine contemporary market rates such as the real interest rate or bond yields with risk premiums derived from historical evidence. In an era of volatile markets and challenges to capital preservation, we explained how forward-looking investment plans can benefit from a deep knowledge of historical asset class returns.

Five years after the onset of the GFC, once interest rates had declined to historically lower levels, we were among the first to write in the Yearbook about investment strategy in the new, low-return world (Dimson, Marsh and Staunton (2013)). We reported evidence of a strong association between low real interest rates and low subsequent equity returns. We estimated that the prospective real return on world equities had by then fallen to around 3%–3½% per annum.

The projections we made for asset returns over the following 20–30 years contrasted sharply with some of the forecasts then being made by asset managers, retail financial product providers, pension funds, endowments, regulators, and governments. We cautioned that overly optimistic estimates of future returns are dangerous, not only because they mislead but also because they can mask the need for remedial action. Our latest assessments of long-term returns may be found in Chapter 6 of this current Yearbook, which now incorporates returns from 90 national markets into the 124-year history of the World index.

Interest rate cycles

In 2016 we looked at time-varying expected returns (Dimson, Marsh and Staunton (2016a)). We used over a century of daily returns for the US and 85 years of UK data to examine the immediate effect of interest rate increases (and decreases) on stock and bond markets. The announcement effects were in the predicted direction but quite small, indicating that markets are efficient in anticipating rate changes and their impact.

We also conducted a coarser analysis based on annual data, extended to 21 countries over the period from 1900 onward. Real equity and bond returns both tended to be higher in the year following rate falls than in the year after rate rises. This relationship also held for subsequent periods longer than a year.

This raised an obvious question: how do different asset classes perform over hiking and easing cycles? To research this, we evaluated a trading strategy that, in principle, could have been implemented in real time (Dimson, Marsh and Staunton (2016)).

First, we looked at the performance of equities, bonds, bills and currencies and the corresponding equity and maturity premia. Our updated analysis is reported in Chapter 3 of this current Yearbook. We then examined performance within the equity market, analyzing factor returns, including industries, as well as the returns from size, value, and momentum. Finally, we examined the returns on real assets (including precious metals such as gold and silver), collectibles (including art, stamps, and wine), and real estate (including housing and farmland). We found consistent differences between returns during hiking and easing cycles. Returns and premiums were generally appreciably higher during easing cycles.

Mean reversion

It is often argued that the risk of equities declines when the investment horizon is long, because equity returns are said to revert to the mean. Such mean reversion would not only reduce risk but could provide timing signals that allow investors to boost returns. In 2013 we wrote about mean reversion (Dimson, Marsh and Staunton (2013a)).

We concluded that the popular evidence for mean reversion is an "optical illusion" that employs hindsight. We used the Yearbook's global dataset to analyze the evidence on return predictability in the absence of any look-ahead bias. We examined the profitability of buying shares when the cyclically adjusted price/earnings (CAPE) or cyclically adjusted price/dividend ratio (CAPD) looks cheap based solely on preceding data. We found that the evidence on mean reversion is weak. Market-timing strategies based on mean reversion typically gave lower, not higher, returns.

As we have found in other areas of our research, if investors are willing to accept some increase in risk, there are signals that can be used to identify when markets offer a larger or smaller reward. However, there is insufficient predictability to make equity investing "safe" over any horizon.

Dividend yield

Starting with *Triumph of the Optimists* and an early Yearbook chapter called 'The Quest for Yield' (Dimson, Marsh and Staunton (2011)), we started quantifying the contributions to long-term returns of income, growth, and price/dividend multiple expansion. We documented the overwhelming and worldwide importance of dividends to the long-term real returns on common stocks. We examined long-term returns in common currency and reported that, over the entire period starting in 1900, there was a striking outperformance of higher yielding stock markets relative to their low yielding counterparts. We showed that this cross-country pattern persisted in successive periods of a quarter-century.

Currencies

In 2012 we studied currencies over the long haul (Dimson, Marsh and Staunton (2012)). We found that equities perform best after periods of currency weakness, which suggests that more unhedged cross-border stock exposure can be desirable at those times. In contrast to equities, cross-border bond investment can add to portfolio risk primarily through currency exposure. Short-term currency hedging is therefore found to be particularly meaningful in bond portfolios.

However, hedging benefits are found to fall off with longer investment horizons. We examined whether past currency movements are related to subsequent asset returns and found that equities performed best after currency weakness. The same was true for bonds over several decades. Our analysis provided some comfort to "buy-on-weakness" investors and offered no support for "stick-to-strong-currency" strategies.

The Yearbook provides compelling evidence that, over the long haul, exchange rates reflect relative inflation rates. For longer-term investors, the risk reduction benefits of hedging rapidly decline. This is because currencies tend to converge towards reflecting relative inflation rates. It is also because hedging introduces a new form of risk, namely, a bet on real interest rates at home versus abroad. We also looked at whether currencies are predictable. While, over the long run, currencies do tend to converge to PPP, this is of limited usefulness for short-term predictions.

Factor investing

The 2017 Yearbook focused on factor investing (Dimson, Marsh and Staunton (2017)). We discussed five approaches that were widely cited as contributors to long-term returns: size, value, yield, momentum and volatility. We assembled evidence

on long-term factor premiums over a period (then) of up to 117 years for the UK, and shorter periods for 22 other markets. We presented out-of-sample evidence on the performance of smart-beta strategies and reported on the attenuation of performance in the post-publication era. A subsequent paper based on the Yearbook chapter was published in the Journal of Portfolio Management and named one of three outstanding articles in the 19th Annual Bernstein Fabozzi/ Jacobs Levy Awards.

Our study of long-term factor returns has since been extended in coverage. We now (in Chapter 7 of this current Yearbook) report the size premium in 34 markets, the value premium in 35 markets, and the momentum premium in 35 markets.

Real estate

In 2012 we wrote about real estate (Dimson, Marsh and Staunton (2012)). We examined the investment performance of commercial real estate using Investment Property Databank indices. Real property returns appear to be hurt less than stocks, bonds or bills by contemporaneous inflation. However, real estate prices can lag traded assets, and a rise in consumer prices was associated with a delayed decline in real property values that exceeded other assets. On balance, and given its relative illiquidity, an appropriate role for commercial property was as a diversifier and as a source of returns, forming part of an investor's core long-term holdings.

For individual investors, the most prevalent exposure to real estate is their own home. We investigated the behavior of house prices in all but one of the (then) 19 Yearbook countries. We also assembled a six-country database of house prices since 1900. House price indexes did appear to keep pace with inflation over the long term.

In 2018, we returned to housing (Dimson, Marsh and Staunton (2018)). Using a database of house prices for 11 countries spanning 1900–2017, we published a global comparison of the long-term investment performance of residential homes. On a population-weighted basis, and extrapolating index coverage to rural as well as city locations, real house prices had appreciated by some 0.4% per year before costs and quality adjustments (–2.1% per year on a quality-adjusted basis). We counselled that investment in private residences should be justified by the consumption benefits this provides and warned against exaggerated expectations of a large risk premium.

Treasure assets/collectibles

Treasure assets are sometimes referred to as investments of passion. They are beautiful and collectible items, though they do not generate income and any financial reward would need to come from capital gains. Collectors point to cultural and artistic investment not only as a pleasurable activity but also as a contribution to financial diversification. However, within the category of passion investments, investors almost invariably hold focused portfolios. The average of their holdings should not be regarded as a desirable allocation for a financial investor.

Long-term data for these emotional assets is hard to assemble not only because reliable historical records are elusive, but also because of heterogeneity in the items that have changed hands. In 2018, in addition to real estate, we focused on assets with long price histories, and with records that are as good as one can access in this asset class. We examined long-run investment performance since 1900 for art, stamps, wine and violins. We also studied assets with shorter (albeit still lengthy) price histories, namely rare books, historic cars and jewelry.

We made return comparisons not only on a pre-tax basis, but also after accounting for the tax payable by wealthy investors over the previous century. Our work supported the view that a moderate allocation to tangible alternative assets is likely appropriate for high-net-worth investors.

Emerging markets

In 2010 and 2014 we wrote about the growth puzzle (Dimson, Marsh and Staunton (2010) and (2014)). We showed that, over the long run, investors had underperformed by investing in markets with high past GDP growth, compared to lower growth markets. We warned against excess enthusiasm for investment in high past growth markets – which were often developing countries.

Relatedly, we also wrote about emerging markets (EMs) (Dimson, Marsh and Staunton (2010a) and (2014a)). In 2019, our special feature highlighted the growing presence of China in benchmarks, the very divergent performances reported by competing equity indices for China, and the underwhelming performance of Chinese equities, despite China's astonishing record of economic growth (Dimson, Marsh and Staunton (2019)).

We reviewed emerging market performance since 1900 and showed that emerging markets had underperformed developed markets (DMs), but found this was mostly due to very poor performance during the 1940s. We noted that

even though global markets are more connected, the gains from spreading assets across DMs and EMs are still substantial. The typical DM investor can reduce risk by holding EMs, and the typical EM investor can also benefit from investing abroad.

In 2021, we returned to the emerging markets theme, presenting a substantial extension of our DMS dataset (Dimson, Marsh and Staunton (2021)). Nine emerging markets were added, seven from Asia and two from Latin America, each providing at least 50 years of investment performance. We also introduced historical data for a further 58 countries with shorter histories. We documented factor investing and rotation strategies in the emerging world. Notably, the value effect has been strong both within EMs and also as a basis for rotation between markets.

Responsible investing

Responsible investing was a special theme in the 2015 Yearbook (Dimson, Marsh and Staunton (2015a)). Asset managers were coming under pressure to demonstrate responsible investment behavior. This could take the form of "exit" via ethical screening, or "voice" through engagement and intervention. We demonstrated that "sin" can pay, not least because those choosing to exit from stocks they view as offensive can cause them to offer higher returns to those less troubled by ethical considerations. We reported superior long-run returns from tobacco and alcohol stocks in both the US and the UK.

When we revisited the environmental, social and governance (ESG) topic in 2020 (Dimson, Marsh and Staunton (2020)), we focused on the question of whether responsible investing can enhance returns, or whether ethical commitments involve making a sacrifice. We concluded that, despite claims to the contrary, there was no reliable evidence that ESG screening enhances returns or reduces risk. This remained true whether we looked at the performance of companies based on their ratings or at ESG funds or indexes.

For ESG investment strategies based on exclusions, we concluded that theory and evidence suggested that a small return and diversification sacrifice was involved, but the magnitude of this was unlikely to be material. In other words, the price for ethical principles appeared small.

We did, however, provide evidence that corporate engagement can pay, whether the focus is on environmental and social issues or on corporate governance. We presented research that finds engagement is more likely to pay off when action is coordinated with likeminded activists.

Our 2020 article reported that there was a remarkable divergence between the ESG scores given to a particular stock by different rating agencies. We were the first to publish evidence on this, and a paper based on our Yearbook research was published in 2020 in the Journal of Portfolio Management and awarded first prize in the prestigious 22nd Annual Bernstein Fabozzi/Jacobs Levy Awards. Our observations have now been confirmed and replicated in subsequent studies conducted by leading empirical researchers.

Industry analysis

In an international comparison, we estimated the concentration of industries by country, and the concentration of countries by industry (Dimson, Marsh and Staunton (2015)). In 35 out of 40 worldwide industries, two countries accounted for a majority of the industry's global capitalisation. In 33 out of 47 countries, the weighting of three large industries accounted for a majority of the country's market capitalisation. We also examined the relative importance of industries versus countries in determining equity performance. We found that since 2003, industries and countries have been roughly equally important.

We also examined the rise and fall of industries over time in the US and UK, compiling long-term stock market indices from 1900 onward. Successive waves of new industries, technologies and companies have transformed the world. We therefore addressed the question of whether it was better to invest in new or old industries. We found that, historically, there had been some tendency to overvalue new industries and technologies and undervalue the old. We showed that an industry value rotation strategy that leaned against this historically would have generated superior returns. However, an industry momentum approach was an even more effective strategy.

We noted that new industries are typically born on a wave of IPO activity and provided evidence on the poor post-IPO performance of stocks around the world. Clearly, investors need to be especially cautious about the valuations of IPOs. We also examined the performance of stocks based on their degree of seasoning – the length of time they had been listed since their IPO. We found that over our 35-year research period, terminal wealth was almost three times higher from investing in the most, rather than the least seasoned stocks. At the stock level, "old" clearly beat "new".

Global diversification

In our 2022 Yearbook feature (Dimson, Marsh and Staunton (2022)), we focused on portfolio diversification. Investors can easily be misled by claims that only 10 to 20 stocks are needed for a diversified portfolio. We showed that far more are required for effective diversification, especially for a global investor.

Moving to international diversification, we found that over the last 50 years, for investors in most countries, investing globally led to higher Sharpe ratios than domestic investment. While there were few exceptions, one of these was the world's largest financial market, the US, where investors would have been better off remaining in domestic stocks. Prospectively, our advice to investors from all countries, including the US, is that they should invest globally. This is likely (but not guaranteed) to reduce risk and increase Sharpe ratios.

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 would not place reliance on this negative correlation continuing. The stock-bond correlation tends to be negative during crises. This makes government bonds valuable diversifiers that can enhance the power of portfolio diversification when it is needed most.

Commodities and inflation

In 2011 we studied the impact of inflation on national stock market returns (Dimson, Marsh and Staunton (2011a)). If countries are classified by the inflation that will characterize the country over the following year, a strategy of rotating wealth in favor of low-inflation markets provides superior real returns. However, at the New Year we do not know what the inflation rate is going to be over the next twelve months. Instead, we can classify markets by their inflation over the prior year. We found that a strategy of investing in countries with high past inflation performed best. Investing in troubled markets was riskier but over the long term it was more rewarding.

In our 2023 special feature we examined the role commodities can play in investors' asset allocations from an inflation hedging and diversification perspective (Dimson, Marsh and Staunton (2023)). The backdrop of a more inflationary environment made this highly topical. Since rising commodity prices, including energy prices, were important contributors to the recent bout of inflation, we investigated whether investing in commodities offers an effective hedge.

Individual commodities have, on average, generated low long-run returns. However, portfolios of futures have provided attractive risk-adjusted long-run returns, albeit with some large, lengthy drawdowns. Based on historical returns, we concluded that a balanced portfolio of collateralized commodity futures is likely to provide an annualized long-run future risk premium of around 3%. We cautioned, however, that there was a limit to exploiting this otherwise attractive asset class in that the investable market size was quite small.

Historically, commodities have had a low correlation with equities and a negative correlation with bonds, making them effective diversifiers. They have also provided a hedge against inflation. Indeed, commodities are unique in this respect, compared with the other major asset classes. However, their inflation-hedging properties also mean that in extended periods of disinflation they tend to underperform.

Summary

In its first quarter-century, the Global Investment Returns Yearbook has become established as the go-to research resource for long-term investment strategy. The underlying data is used by consultants, advisors, regulators, wealth managers and institutions, and this has added to the impact of our project. We look forward to new opportunities to address contemporary issues through the lens of financial history.

Selected individual markets

The following four pages are extracted from Chapter 11 of the UBS Global Investment Returns Yearbook 2024.

The UBS Global Investment Returns Yearbook covers 35 markets and five composite indexes, i.e. the world, the world ex-US, Europe, developed markets and emerging markets. Twenty-three of the countries and all five composite indexes start in 1900. The other 12 markets start later but have substantial histories. In Chapter 11 of the full Yearbook, each country and index has three pages of descriptive data, charts, tables and statistics. We show here only the initial page for a small selection of three countries and one composite index.

Japan

Futures have a long history in financial markets and, by 1730, Osaka had 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.

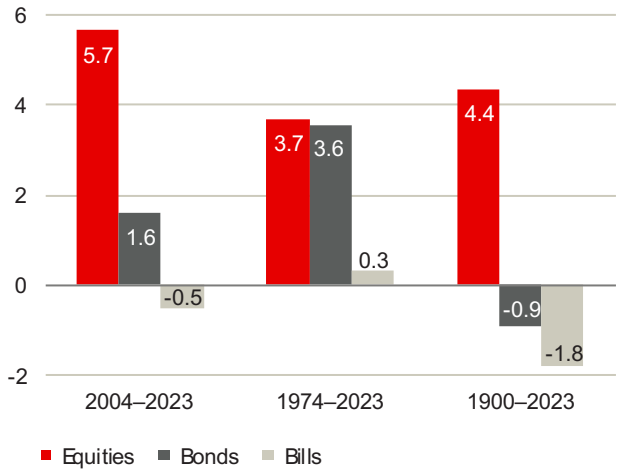
From 1949 to 1959, Japan's "economic miracle" began and equities gave a real return of 1,565% over this period. With one or two setbacks, equities kept rising for another 30 years. By the start of the 1990s, the Japanese equity market was the largest in the world, with a 45% weighting in the world index compared to 29% for the US. 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 2023, Japan was the worst-performing stock market of all the DMS 23 countries. Japan suffered a prolonged period of stagnation, banking crises and deflation. At the start of 2024, its capital value remains below that attained by the end of the 1980s. Its weighting in the world index fell from 41% to 6%.

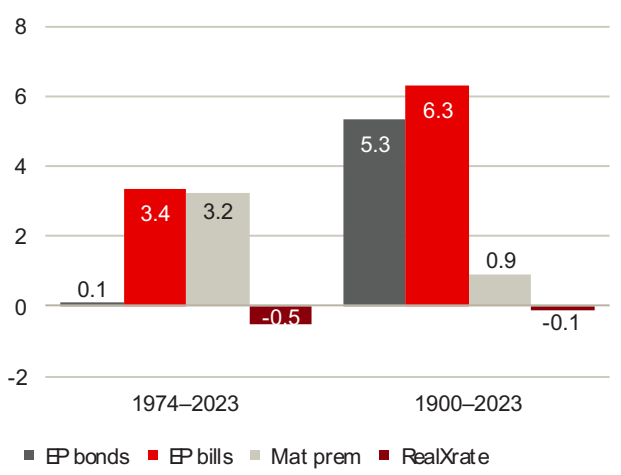
Despite the fallout after the asset bubble burst, Japan remains a major economic power. It has the world's second-largest equity market and its third-biggest bond market. It is a world leader in technology, automobiles, electronics, machinery and robotics, and this is reflected in the composition of 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 (3%).

The FutureBrand Index ranks Japan as the world's number one country brand.

Figure 121: Annualized real returns and risk premiums (%) for Japan, 1900–2023



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 2024. Not to be reproduced without express written permission from the authors.

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 seventh-largest equity market, accounting for 2.4% of total world value. Since 1900, Swiss equities have achieved a real return of 4.5% (equal to the median across our countries).

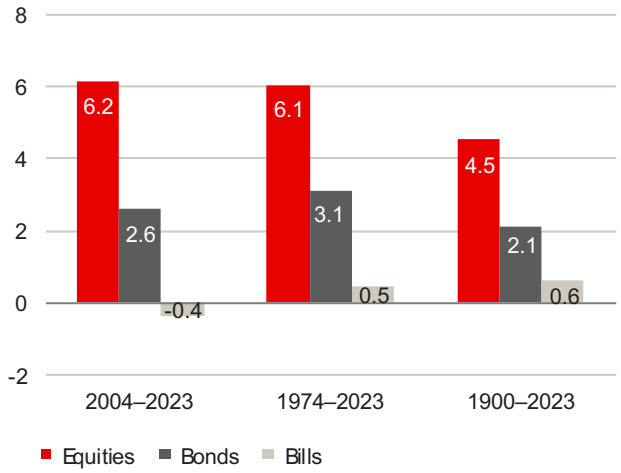
Meanwhile, Switzerland has been the world's best-performing government bond market, with an annualized real USD return of 2.8% (it ranks second in real local currency return terms, with an annualized return since 1900 of 2.1%). Switzerland has also had the world's lowest 124-year inflation rate of just 2.1% and the world's strongest currency.

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.

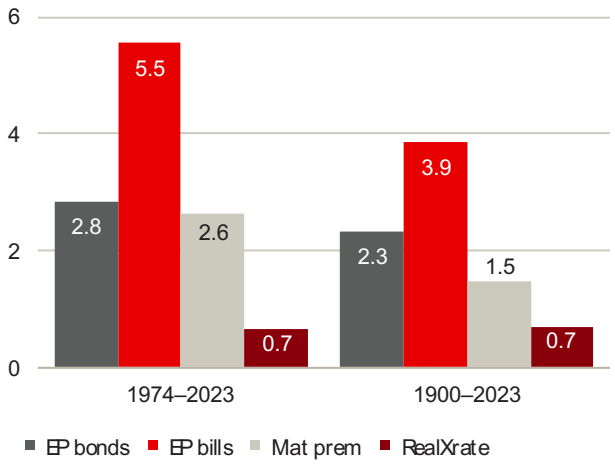
A large proportion of all cross-border private assets invested worldwide are still managed in Switzerland.

Switzerland's Health Care industry accounts for over a third (34%) of the value of the FTSE World Switzerland Index. Nestle (19%), Roche and Novartis (each 13%) together account for close to half of the index's value.

Figure 147: Annualized real returns and risk premiums (%) for Switzerland, 1900–2023



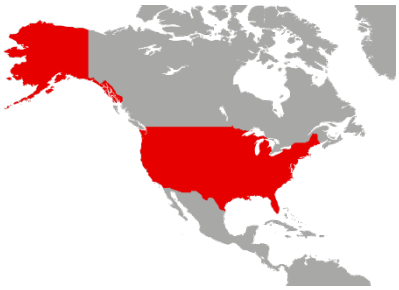
Note: The three asset classes are equities, long-term government bonds, and Treasury bills. All returns include reinvested income, are adjusted for inflation, and are expressed as geometric mean returns.



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 2024. Not to be reproduced without express written permission from the authors.

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.

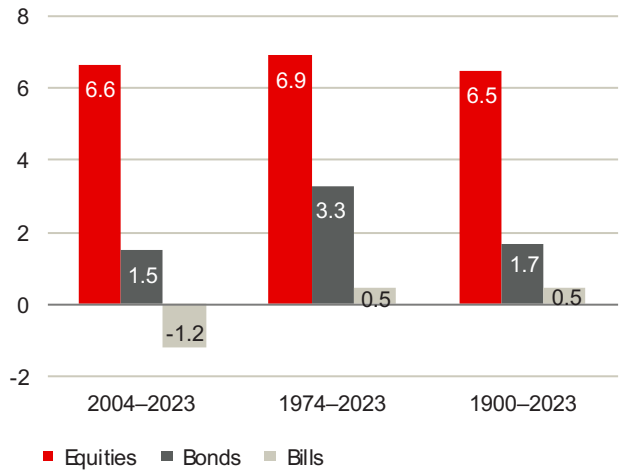
The US is also a financial superpower. It has the world's largest economy, and the dollar is the world's reserve currency. Its stock market accounts for 60.5% of total world value (on a free-float, investible basis), which is almost ten times as large as Japan, its closest rival. The US also has the 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 generated an annualized real return of 6.5%, the highest common-currency return for a Yearbook country.

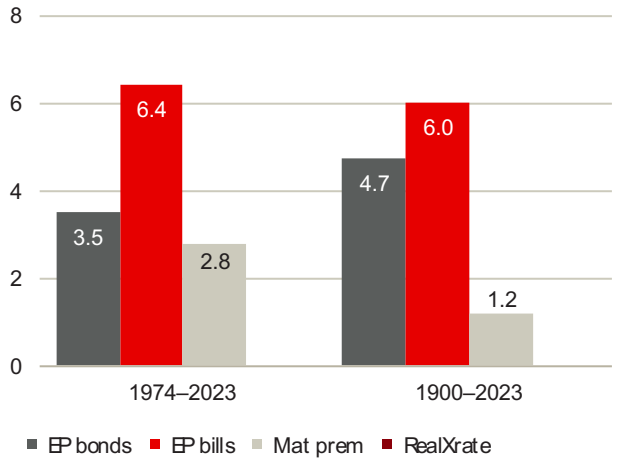
There is an obvious danger in placing too much reliance on the impressive long-run past performance of US stocks. The New York Stock Exchange traces its origins back to 1792. At that time, the Dutch and UK stock markets were already nearly 200 and 100 years old, respectively. Thus, in just a little over 200 years, the US has gone from zero to a 60.5% 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 US itself. That is why this Yearbook focuses on global investment returns, rather than just US returns.

Figure 155: Annualized real returns and risk premiums (%) for the US, 1900–2023



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 2024. Not to be reproduced without express written permission from the authors.

World ex US

In addition to the World indexes, we also construct World indexes that exclude the US, using exactly the same principles. Although we are excluding just one country, the US today accounts for 60.5% of the total stock market capitalization of the 90 countries included in the DMS World equity index. Our 89-country, World ex-US equity index thus represents just 39.5% 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.

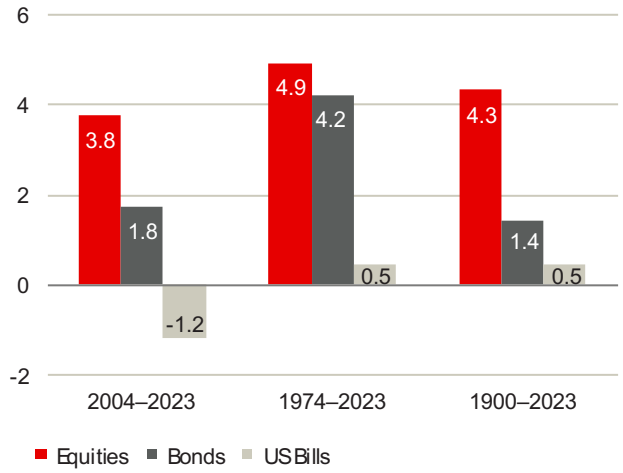
We noted in Chapter 1 that, until relatively recently, most of the long-run evidence cited on historical asset returns drew almost exclusively on the US experience. We argued that focusing on such a successful economy can lead to "success" bias. Investors can gain a misleading view of equity returns elsewhere or of future equity returns for the US 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-US equity index was 4.3% per year, which is 2.2% per year below that for the US.

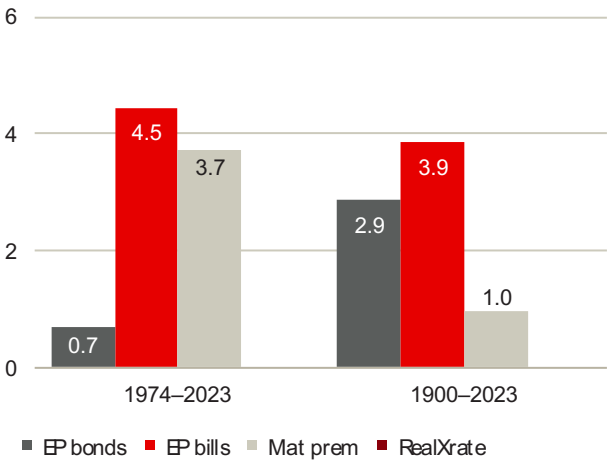
This differential of 2.1% per annum leads to very large differences in terminal wealth when compounded over 124 years. A US-based investor who invested solely in their domestic market would have enjoyed a terminal wealth more than twelve times greater than from investing in the rest of the world, excluding 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-US thus stresses the importance of looking at global returns, rather than focusing on, and generalizing from, the US.

Figure 159: Annualized real USD returns and risk premiums (%) for the World ex-US, 1900–2023



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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