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Credit Suisse Global Investment Returns Yearbook 2018

Elroy Dimson, Paul Marsh, Mike Staunton
Summary Edition

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This publication is a summary version of the full Credit Suisse Global Investment Returns Yearbook 2018, containing extracts from the full report, which is available in hardcopy only. For guidance on how to obtain the full report or gain access to the underlying data, see page 41.

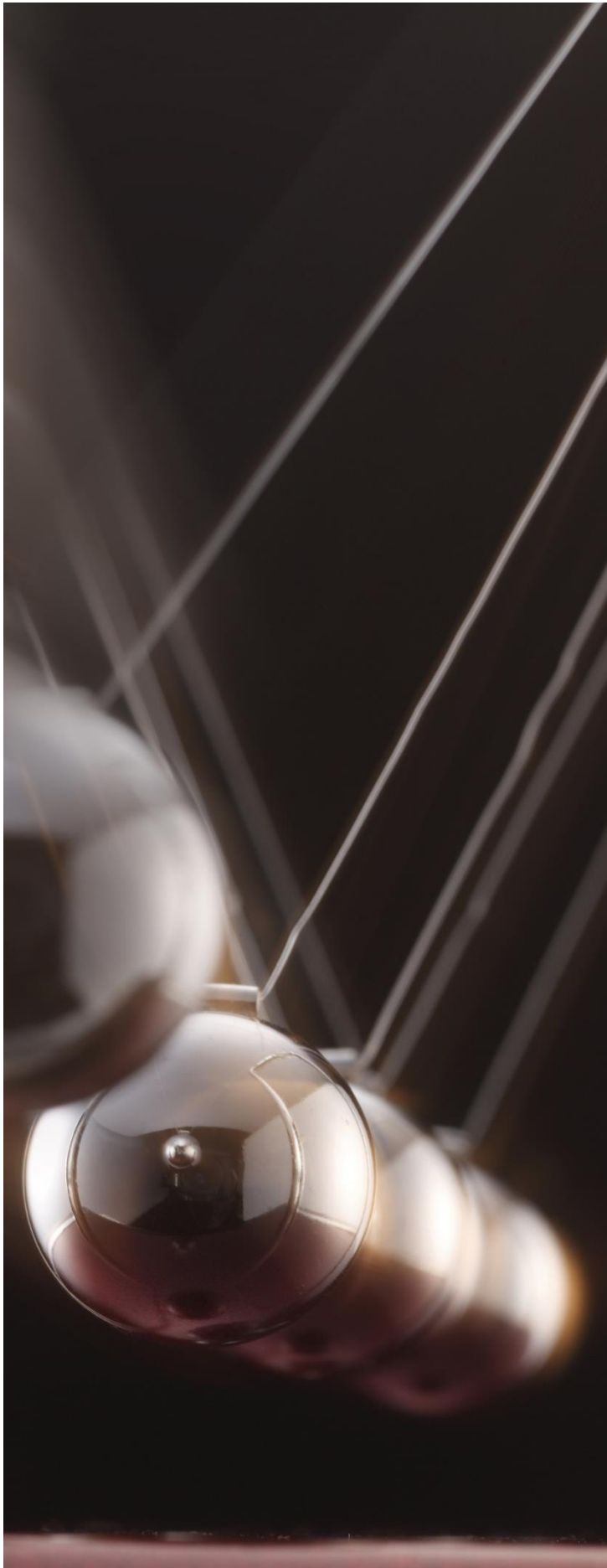
We provide summary highlights from the full hardcopy report. The Yearbook itself contains four deep-dive chapters of analysis leveraging this unique dataset. The first chapter describes the coverage of the DMS database, the industrial transformation that has taken place since 1900, explains why a long-run perspective is important, and summarizes the long-run returns on stocks, bonds, bills, inflation and currencies over the last 118 years.

The second chapter deals with risk and risk premiums. It documents historical risk premiums around the world, discusses how these vary over time, and provides long-run predictions.

The third chapter focuses on factor investing: size, value, income, momentum, volatility and other smart-beta factors.

The fourth chapter presents the financial returns since 1900 of tangible assets such as housing and collectibles.

The fifth chapter of the full hardcopy version presents detailed historical analysis of the performance of 23 countries and three regions.



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**THE CREDIT SUISSE GLOBAL INVESTMENT
RETURNS YEARBOOK 2018**

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See page 41 for copyright and acknowledgement instructions, guidance on how to gain access to the underlying data, and for more extensive contact details.

Preface

The Credit Suisse Research Institute is proud to publish the 2018 edition of the Global Investment Returns Yearbook. The Yearbook is produced by Elroy Dimson, Paul Marsh and Mike Staunton of London Business School, recognized as the leading authorities on the analysis of the long-run performance and trends of stocks, bonds, Treasury bills (cash), inflation and currencies. With its 118 years of financial history, this annual study remains not only the most comprehensive of sources for the analysis of historic investment returns, but also a lens through which to gain perspective on the here and now. This is of heightened relevance as we begin 2018 with volatility returning to markets and investors re-examining the factors that have driven markets in the post financial crisis world. This publication is a summary version of the full Credit Suisse Global Investment Returns Yearbook 2018.

2018 Global Investment Returns Yearbook

The backdrop for the 2018 Yearbook has been a sustained period of high real returns on equities with real bond yields remaining at historic low levels across many regions. The year 2017 specifically saw equities reward investors with a return of 24% on the world equity index with handsome gains in both developed and emerging markets. Indeed, the entire period since the Global Financial Crisis has seen high returns from almost all assets except cash. At the same time, the Yearbook reminds us how subdued volatility has been through this period, with the Chicago Board Options Exchange (CBOE) Volatility Index (VIX) hitting an all-time low in November.

As we entered 2018, a key debate was to be had as to whether these high returns, high historic valuations and low volatility could persist. At the time of writing, the relevance of this has been thrown into stark focus by the swift reversal in equity markets and a re-emergence of long forgotten volatility in these early months of the year. A severe question mark specifically hangs over the low inflation thesis that has underpinned bond markets and the long bull market they have enjoyed.

The immense value of the Yearbook is that it helps separate fact from fiction as investors and commentators wrestle with such issues. Many suggest real interest rates and risk premia need to "normalize". The problem is what is normal when you genuinely look at the record books? Do equities genuinely represent the inflation hedge that is presented as a truism by many market participants?

Of great topical relevance at present, the Yearbook notably documents and analyzes volatility since 1900. It shows that episodes of volatility akin to those we are witnessing are hard to predict, tend to revert rapidly back to "normal" volatility, and have

little predictive ability for future market returns which challenges the views offered by some of late.

Importantly, the study also helps put such concerns into perspective. Its 118 years of history spans numerous corrections, crashes, and severe bear markets. Many of these appear as mere blips in what, at least with hindsight, has been a long secular rise in equities.

Back to the future

The authors of the Yearbook continue to argue that we live in a world of lower expected returns, a view not inconsistent with that of Credit Suisse's strategists, and a natural consequence of the prevailing low real interest rate world. Underlining this point, the study documents the long-run history of real interest rates in 23 countries since 1900, showing that when real rates are low, as they are today, future returns on equities and bonds actually tend to be lower rather than the higher returns we have been experiencing in the recent past.

The authors also present analysis showing that the future equity premium is also likely to be somewhat lower than over the last 118 years. While believing that equities continue to offer the highest expected returns, they expect an annualized equity premium relative to cash of around 3½% consistent with the view they have held throughout this millennium.

The Yearbook documents the extraordinary 18-year history of the 21st century to date, with two savage bear markets, followed by strong recoveries. Since the end of 1999, the equity premium on global equities has been 3.4%. While many investors regard this as disappointing, it is only marginally below the Yearbook's long-run prediction. If this is the "new normal", the authors still point out that an equity premium of 3½% would see equities doubling relative to cash over 20 years.

Is "Factor Investing" the answer in a low-return world?

The [2018 Yearbook](#) also continues to document long-run factor returns around the world. Factor investing and smart beta strategies continue to be in vogue, with factor based funds hitting the USD 1 trillion milestone in 2017. Do such strategies provide a way to escape the constraints imposed on returns in a low real interest rate world? The [Yearbook](#) shows that there is long-run evidence, spanning many countries, for the existence of factor premiums.

Equally, however, it shows how volatile factor returns can be on a year-to-year basis, and how factor premiums can remain negative for extended periods. This year, the authors look particularly at the value factor, which has suffered a "lost decade". Value investors are obviously hoping for some respite here. However, as seductive as the long-term charts are that support a value bias to stock selection, sadly, the [Yearbook](#) shows that it is hard to predict or time when value will return to favor in any systematic fashion.

There's more to wealth than financial assets

Switching from short-term volatility to ultra-long-term investment horizons, the [Yearbook](#) examines a new topic in 2018. High net worth investors possess more assets than just financial securities. In addition to their marketable assets, they own houses, land, artworks and artefacts, and they are often passionate collectors. They buy fine wine, classic cars, musical instruments, rare books, jewelry, collectible stamps, gold, silver, gemstones and other treasure assets. These private wealth assets offer the prospect of financial gain as well as personal enjoyment.

In the [2018 Yearbook](#), Professors Dimson, Marsh and Staunton present the broadest study ever published on the long-term rewards from private-wealth assets. They document the price appreciation since 1900 from a wide variety of private-wealth investments and compare them to the returns from financial assets. Many private assets have beaten inflation and in a period of low expected financial returns, they offer an emotional dividend that can be attractive to investors.

The Credit Suisse Research Institute and the Yearbook Project

The [2018 Yearbook](#) is published by the Credit Suisse Research Institute with the aim of delivering the insights of world-class experts to complement the research of our own investment analysts. It marks the tenth collaboration with Elroy Dimson, Paul Marsh and Mike Staunton. For previous editions and articles, or other studies published by the Research Institute, please contact your Credit Suisse sales representative, relationship manager or visit www.credit-suisse.com/researchinstitute.

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Chapter 1: Long-run asset returns

In this chapter, we describe the coverage of our long-run global returns database, which now covers stocks, bonds, bills, inflation, currencies and Gross Domestic Product in 23 countries and three regions over the 118 years since 1900. We outline the industrial transformation that has taken place since our start date of 1900 (“emerging industries”) and the parallel transformation in markets as countries have moved from emerging to developed status (“emerging markets”). We then summarize the long-run returns on stocks, bonds, bills, inflation and currencies over the last 118 years.

The core of the [Credit Suisse Global Investment Returns Yearbook](#) is a long-run study covering 118 years of investment returns since 1900 in all the main asset categories in 23 countries and three regions, including the world. The unrivalled quality and breadth of its underlying DMS database (Dimson, Marsh, and Staunton, 2018), makes the [Yearbook](#) the global authority on the long-run performance of stocks, bonds, bills, inflation and currencies. The [Yearbook](#) extends and brings up to date the key findings from our book [Triumph of the Optimists](#).

The first chapter outlines the industrial transformation that has taken place since 1900 (“emerging industries”), and the parallel transformation in markets as countries moved from emerging to developed status (“emerging markets”). We explain why a long-run perspective is important, and summarize the long-run returns on stocks, bonds, bills, inflation and currencies over the last 118 years.

The second chapter deals with risk and risk premiums. We document the historical risk premiums around the world, discuss how these vary over time, and provide long-run predictions.

The third chapter focuses on factor investing: size, value, income, momentum, volatility and other factors. We emphasize the difference between factor effects, for example, the tendency of small-caps to perform differently from large-caps, and factor premiums, for example, the tendency for small-caps to outperform large-caps. We outline the theories put forward to explain factor premiums, and discuss whether they are likely to persist.

[Chapter 4](#) is a special feature for 2018, and presents the long-run returns from private wealth assets, such as housing, gold and precious metals, and collectibles, including art, wine, stamps, musical instruments and classic cars. Finally, [Chapter 5](#) presents detailed historical analysis of the performance of each of our 23 countries and three regions.

Yearbook coverage

The global database that underpins the [Yearbook](#) contains annual returns on stocks, bonds, bills, inflation, and currencies for 23 countries from 1900 to 2016. The countries comprise the United States and Canada, ten countries from what is now the euro currency area (Austria, Belgium, Finland, France, Germany, Ireland, Italy, the Netherlands, Portugal, and Spain), six non-Eurozone markets in Europe (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). Together, at the start of 2018, these countries make up 91% of the investable universe for a global investor, based on free-float market capitalizations.

The DMS database also includes three regional indexes for equities and bonds denominated in a common currency, here taken as US dollars. These are a 23-country World index, a 22-country World ex-USA index and a 16-country Europe index. The equity indexes are weighted by each country's market capitalization, while the bond indexes are weighted by GDP.

All 23 countries 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 118-year history of investment returns, for which we present summary statistics in this and the next chapter, and more detailed information in the country

chapters. For Russia and China, we have returns for the pre-communist era, and then for the period since these markets reopened in the early 1990s. We include these countries in the world and regional indexes, including the total losses, in order to avoid survivorship bias.

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, for example Chinese companies with assets in Hong Kong and Formosa (now Taiwan). Despite this, when incorporating these countries into our world/regional indexes, we assume that shareholders and domestic bondholders in Russia and China suffered total losses in 1917 and 1949, respectively. We then re-include these countries in the index after their markets re-opened in the early 1990s and once reliable market indexes were initiated.

The DMS series all commence in 1900, and this common start date aids international comparisons. Data availability and quality dictated this choice of start date, and for practical purposes, 1900 was the earliest plausible start date for a comparative international database with broad coverage (see Dimson, Marsh, and Staunton, 2007).

Figure 1 shows the relative sizes of world equity markets at our starting date of end-1899 (left panel), and how they had changed by end-2017 (right panel). The right panel shows that the US market dominates its closest rival and today accounts for over 51% of total world equity market value. Japan (8.6%) is in second place, ahead of the UK (6.1%) in third place. France, Germany, China, Canada and Switzerland each represent around 3% of the global market. Australia occupies ninth position with 2.4%.

In Figure 1, nine of the Yearbook countries – all of those accounting for 2% or more of world market capitalization – are shown separately, with 14 smaller markets grouped together as “Smaller Yearbook.” The remaining area of the right-hand pie chart, labelled “Not in Yearbook,” represents countries, comprising 9.3% of world capitalization, for which our data does not go all the way back to 1900. Mostly, they are emerging markets. Note that the right-hand panel of Figure 1 is based on the free-float market capitalizations of the countries in the FTSE All-World index, which spans the investable universe for a global investor. Emerging markets represent a higher proportion of the world total when measured using full-float weights, when investability criteria are relaxed, or if indexes are GDP-weighted (see the 2014 Yearbook).

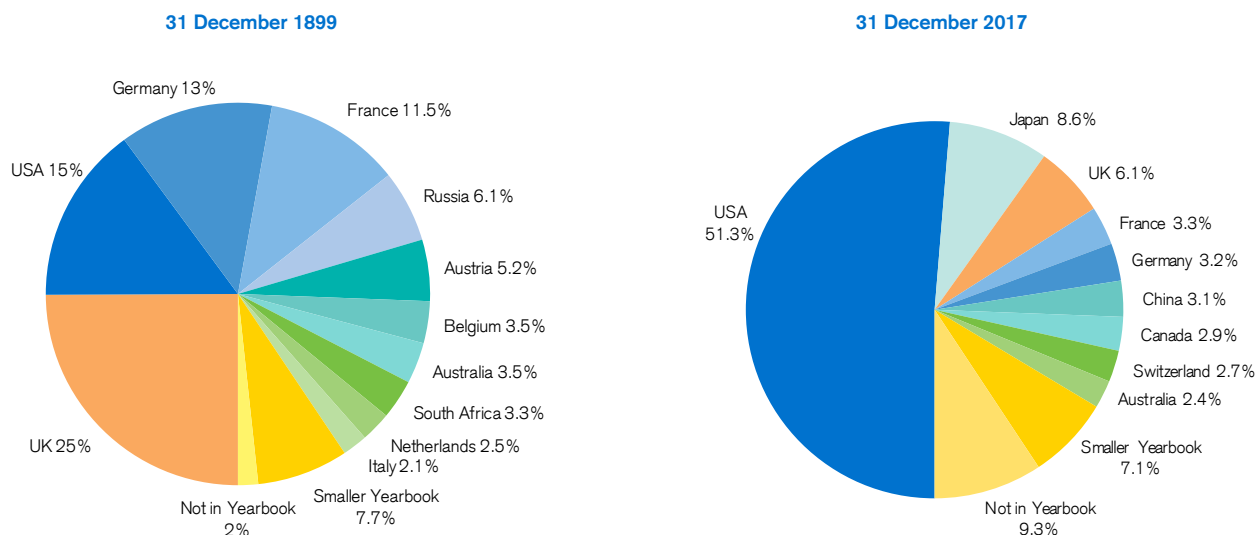
The left panel of Figure 1 shows the equivalent breakdown at the end-1899 start of the DMS database. The chart shows that at the start of the 20th century, the UK equity market was the largest in the world, accounting for a quarter of world capitalization, and dominating even the US market (15%). Germany (13%) ranked in third place, followed by France, Russia, and Austria-Hungary. Non-Yearbook countries are again labelled “Not in Yearbook.”

In total, the DMS database covered almost 98% of the global equity market at the start of our period in 1900. By the end of 2017, our 23 countries still represented some 91% of the investable universe. But the changing fortunes of individual countries raise two important questions.

The first relates to survivorship bias. Investors in some countries were lucky, but others suffered financial disaster or dreadful returns. If countries in the latter group are omitted, there is a danger of overstating worldwide equity returns.

Figure 1

Relative sizes of world stock markets, end-1899 versus end-2017



Source: DMS database, Elroy Dimson, Paul Marsh and Mike Staunton (2018)

Source: FTSE Analytics FTSE All-World Index Series, December 2017

In 2013, we added Russia and China to our database – the two best known cases of markets that failed to survive. China was a small market in 1900 and even in 1949, but Russia accounted for some 6% of world market capitalization at end-1899. Similarly, we also added Austria-Hungary, which had a 5% weighting in the end-1899 world index. While Austria-Hungary was not a total investment disaster, it was the worst-performing equity market and the second worst-performing bond market of our 21 countries with continuous investment histories. Adding Austria, China, and Russia to our database and the world index was important in eliminating non-survivorship and “unsuccess” bias. In 2014, we added another “unsuccessful” market, Portugal, to our dataset.

The second and opposite source of bias, namely success bias, is even more serious. Figure 2 provides insight on this by showing the evolution of global equity market share for key countries over the last 118 years. Early in the 20th century, the US equity market overtook the UK and has since then been the world’s dominant stock market, although at the end of the 1980s Japan was very briefly the world’s largest market. At its peak, at start-1990, Japan accounted for almost 45% of the world index, compared with around 30% for the USA. Subsequently, Japan’s weighting fell to just 8%, reflecting its poor relative stock market performance since then. In contrast, the US has regained its dominance and today comprises 51% of total world capitalization.

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

from zero to 51%. 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 our focus in the *Yearbook* is on global returns.

The emergence of markets

Most of the 23 countries in our dataset are today classified as developed markets. However, back in 1900, several countries that we today regard as developed would then have been classified as emerging. Indeed, if we go back far enough in time, even the USA was an emerging market.

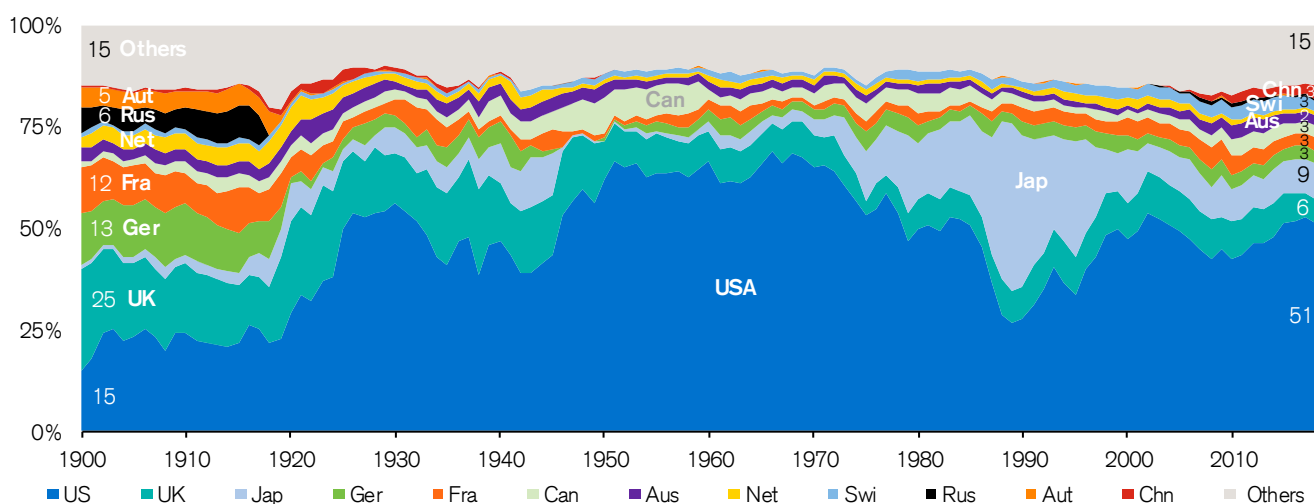
The terms “emerging markets” and “emerging economies” first “emerged” in the early 1980s, and are attributed to World Bank economist Antoine van Agtmael (Agtmael, 2007). Before then, investors mostly used the arguably more accurate term “less developed” – as there is no guarantee that markets will emerge.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

Before we can discuss the “emergence” of markets, we need a way to classify markets as developed or emerging. Today, investors rely on the major index providers for this. They consider multiple factors. MSCI uses 23 variables, FTSE has 13 criteria, and S&P uses ten, with ten more coming into play if a change is indicated. The criteria used typically include economic development, size and liquidity requirements, and market accessibility. Investor and market opinion also matters.

Despite the multiplicity of different criteria, there is strong agreement between index providers on the developed/emerging boundary. Furthermore, in the 2010 *Yearbook*, we pointed out that, despite the complexity of index compilers’ procedures, there

Figure 2

The evolution of equity markets over time from end-1899 to end-2017



Source: Elroy Dimson, Paul Marsh, and Mike Staunton, *Triumph of the Optimists*, Princeton University Press, 2002, and subsequent research

was a simple rule that replicated their decisions very accurately, namely, to categorize countries as developed if they had GDP per capita above USD 25,000.

Given the success of this rule, we apply it to historical data adjusting for US inflation to obtain the equivalent cut-off for earlier years. For the 23 countries in our database in 1900, seven would have been deemed emerging markets: China, Finland, Japan, Portugal, Russia, South Africa, and Spain. Three are still emerging today – 118 years later – namely, China, Russia, and South Africa. Using the GDP per capita rule, we estimate that Finland would have moved to developed in 1932, Japan in 1967, and Spain in 1974, while Portugal would still be emerging today (despite being promoted to developed by the index providers in 1997–98).

Looking at other countries not (yet) covered by our database, Hong Kong moved from emerging to developed in 1977, Singapore in 1980 and Israel in 2010. South Korea, which is on the cusp using our criterion, is now deemed developed by FTSE, but not by MSCI. FTSE plans to promote Poland to developed status in 2018.

Some countries have gone backwards. Chile and Argentina would have been deemed developed markets in 1900, but by the 1950s, Chile had slipped to emerging, while Argentina followed in 1975, and is today a “frontier” market, below emerging market status. Greece was promoted to developed in 2001 but has since been demoted back to emerging.

These moves reflect the shifting fortunes of countries, but it is striking that there have been so few shifts from emerging to developed over 118 years. The outstanding success stories are obvious, but it is easy to forget the problems that have afflicted once highly promising countries such as Argentina, Nigeria, Venezuela, and Zimbabwe.

It is natural to think of emerging markets as growth markets and this raises the question of how

they have performed historically relative to developed markets. The first emerging markets index, the S&P/IFCG Emerging Markets Composite appeared in 1985. MSCI’s index started three years later, with FTSE following in 1994. Clearly, the relative recency of these indexes is unhelpful for investors seeking a longer-term performance record.

To provide a longer-term perspective, we can use our extensive long-run returns database to construct an emerging markets index since 1900, using the GDP per capita rule to classify countries. Our index begins life in 1900 with seven countries. Rather than restricting it to the emerging countries in the DMS database, we add in further markets once returns data becomes available. Thus, in 1955, we add Brazil and India; in 1963, Korea and Hong Kong (until the latter moved to developed in 1977); in 1966, Singapore (until it moved to developed in 1980); in 1970, Malaysia; in 1976, Argentina, Chile, Greece, Mexico, Thailand, and Zimbabwe; and so on. We then link into the MSCI Emerging Markets index from its inception in 1988.

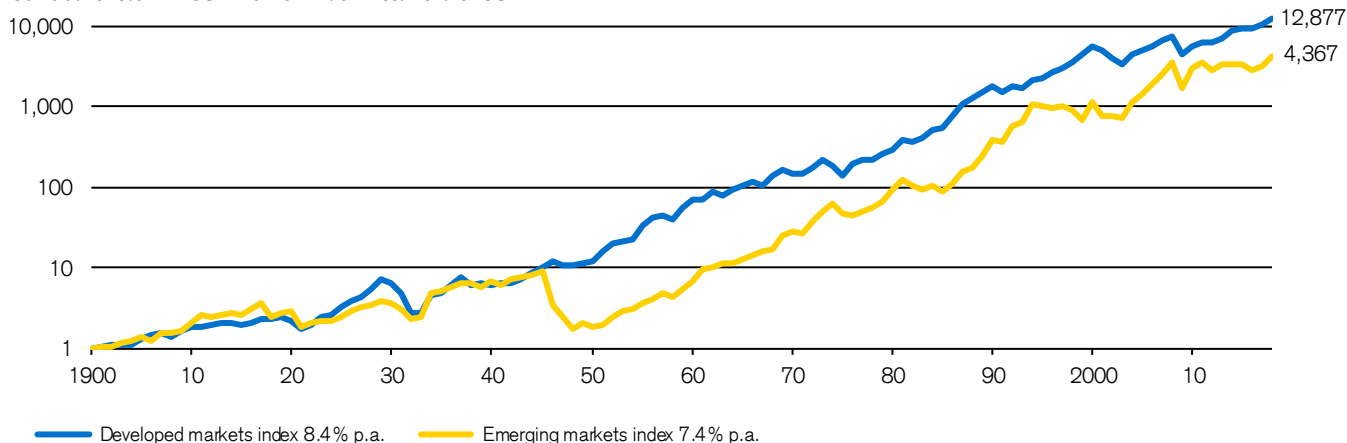
As a comparator, we create a developed markets index, using the same rule. This had 16 constituents in 1900, and was joined by Finland in 1932 and Japan in 1967. We then link into the MSCI Developed World Index when it started in 1970. Our indexes are computed in USD, and include reinvested dividends.

Figure 3 shows the long-run performance of emerging versus developed markets. In the early part of the 20th century, emerging markets outperformed, but were hit badly by the October 1917 Revolution in Russia, when investors in Russian stocks lost everything. During the global bull market of the 1920s, emerging markets underperformed, but they were affected less badly than developed markets by the Wall Street Crash. From the mid-1930s until the mid-1940s, emerging-market equities moved in line with developed markets.

Figure 3

Long-run emerging and developed market returns, 1900–2017

Cumulative return in USD from an initial investment of USD1



Source: Elroy Dimson, Paul Marsh, and Mike Staunton, [Credit Suisse Global Investment Returns Yearbook 2014](#), with subsequent updates

Looking in isolation at the returns over the first decade of the 21st century tells us little about the future expected risk premium from equities. It was simply the case that investors were unlucky and returns were attenuated by two deep bear markets. This was a brutal reminder that the very nature of the risk for which they sought a reward means that events can turn out poorly, even over multiple years.

At the same time, the returns over the previous 20 years also revealed nothing very useful when taken in isolation. These returns must surely have exceeded investors' prior expectations, and thus provided too rosy a picture of the future. The previous 20 years – the 1980s and 1990s – were a golden age. Inflation fell from its highs in the 1970s and early 1980s, which lowered interest rates and bond yields. Profit growth accelerated and world trade and economic growth expanded. This led to strong performance from both equities and bonds. However, golden ages, by definition, occur infrequently. To understand risk and return in capital markets – a key objective of the *Yearbook* – we must examine periods much longer than 20 years. This is because stocks are volatile, with major variation in year-to-year returns. We need very long time series to support inferences about stock returns.

Our 118 year returns, which we document below, include several golden ages, as well as many bear markets; periods of great prosperity as well as recessions, financial crises, and the Great Depression; periods of peace, and episodes of war. Very long histories are required in order to hopefully balance out the good luck with the bad luck, so that we obtain a realistic understanding of what long run returns can tell us about the future.

Long-run equity returns and bond returns

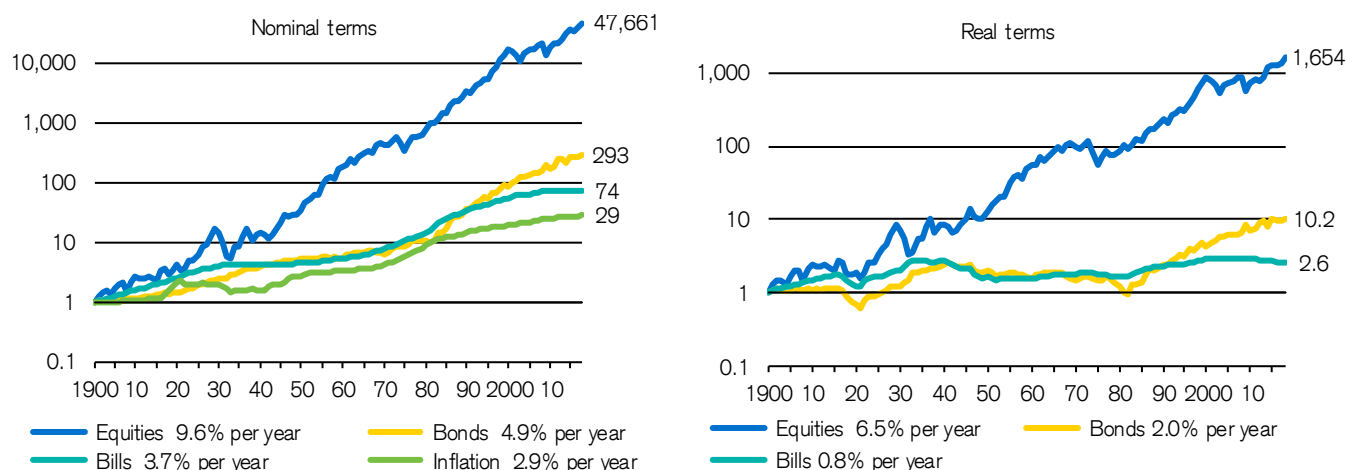
The left-hand side of *Figure 4* shows the cumulative total return from stocks, bonds, bills, and inflation from 1900 to 2017 in the world's leading capital market, the United States. Equities performed best, with an initial investment of USD 1 growing to USD 47,661 in nominal terms by end-2017. Long bonds and treasury bills gave lower returns, although they handsomely beat inflation. Their respective index levels at the end of 2017 are USD 293 and USD 74, with the inflation index ending at USD 29. The legend to the chart shows the annualized returns. Equities returned 9.6% per year, versus 4.9% on bonds, 3.7% on bills, and inflation of 2.9% per year.

Since US prices rose 29-fold over this period, it is more helpful to compare returns in real terms. The right-hand side of *Figure 4* shows the real returns on US equities, bonds, and bills. Over the 118 years, an initial investment of USD 1, with dividends reinvested, would have grown in purchasing power by 1,654 times. The corresponding multiples for bonds and bills are 10.2 and 2.6 times the initial investment, respectively. As the legend to the chart shows, these terminal wealth figures correspond to annualized real returns of 6.5% on equities, 2.0% on bonds, and 0.8% on bills.

Figure 4 shows that US equities totally dominated bonds and bills. There were severe setbacks of course, most notably during World War I; the Wall Street Crash and its aftermath, including the Great Depression; the OPEC oil shock of the 1970s after the 1973 October War in the Middle East; and the two bear markets in the first decade of the 21st century. Each shock was severe at the time. At the depths of the Wall Street Crash, US equities had fallen by 80% in real terms. Many investors were ruined, especially those who bought stocks with borrowed money. The crash lived on in the memories

Figure 4

Cumulative returns on US asset classes in nominal terms (left-hand side) and real terms (right-hand side), 1900–2017



Source: Elroy Dimson, Paul Marsh, and Mike Staunton, *Triumph of the Optimists*, Princeton University Press, 2002, and subsequent research

of investors – and indeed those who subsequently chose to shun equities – for at least a generation.

Figure 4 sets the Wall Street Crash in its long-run context by showing that equities eventually recovered and gained new highs. Other dramatic episodes, such as the October 1987 crash hardly register while the bursting of the technology bubble in 2000 and the financial crisis of 2009 certainly register, but are placed in context. Besides revealing impressive long-run equity returns, Figure 4 thus helps to set the bear markets of the past in perspective. Events that were traumatic at the time now just appear as setbacks within a longer-term secular rise.

As noted above, we should be cautious about generalizing from the USA which, over the 20th century, rapidly emerged as the world's foremost political, military, and economic power. By focusing on the world's most successful economy, investors could gain a misleading impression of equity returns elsewhere, or of future equity returns for the USA itself. For a more complete view, we also need to look at investment returns in other countries.

Long-run returns around the world

The Yearbook allows us to make global comparisons. Figure 5 shows annualized real equity, bond, and bill returns over the last 118 years for the 21 Yearbook countries with continuous investment histories plus the world index, the world ex-USA, and Europe, ranked in ascending order of equity market performance. The real equity return was positive in every location, typically at a level of 3% to 6% per year. Equities were the best-performing asset class everywhere. Furthermore, bonds beat bills in every country except Portugal. This overall pattern, of equities beating bonds and bonds beating bills, is precisely what we would expect over the long haul, since equities are riskier than bonds, while bonds are riskier than cash.

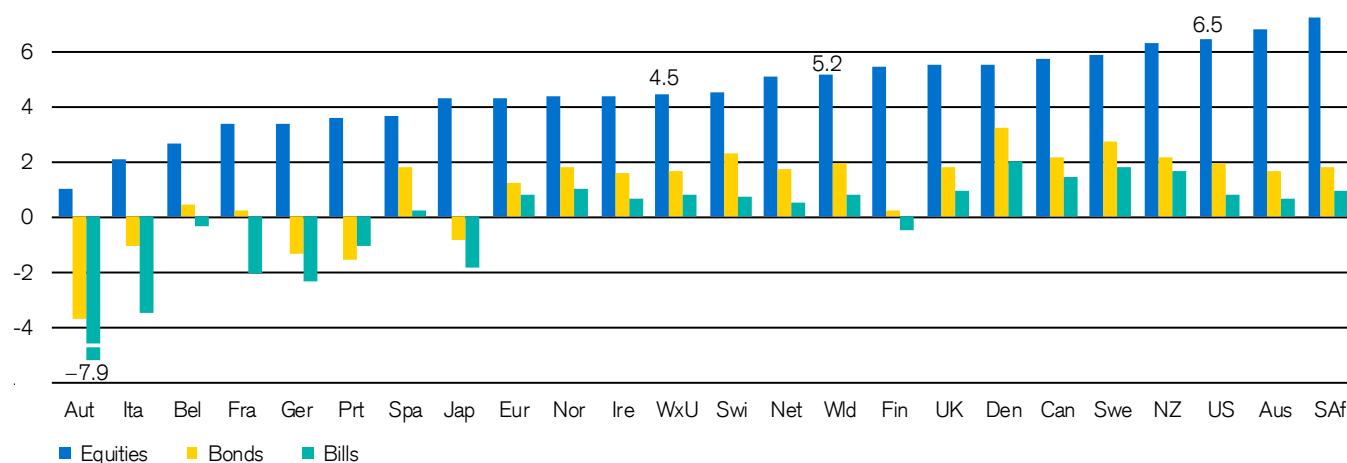
Figure 5 shows that, while most countries experienced positive real bond returns, five countries had negative returns. Mostly, countries with poor bond returns were also among the worst equity performers. Their poor performance dates back to the first half of the 20th century, and these were the countries that suffered most from the ravages of war, and from periods of high or hyperinflation, typically associated with wars and their aftermath.

Figure 5 shows that the USA performed well, ranking third for equity performance (6.5% per year) and sixth for bonds (2.0% per year). This confirms our earlier conjecture, namely, that US returns would be high since the US economy has been such an obvious success story, and that it was unwise for investors around the world to base their future projections solely on historical US evidence. However, Figure 5 helps set this debate in context by showing that, while US stocks did well, the USA was not the top performer, nor were its returns especially high relative to the world averages. The real return on US equities of 6.5% contrasts with the real USD return of 4.5% on the World-ex USA index. A common factor among the best-performing equity markets over the last 118 years is that they tended to be resource-rich and/or New World countries.

(Extract from Chapter 1.)

Figure 5

Real annualized returns (%) on equities versus bonds and bills internationally, 1900–2017



Source: Elroy Dimson, Paul Marsh, and Mike Staunton, *Triumph of the Optimists*, Princeton University Press, 2002, and subsequent research

Real interest rates and asset returns

The real interest rate on cash/Treasury bills represents the real return on a (near) risk-free asset. The expected return on equities needs to be higher than this as risk-averse investors require some compensation for their higher risk. If real equity returns are equal to the real risk free rate plus a risk premium, it follows that, other things equal, when the real interest rate is low, real equity returns will also be lower, and vice versa. Indeed, this applies to all risky assets, including equities, bonds, real estate, and so on.

To investigate whether history bears out this relationship between lower real equity returns and lower real interest rates, we examine, in [Figure 6](#), the full range of 21 countries for which we have a complete 118-year investment history. We compare the real interest rate in a particular year with the real return from an investment in equities and bonds over the subsequent five years. After excluding periods that span the hyperinflationary periods in Germany and Austria, we have a total of 2,382 observations of (overlapping) 5-year periods. These are ranked from lowest to highest real interest rates and allocated to bands, with the 5% lowest and highest at the extremes and 15% bands in between.

The line plot in [Figure 6](#) shows the boundaries between bands. The bars are the average real returns on bonds and equities, including reinvested income, over the subsequent five years within each band. For example, the first pair of bars shows that, during years in which a country experienced a real interest rate below -11%, the average annualized real return over the next five years was -5.5% for equities and -11% for bonds.

The first three bands comprise 35% of all observations, and relate to real interest rates below 0.1%, so that negative real interest rates were experienced in around one-third of all country-years. Thus, although today's nominal short-term interest rates

are at record lows, real rates are not. Historically, however, the bulk of the low real rates occurred in inflationary periods, in contrast to today's low-inflation environment.

As one would expect, there is a clear relationship between the current real interest rate and subsequent real returns for both equities and bonds. Regression analysis of real interest rates on real equity and bond returns confirms this, yielding highly significant coefficients.

When real interest rates are low, expected future returns on all risky assets are also lower, and vice versa. However, during periods when real interest rates fall unexpectedly, this will tend to provide an immediate boost to asset prices and hence returns, even though prospective returns will have been lowered. Similarly, unexpected rises in the real rate of interest will tend to have an immediate lowering effect on prices and returns, even though prospective returns will then be higher.

Exchange rates and long-run asset returns

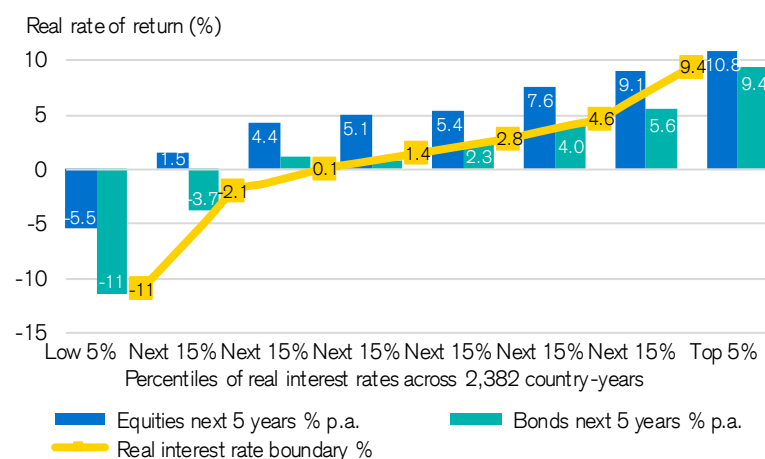
For more than 30 years, investors have been exhorted to diversify internationally so that they can benefit from the "free lunch" of risk reduction through diversification. Even 30 years ago, this idea was not new. Long before the birth of portfolio theory, international diversification was familiar to investors. Over a century ago, when capital flowed freely, London, New York, Amsterdam, and Paris facilitated the development of transport systems, utilities, and natural resources around the world. In those days, many currencies were tied directly or indirectly to the gold price, and currencies did not seem an important element of the risk of investing overseas.

Today, however, exchange rates are volatile, and a switch from domestic toward foreign equities can introduce unwanted exchange rate risk to a portfolio. For investors whose emphasis is on consumption in their home country – individuals, charities, insurance companies, pension funds, and the like – it is important to identify the potential risks from currency exposure. In this section, we analyze whether exchange-rate changes influence the returns earned by very long-run investors. Over the long haul, we find that currencies have tracked relative inflation rates within a band that is narrow compared to the cross-country variation in stock returns. We examine common-currency returns for each market, measured using an investor's home currency. We show that, although the 118-year returns depend on the reference currency, in real terms the ranking of markets by long-term return does not vary greatly with the location of the investor.

(End of extract from [Chapter 1.](#))

Figure 6

Real asset returns versus real interest rates, 1900–2017



Source: Elroy Dimson, Paul Marsh, and Mike Staunton, DMS dataset



Chapter 2: Risk and risk premiums

This chapter discusses the nature of the risks from investing in equities and bonds, and looks at extreme periods of equity market history. It presents evidence on the magnitude of the historical equity risk premium (the amount by which equities have outperformed bonds and bills) and the maturity premium (the amount by which long bonds have outperformed bills). It discusses how and why risk and risk premiums change over time. Finally, it presents estimates of how large risk premiums are likely to be in the future.

Investment in equities has proved rewarding over the long run but, as we noted in [Chapter 1](#), it has been accompanied by correspondingly greater risks. Similarly, we saw that, over the long run, bonds outperformed cash but, again, at the cost of higher volatility.

Investors do not like volatility – at least on the downside – and will be prepared to invest in riskier assets only if there is some compensation for this risk. We can measure the reward for risk that they have achieved in the past by comparing the return on risky assets, such as equities or bonds, with the return from risk free investments, such as treasury bills. In the case of stocks, the difference between equity and bill returns is known as the equity risk premium. For long-term government bonds, the difference between bond and bill returns is referred to as the maturity premium. This is because the additional risk from investing in long-term bonds arises from uncertainty about future inflation and real interest rates over the bond's term to maturity.

Our main focus in this chapter is on the equity risk premium, although we also provide evidence on the maturity premium. Of the two, the equity premium is the harder to measure and to forecast, while at the same time being an extremely important economic variable. An estimate of the future equity premium is central to projecting future investment returns, asset allocation decisions, calculating the cost of equity, valuing companies and shares, appraising investment proposals, and determining fair rates of return for regulated businesses and in legal disputes.

We begin by examining the variation of the historical equity risk premium over time, focusing on the US market. Since investors are concerned about the prospect of downside risk, we look at extreme periods of equity market history.

In the past, most of the evidence on the historical equity premium was for the USA, but, as we noted

in the last chapter, this makes it susceptible to success bias. We therefore look at the historical equity risk premium since 1900 in all 21 countries that have continuous investment histories and for the world index. We examine the impact of including markets, such as China and Russia, which do not have continuous histories and where investors experienced total losses.

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

We explore and challenge this view. First, we decompose the equity premium into component parts and show the extent to which the historical premium has arisen from dividend payments, growth in dividends, and rerating. Second, we use this decomposition to derive an estimate of the future equity premium. Finally, we discuss how the equity premium changes over time.

In the final section of this chapter, we examine the magnitude of the maturity premium. We conclude with a brief summary.

The historical equity risk premium

We measure the historical equity risk premium by taking the geometric difference between the equity return achieved over a period and the risk-free rate of return that was available over the same period.

Figure 7 shows the year-by-year US historical risk premium relative to bills. The distribution of outcomes was wide, with the lowest and highest premiums being realized, as might be expected, in the worst and best years for stocks. The lowest premium was -45% in 1931, when equities returned -44.3% and treasury bills 1.1%, while the highest was 57% in 1933, when equities gave 57.0% and bills 0.3%. Figure 7 shows that, for the USA, the distribution of annual premiums is roughly symmetrical, resembling a normal distribution. The arithmetic mean is 7.5% and the standard deviation is 19.5%. On average, therefore, US investors received a positive – and quite large – reward for exposure to equity market risk.

Because the range of year-to-year premiums is very broad, it can be misleading to label these as “risk premiums.” Investors clearly cannot have expected, let alone required, a negative risk premium from investing in equities, as otherwise they would simply have avoided them. All the negative and many of the very low premiums shown in Figure 7 must therefore reflect nasty surprises. Equally, investors could not have “required” the very high premiums, such as 57% in 1933. Such numbers are implausibly high as a required reward for risk, and the high realizations must therefore reflect pleasant surprises. To avoid confusion, we should probably refer to these as “excess returns,” i.e. returns in excess of (or under) the risk-free interest rate.

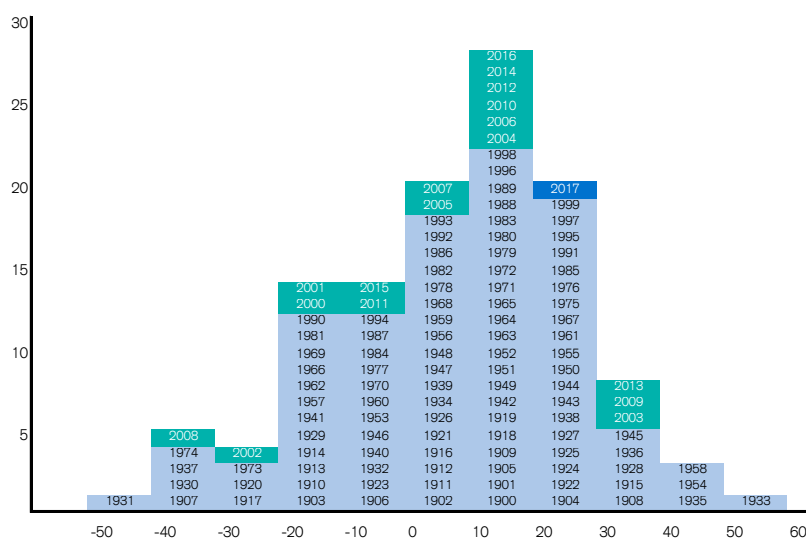
To make sensible inferences about the historical risk premium, it is thus necessary to look at much longer periods than a single year. Over longer horizons, we might expect good and bad luck to cancel each other out. However, long needs to be long indeed, as even over intervals of a decade or more, there can be major performance surprises. For example, there have been several lengthy periods, including the opening decade of the 21st century, as well as intervals in the 1970s and early 1980s when the realized US risk premium was negative. It follows that we need very long periods to infer investors' expectations about the reward for exposure to equity market risk. Even then, inference can be problematic, as we will see below. Over the full 118 years, the annualized (geometric mean) US equity risk premium relative to bills was 5.6%.

Extremes of equity market history

It is informative to examine the periods of extreme returns represented by the “tails” in Figure 7. The top two panels of Table 1 highlight notable episodes of world political and economic history since 1900. They show real equity returns over the six worst episodes for equity investors, and over four “golden ages” for the world indexes and the world’s five largest markets. These are of interest not just because of their economic importance but because they experienced some of the most extreme returns in our database (apart from the total value loss in China and Russia).

Figure 7

Histogram of US equity risk premium vs treasury bills, 1900–2017



Source: Elroy Dimson, Paul Marsh, and Mike Staunton, *Triumph of the Optimists*, Princeton University Press, 2002, and subsequent research

The six worst episodes for global equity investors comprise the two world wars and the four great bear markets – the Wall Street Crash and Great Depression, the first oil shock and world recession of 1973–74, the 2000–02 bear market that followed the internet bubble, and the credit crisis bear market 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% respectively, while both US and UK equities enjoyed small positive real returns.

Table 1 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 United States, Germany, and France, this was the most savage 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. Table 1 records calendar year returns, but the US equity market did not start falling until September 1929, reaching its nadir in June 1932, when it had fallen 80% (in real terms) below its 1929 peak.

UK and Japanese investors suffered greater losses in 1973–74 during the recession after the first OPEC oil squeeze, than in the 1930s. In 1973–74, the real returns on UK, US, Japanese and world equities were –71%, –52%, –49%, and –47%, respectively. The penultimate row of the top panel of Table 1 shows that the world equity index fell by almost as much (44% in real terms) in the bear market of 2000–02. Table 1 shows calendar year returns, but from start-2000 until the trough of the bear market in March 2003, the real returns on US, UK, Japanese, and German equities were even lower at –47%, –44%, –53%, and –65%, respectively.

Finally, the bottom row of the top panel of Table 1 shows real equity returns during the credit and banking 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 on record for equities. On a strict calendar year basis, Table 1 shows

that 2008 holds the title of worst year ever for the world and world ex-USA indexes. In its short 17-year life, the 21st century already has the dubious honor of hosting two of the four worst bear markets in history.

The second panel of Table 1 summarizes real returns over four “golden ages” for equity investors. The 1990s, which we highlighted in Chapter 1 as a recent period of exceptional performance, was the most muted of the four, with the world index showing a real return of 111%. 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 (257% in real terms) and the two post-world war recovery periods (168% in the decade after World War I and 395% from 1949 to 1959). During the latter period, a number of equity markets enjoyed quite staggering returns. For example, Table 1 shows that during these nascent years of the German and Japanese “economic miracles,” their equity markets rose in real terms by 4373% (an annualized 41.3%) and 1565% (an annualized 29.1%), respectively.

Table 1

Real equity returns in key markets over selected periods

Period (calendar years)	Real rate of return (%) over the period						
	USA	UK	France	Germany	Japan	World	World ex-US
Six worst episodes							
1914–18: World War I	–18	–36	–50	–66	66	–31	–35
1929–31: Wall Street Crash	–61	–31	–44	–59	11	–54	–44
1939–48: World War II	22	34	–41	–88	–96	–12	–41
1973–74: Oil shock/recession	–52	–71	–40	–26	–49	–47	–39
2000–02: Internet ‘bust’	–42	–38	–45	–58	–49	–44	–46
2008: Credit/banking crash	–38	–33	–41	–43	–41	–41	–44
Four best episodes							
1919–28: Post-WWI recovery	376	234	171	18	30	168	82
1949–59: Post-WWII recovery	430	212	269	4373	1565	395	345
1980–89: Expansionary 80s	176	337	297	220	431	257	327
1990–99: Nineties/tech boom	276	198	218	154	–42	111	42
Periods with highest returns							
One-year returns (%)	56	97	66	155	121	68	80
	1933	1975	1954	1949	1952	1933	1933
Two-year returns (%)	92	107	123	187	245	90	138
	1927–28	1958–59	1927–28	1958–59	1951–52	1932–33	1985–86
Five-year returns (%)	235	176	270	652	576	185	271
Period	1924–28	1921–25	1982–86	1949–53	1948–52	1932–36	1985–89
Periods with lowest returns							
One-year return	–39	–57	–41	–91	–86	–41	–44
Period	1931	1974	2008	1948	1946	2008	2008
Two-year returns (%)	–54	–71	–53	–90	–95	–47	–49
Period	1930–31	1973–74	1944–45	1947–48	1945–46	1973–74	1919–20
Five-year returns (%)	–46	–63	–78	–93	–98	–58	–63
Period	1916–20	1970–74	1943–47	1944–48	1943–47	1916–20	1916–20
Longest runs of cumulative negative real returns							
Return (%) over stated period	–8	–4	–19	–3	–1	–8	–2
Period	1905–20	1900–21	1929–82	1900–54	1900–50	1910–31	1905–31
Number of years	16	22	54	55	51	22	27

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

The third and fourth panels of [Table 1](#) show the returns for, and dates of, the one-, two-, and five-year periods during which each country and the world indexes experienced their highest and lowest returns. The picture that emerges reinforces the discussion above, as in nearly all cases, the best and worst periods are drawn from, and are subsets of, the episodes listed in the top two panels. Note that the spreads between worst and best are wide. The one-year real returns range from -41% to $+68\%$ (for the world), -39% to $+56\%$ (USA), -91% to $+155\%$ (Germany), and -86% to $+121\%$ (Japan). Five-year real returns extend from -58% to $+185\%$ (world), -46% to $+235\%$ (USA), -93% to $+652\%$ (Germany), and -98% to $+576\%$ (Japan).

Finally, the bottom panel of [Table 1](#) reports the longest period over which each country (or world index) has experienced a cumulative negative real return. For the USA, the longest such period was the 16 years from 1905 to 1920, when the cumulative return was -8% . This reconfirms Jeremy Siegel's widely-cited observation that US investors have historically always enjoyed a positive real return as long as they have held shares for at least 20 years.

However, [Table 1](#) shows that investors in other countries have not been as fortunate as their American counterparts. Japan, France, and Germany suffered extended periods lasting over half a century during which cumulative equity returns remained negative. The charts in [Chapter 5](#), showing the dispersion of real returns on equities over periods of 10–118 years, show that more than 70% of the Yearbook countries with continuous histories experienced intervals of cumulative negative real stock market returns lasting for more than two decades.

The worldwide equity risk premium

Before our series of studies, most of the long-term evidence on the historical equity premium had been for the US market, which today is the world's largest stock market. US history is therefore susceptible to success bias. In this section, we focus on global evidence.

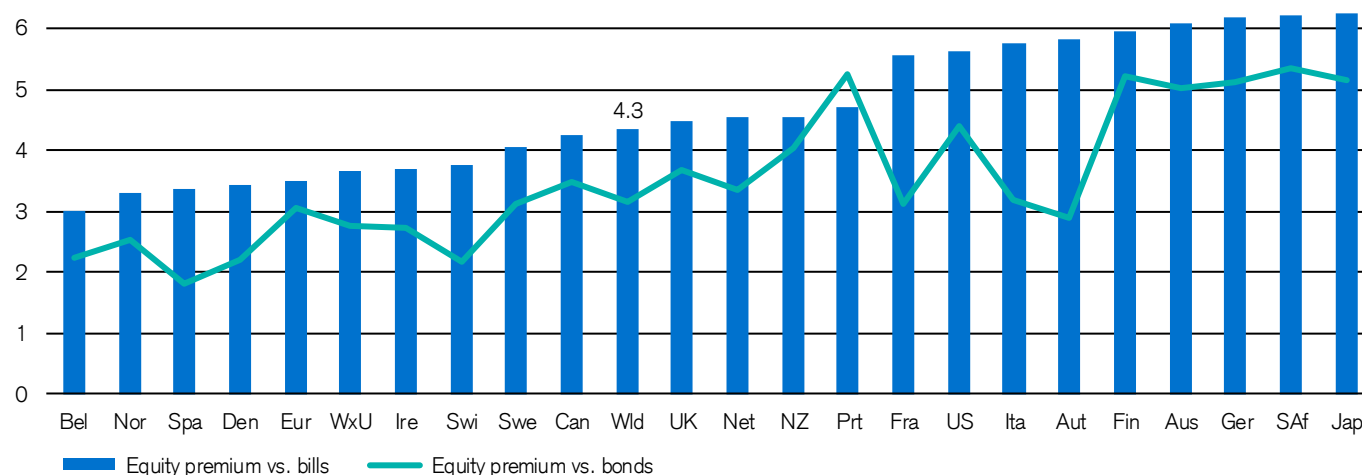
The annualized equity premiums for our 21 countries with continuous investment histories and for the world indexes are summarized in [Figure 8](#), where countries are ranked by the equity premium measured relative to bills, displayed as bars. The line-plot shows each country's risk premium measured relative to bonds. Over the entire 118 years, the annualized (geometric) equity risk premium, relative to bills, was 5.6% for the USA and 4.5% for the UK. Averaged across the 21 countries, the risk premium relative to bills was 4.8%, while the risk premium on the world equity index was 4.3%. Relative to long government bonds, the story is similar. The annualized US equity risk premium relative to bonds was 4.4% and the corresponding figure for the UK was 3.7%. Across the 21 markets the risk premium relative to bonds averaged 3.6%, while for the world index, it was 3.2%.

Our global focus also results in rather lower risk premiums than were previously assumed. Prior views have been heavily influenced by the experience of the USA, yet we find that the US risk premium is higher than the average for the other 20 countries in our dataset.

[\(End of extract from Chapter 2.\)](#)

Figure 8

Worldwide annualized equity risk premium (%) relative to bills and bonds, 1900–2017



Source: Elroy Dimson, Paul Marsh, and Mike Staunton, *Triumph of the Optimists*, Princeton University Press, 2002, and subsequent research. Premiums for Austria and Germany are based on 116 years, excluding 1921–22 for Austria and 1922–23 for Germany.

Chapter 3: Factor investing

Factor investing has become popular and its adoption is accelerating as investors seek to harvest additional risk premiums. However, many of the factors put forward as having generated premiums in the past are simply the result of data mining. To mitigate this trap, we estimate the risk premiums earned from factor investing over very long periods (up to 118 years) and across many markets (up to 23). We report on the profitability of following strategies based on market capitalization, value versus growth, dividend yield, stock-return momentum and low volatility investing. We conclude by arguing that, while factors will always be important in investment in terms of helping explain differential performance, there is no guarantee that factor premiums will persist. Smart-beta investors should focus on factors supported by robust evidence and should diversify across multiple factor risk premiums.

Factor investing and smart-beta strategies are in vogue. A recent survey of major investors reports that almost three-quarters of asset owners are already using or are actively evaluating smart beta (FTSE Russell, 2017). Of those with an allocation to smart beta, nearly two-thirds are evaluating additional allocations, and the proportion of asset owners using at least five smart-beta indexes has risen tenfold from 2% in 2014 to more than one-third in 2017. These market participants, with over USD 2 trillion in assets, include corporations, governments, pension plans and non-profit organizations, and they have adopted factor investing as an integral part of their strategy.

Exchange traded funds (ETFs) and exchange traded products (ETPs) have opened up further opportunities for investors to target asset exposures selectively. By the beginning of 2018, there were over 7,000 ETFs and ETPs, with over 12,000 listings and assets totaling USD 5 trillion; see Fuhr (2017). There were over 1,000 smart-beta equity products, with over 2,000 listings. There were 145 smart-beta equity providers in 32 different countries. In late 2017 the Financial Times reported that factor-based funds exceeded the USD1 trillion milestone.

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

To identify factors, researchers typically construct long-short portfolios. These portfolios are long the preferred exposure and short the unwanted exposure. In the equity market, for example, an income factor portfolio would contain high-dividend yield stocks accompanied by a short position in

lower-yielding stocks. It is far easier to buy stocks you do not own than to sell stocks you do not own. So the long side of a factor portfolio is usually easy to acquire, whereas the short side can be challenging. Long-short strategies are therefore relatively expensive – on occasion impossible – to construct, and they can certainly be difficult to scale up. “Pure play” long-short strategies are sometimes called style strategies.

What are the smart-beta strategies that researchers have highlighted? Fama and French (1993, 2012, 2015) identify four factors in addition to the market: size, value, profitability, and investment; Black (1972) and Frazzini and Pedersen (2014) identify low risk; and Jegadeesh and Titman (1993) and Carhart (1997) identify momentum. Asness, Ilmanen, Israel and Moskowitz (2015) argue that there are four classic style premiums, namely value, momentum, income (or “carry”), and low-volatility (or “defensive”) investing. Ang, Hogan, and Shores (2016) focus on size, value, momentum, volatility, and profitability.

In all, researchers have identified at least 316 factors, of which Harvey, Liu and Zhu (2016) point out that nearly all are unlikely to be robust in independent testing. Novy-Marx and Velikov (2015) and Green, Hand and Zhang (2017) express complementary doubts about the prospective profits from exploiting factors that appear promising on an in-sample basis. The problem of apparently significant in-sample results being non-robust in out-of-sample tests has been discussed for more than a quarter of a century; see, for example, Dimson and Marsh (1990) and Markowitz and Xu (1994). But there is no substitute for genuine out-of-sample (OOS) testing. Harvey (2017) notes the impracticality of waiting for additional data in order to test a model’s OOS reliability – not to mention the understandable impatience of practitioners.

Out-of-sample evidence

The only reliable tests involve examining data for different assets and countries and, especially, for different sample periods. That is the objective of this volume. We aim to answer the question, “Does this pattern persist?” by looking back in time and across countries as well as reporting very recent evidence.

An investor’s choice of holdings, sector weights and geographical exposure has an obvious impact on portfolio returns. But investment performance is also influenced by whether a portfolio leans toward small or large companies, value or growth stocks, higher- or lower-yielding securities, momentum- or reversal-based strategies, or defensive or aggressive risk exposures. Asset managers and benchmark providers have recently emphasized these factors. However, size, value, income, momentum and volatility are far from new phenomena: in fact, all five were described three decades ago in the book *Stock Market Anomalies* (Dimson, 1988). Since they are among the longest-established and best-documented regularities in the stock market, we can study them, on an OOS basis, in two ways; first, examining recent data, and second, evaluating truly long-term data.

Although the interval is far too brief to draw conclusions about style premiums, last year’s factor returns were obviously out-of-sample. They are shown in the 2017 column of [Figure 9](#) below. It is clear that the returns to factor exposures vary across risk factors, and different factors generated quite divergent returns. Returns for the same factor over the same period can also differ between countries. A crucial question is how these strategies performed

before the date of the earliest period that underpinned prior research.

These factors matter a great deal, even if they cease to be associated with superior investment performance. This is because small companies will continue to perform differently from large stocks, even if they fail on average to outperform. Similarly, value stocks, high-yielders and past winners will continue to show different performance characteristics from growth stocks, low yielders and past losers, regardless of whether they generate a premium.

Almost all investors are knowingly or unknowingly exposed to factors such as size, value, yield, momentum, and risk. It is important, therefore, to understand these exposures when developing an investment strategy or when evaluating a fund manager’s performance. Furthermore, a factor that is ranked high in performance in a particular year may remain high, may slip to low, or may end up in the middle in the following year. [Figure 9](#) lists each year’s factor returns since the financial crisis, ranked from highest to lowest. Since the global financial crisis, the ranking of factor returns has not been stable, and earlier years (not shown here) are similar. Because of the inherent unpredictability of risk premiums, perceptive investors diversify their portfolios across risk exposures.

A frustrating feature of factor risk premiums is that they may simply be transient anomalies in stock market behavior. When that is the case, no sooner have they been identified than they cease to work. Meanwhile, with the benefit of over a century of financial market history, we can try to discern whether there are enduring regularities in stock price behavior, or whether there are patterns that reflect

Figure 9

Post-crisis equity factor return premiums in the USA (top panel) and UK (bottom panel)

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2008–17
USA											
Highest	Low vol 89.5	Size 28.5	Size 13.6	Low vol 40.4	Value 11.5	Size 5.3	Low vol 11.1	Momentum 42.4	Value 17.0	Low vol 6.3	Low vol 6.2
	Income 20.6	Value -7.9	Momentum 8.6	Income 29.5	Size 7.8	Momentum 4.5	Income 1.6	Low vol 13.5	Income 15.1	Momentum 5.2	Size 2.8
	Momentum -2.3	Income -17.2	Income 7.1	Momentum 1.3	Momentum -1.0	Value 4.5	Value -2.1	Income 2.1	Size 9.6	Size -6.8	Income 1.9
	Size -4.3	Low vol -30.7	Value -4.6	Size -3.7	Low vol -1.9	Income -8.3	Momentum -5.0	Size -9.3	Low vol -1.9	Value -9.7	Value -2.7
Lowest	Value -6.3	Momentum -50.7	Low vol -15.5	Value -12.7	Income -7.6	Low vol -9.3	Size -6.7	Value -11.9	Momentum -22.4	Income -13.6	Momentum -4.9
UK											
Highest	Low vol 127.0	Size 24.9	Size 12.4	Low vol 35.0	Size 17.0	Momentum 32.4	Momentum 42.8	Momentum 29.5	Value 20.2	Momentum 11.0	Momentum 13.5
	Momentum 78.8	Income 1.1	Value 3.2	Income 28.3	Value 14.8	Size 15.5	Size 12.1	Low vol 23.7	Income 15.3	Size 6.1	Size 6.1
	Income 15.7	Value -6.9	Momentum 0.7	Momentum 20.6	Momentum -1.7	Low vol 11.5	Income -1.3	Size 7.9	Size -4.9	Value 3.0	Low vol 3.9
	Value -11.8	Low vol -20.1	Income -13.7	Size -4.9	Income -8.1	Income 0.0	Low vol -6.2	Income -11.2	Momentum -18.3	Income -0.6	Income 1.8
Lowest	Size -17.5	Momentum -25.4	Low vol -22.9	Value -10.7	Low vol -15.7	Value 0.0	Value -10.0	Value -20.9	Low vol -21.2	Low vol -9.6	Value -2.6

Sources: Elroy Dimson, Paul Marsh, and Mike Staunton (UK premiums and US momentum); Professor Ken French, Tuck School of Business, Dartmouth (website) (other US data)

chance events or circumstances that are episodic and cannot be expected to recur. In the sections which follow, we discuss what we can learn from up to 118 years of stock market history, and draw some conclusions on the transience or permanence of factor premiums over the course of financial market history.

The remainder of this chapter is organized as follows. In the first section, we focus on what was once cited as the stock market's leading anomaly: the size effect. We trace the size effect since discovery and present evidence over the longest available periods and across multiple markets. We then study the impact of value and growth, and document the tendency of companies selling at a low stock price, relative to fundamentals, to perform differently and, in the long run better, than companies selling at a high price relative to fundamentals. Relatedly, we document the performance of high- and low-yielding stocks, and then report on what happens when stocks are selected according to both size and value. Next, we address momentum and low-risk strategies. Finally, we then conclude.

The size effect

The size effect first came to prominence in the USA, where Banz (1981) showed that the smallest companies quoted on the New York Stock Exchange had provided the highest long-term returns. These findings were subsequently replicated in many other countries, with the longest study being for the UK, with a comprehensive history that we extended back to 1955, based on our paper Dimson and Marsh (1986), and which has been maintained continuously since then, most recently in Evans, Marsh and Dimson (2018). Banz found that there was a particularly substantial premium in returns when the smallest and largest 50 NYSE stocks were compared, with a return advantage to the smaller stocks of one percentage point per month.

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

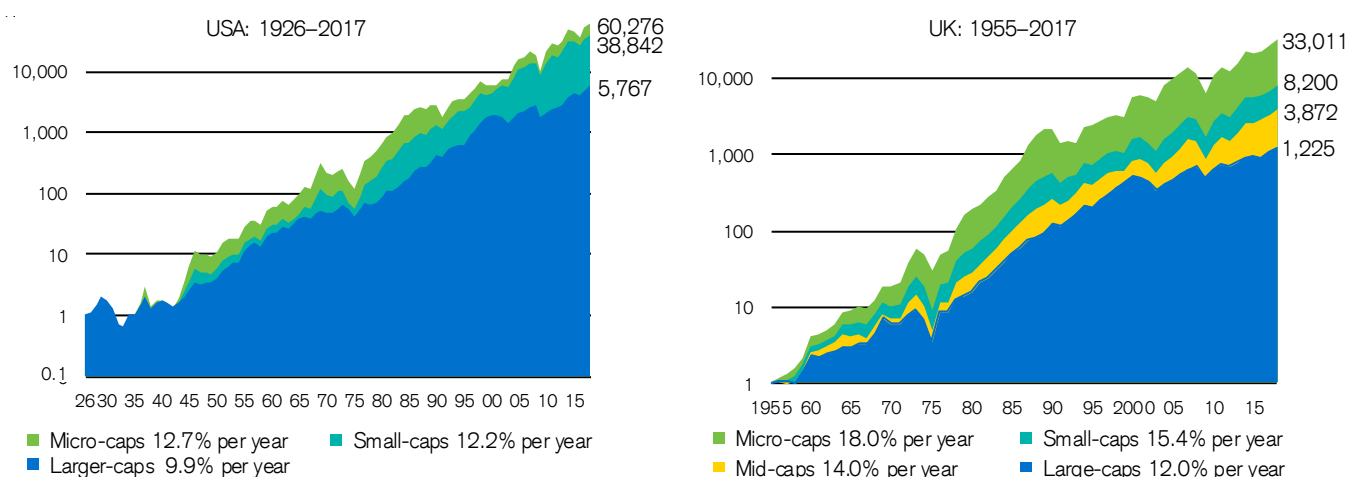
While a dollar invested in larger companies, with dividends reinvested, grew in value to USD 5,767, a similar investment in small-caps gave a terminal value almost seven times greater at USD 38,842. Micro-cap stocks did best of all, with an end-2016 value of USD 60,276. The returns on large-cap stocks were an annualized 9.9%, while small- and micro-cap stocks achieved 12.2% and 12.7%, respectively.

The relative progress of small-caps, however, was not consistent and steady. There were prolonged intervals of underperformance. The left hand chart in Figure 10 shows that they initially performed poorly, especially in the Great Depression, and did not catch up with large-caps until the early 1940s. By 1975, although micro-caps were ahead, small-caps were still only marginally beating large-caps. During 1975–1983, small-caps raced ahead. If this period were omitted, Siegel (2014) notes that large-caps would have beaten small-caps from 1926 to the late 1990s.

(End of extract from Chapter 3.)

Figure 10

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



Source: Elroy Dimson, Paul Marsh, and Mike Staunton, *Triumph of the Optimists*, Princeton University Press, 2002, and subsequent research. US CRSP capitalization decile returns are from Morningstar. UK size-based returns are for the Numis Smaller Companies indexes ex investment companies.



Chapter 4: Private wealth investments

Wealthy individuals' holdings of non-financial assets are substantial, especially their houses, land, artworks, gold, silver, and gemstones. High net worth investors also buy fine wine, classic cars, musical instruments, rare books, jewelry, investment-grade stamps, and other collectibles. These private wealth assets tend to be heterogeneous in nature and are often traded infrequently. To varying degrees, they are also "investments of passion" that provide an emotional reward in terms of enjoyment for the owner. We abstract from these psychic returns and document the long-run price appreciation since 1900 from private wealth investments. We compare these assets' investment performance with the returns from financial securities and discuss their role in a diversified portfolio.

Rather than investing in listed financial securities, it is possible to hold durable assets. These assets may produce an income stream (e.g. rental income from real estate) or as an imputed financial income stream (e.g. on an owner-occupied home). Alternatively, they may provide other benefits such as a compact store of value (e.g. diamonds), the promise of future consumption (e.g. fine wine), or the pleasure of ownership (e.g. artworks). Such investments are in many cases marketable only with a substantial transaction cost, so the purchaser of these tangible assets is likely to be someone with a long investment horizon for whom the liquidity of the asset is a secondary concern.

Investment professionals often fall into the trap of thinking that investment is about owning traded financial assets. However, marketable securities

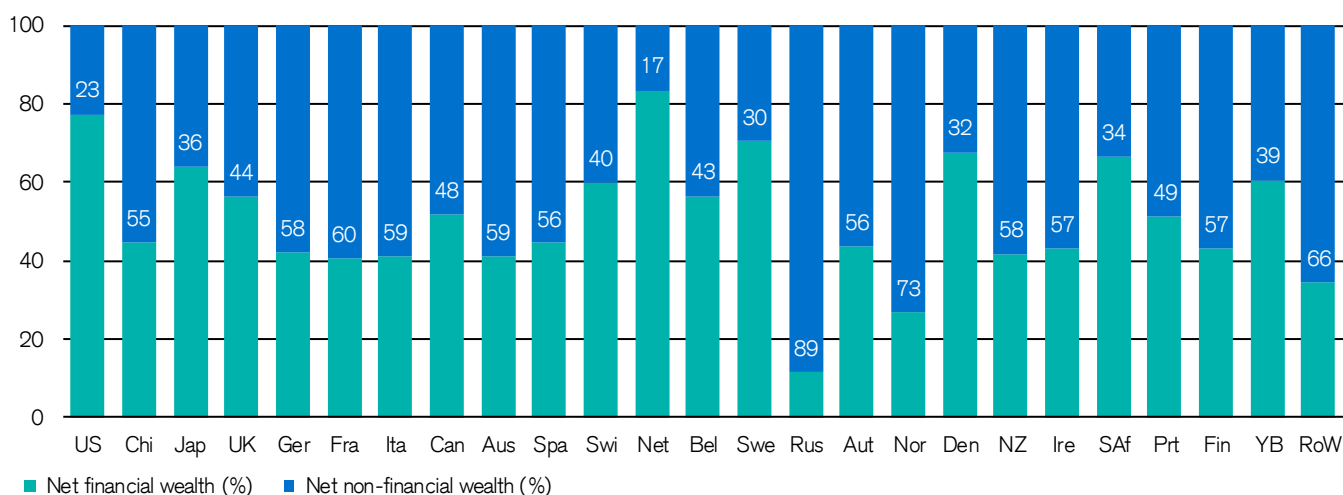
are only part of the investment canvas. Most asset classes are in fact illiquid, and illiquid asset classes are large. We show below that the value of world real estate exceeds the value of all equities and bonds worldwide. Ang (2014) estimates that, for most individuals, illiquid assets (notably housing) account for 90% of their total wealth – and that ignores their human capital.

Holdings in nonfinancial assets

For more comprehensive insights on these investments, we turn to the Credit Suisse Global Wealth Report and the Credit Suisse Global Wealth Databook (November, 2017). These provide annual estimates of the distribution of household wealth within and across countries around the world

Figure 11

Share of net wealth invested in financial and in nonfinancial assets (%)



Source: Davies, Lluberas and Shorrocks, Credit Suisse Global Wealth Report 2017 and Credit Suisse Global Wealth Databook 2017; YB = Yearbook and RoW = Rest of World

(Figure 11). The authors, Jim Davies, Rodrigo Lluberas and Tony Shorrocks, stress the important distinction between financial assets and non-financial assets – principally housing and land, but also (for countries where the data is collected) consumer durables and other long-lived tangible assets.

Most of the data for the Credit Suisse Wealth Report comes from official household balance sheet data. This typically provides estimates of gross financial and non-financial wealth, plus overall household debt. Using estimates kindly provided by Davies, Lluberas and Shorrocks, we have allocated household debt between the two wealth categories to obtain estimates of net wealth. These are plotted in Figure 11 for all of the Yearbook countries, as well as for the aggregate of all Yearbook countries (YB) and for the rest of the world (RoW).

Clearly, the share of gross wealth per adult held in nonfinancial assets varies markedly across countries (again, see Figure 11). This partly reflects underlying differences, and partly differences in data definitions and quality. However, although the underlying data from each country differ in quality and reliability, the broad pattern is clear. On average, for the Yearbook countries, net financial assets comprise just under 60% of total net assets, while nonfinancial assets account for just under 40%. Given that there is underreporting of non-financial assets in many countries (because the definition is often limited to real housing), these figures suggest that private assets are almost as important as traded securities.

The Credit Suisse Global Wealth report estimates that around 150,000 adults worldwide can be classed as UHNWIs (ultra-high net worth individuals), with a net worth above USD 50 million. For wealthy investors, the proportion invested in illiquid, durable investments may be lower, and the proportion in traded securities higher. But the monetary value of wealthy investors' private asset holdings is on average large.

Other surveys provide complementary information. The Knight Frank Wealth Report (2017) estimates there are 193,490 ultra-wealthy individuals worldwide, each owning USD 30 million or more in net assets. The 900 private bankers and wealth managers who were surveyed by Knight Frank estimate a global average asset allocation of almost one quarter of net worth allocated to each of financial assets, real estate investments, personal businesses, and homes and collectibles. The percentage allocations are shown in Figure 12.

The World Ultra Wealth Report (Wealth-X, 2017) reports a substantial weighting in private assets, with a global average asset mix of 60% marketable assets (equities and liquidity), 33% private companies and private equity, and 7% real estate plus luxury assets (yachts, planes, cars, art, and jewelry).

The Jordà, Knoll, Kuvshinov and Taylor (2017) study of investable assets is economy-wide, but the

allocation (averaged across France, Germany, Japan, UK and the USA) is surprisingly similar: 60% financial assets (equities, bonds, bills, deposits and other financials), 19% housing, and 21% other nonfinancial assets. Ravina, Viceira, and Walter (2011) investigate 260 super-wealthy households in the US (average net worth USD 90 million) and found they had a 17% weighting in nonfinancial assets.

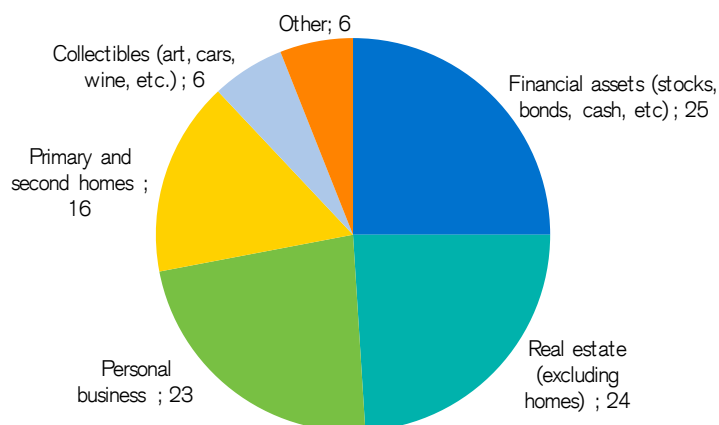
In summary, private assets are large in value. While much of that is represented by property investments, for the wealthy collectibles are also important. To simplify discussion, we divide durable assets into two groups. First, we consider treasure assets: investments that do not normally offer a financial reward other than on eventual disposal. We discuss treasure assets next, looking initially at collectables, then at precious metals and gemstones. Second, there are investments that offer the prospect of cash flows in future years, an example being real estate. We turn to real estate later.

Investments of passion

Investments of passion are sometimes called treasure assets. In the eyes of the owner, they are beautiful and collectible items, even though they do not generate any financial income. 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 an individual or institution.

Figure 12

Global average asset allocation of UHNWIs



Source: Knight Frank (2017)

Price indexes in GBP for treasure assets, 1900–2007

Art: For art, we start with the long-term price index compiled, largely from London art auctions, by Goetzmann, Renneboog, and Spaenjers (2011). This index is based on high-end art sale prices during 1765–2007, as recorded by Reitlinger (1961). The resulting art price index is based on purchase and sale records in inflation-adjusted GBP for identical items sold on dates that may be a few or many years apart. We use this repeat-sales index for 1900–2007 and, following Spaenjers (2016), link it to the end-year UK art market index values over the period 2008–2018 estimated by Artprice (2018). We ignore annual storage and insurance costs, estimated at 0.4% and 0.1% respectively (Roffino, 2017). Discretionary expenditures on installation and display are deemed to be paid by the exhibitor, and not by the owner of the asset (who may or may not be the same entity as the exhibitor). For [Figure 13](#), we convert the index to real USD.

We thank Christophe Spaenjers for the art data.

Stamps: Postage stamp catalogues and price lists have been published by the British stamp dealer Stanley Gibbons (SG) since 1865. Dimson and Spaenjers (2011) hand-collect data from these publications to construct an annual Great Britain (GB) stamp price index for 1900–2008. The index comprises the 50 most valuable stamps at the start of the twentieth century plus other stamps after they enter the top 50, and the index thereby grows to include 127 stamps in total. We chain-link our index to the SG GB250 Index for the period 2009–2016, and use the latest SG Concise GB catalogue to estimate the as-yet-unpublished 2017 value of the SG GB250. While catalogues can overstate market values, note that annualized index returns cannot be biased if the dealer adds a static margin to underlying market values. The index is denominated in GBP adjusted for UK inflation, but for [Figure 13](#), we convert it to real USD.

Wine: A long-term fine wine price index is estimated by Dimson, Rousseau and Spaenjers (2015). The index constituents are Premiers Crus (First Growth) wines from the five top producers in the Bordeaux region of France, namely Haut-Brion, Lafite-Rothschild, Latour, Margaux, and Mouton-Rothschild. The vintages are post-1855. The hand-collected dataset comprises 36,271 prices for standard bottles of wine from 1899–2012, all sourced from the auction house Christie's and from the wine dealer Berry Bros & Rudd. In recent years, cases (of a dozen bottles) of these wines have sold for as much as GBP 0.1 million. The authors apply a value-weighted arithmetic repeat-sales regression to the price pairs in the database to construct a price index in real GBP terms. The index is updated to 2017 using the Liv-ex Fine Wine 100 Index. Storage costs are ignored, as are insurance costs (estimated at 0.5% of value). For [Figure 13](#), we convert the index to real USD.

Violins: Rare musical instruments are represented in our index by violins, notably those built in the eighteenth century by Giuseppe Guarneri del Gesù and Antonio Stradivari, of which the best examples have sold at auction for above GBP10 million. To construct a price index, we extend the repeat-sales violin index estimated by Dimson and Spaenjers (2014) using data from Graddy and Margolis (2011, 2013). We lengthen the series using the musical instruments index in Coutts' (2017) Passion Index. The index is in USD and we adjust for US inflation. Investors, such as specialist funds, often lend their instruments to musicians as they best retain their acoustic properties if played. Maintenance and insurance costs (around 1% of the value) are usually covered by the player, not the investor.

We thank Kathryn Graddy for her violin data.

Financial returns

Long-term data for emotional assets is hard to assemble not only because reliable historical records are elusive, but also because of heterogeneity in the items that changed hands. Many indexes have been estimated over brief intervals for different types of collectible (Burton and Jacobsen, 1999). However, we focus our analysis on assets with a long history, and with records that are as good as one can access. To examine long-term investment performance, we therefore extend series that have been developed by us or a co-author, most of which run from 1900 to the present time. Our price indexes are described in [Boxes 1 and 2](#). The longest histories are for the first four passion investments (see [Box 1](#)): art, stamps, wine, and violins.

These treasure assets were already established as collectibles before the start of the 20th century, and our historical analysis is relatively less exposed to concerns about hindsight bias – the tendency for indexes to come into existence for investments that, in retrospect, proved to be profitable.

Our other histories for passion investments are in [Box 2](#). They comprise rare books, classic cars and jewelry. Rare books have been a passion investment for centuries, and we would have liked to incorporate a return series that starts at or before 1900. However, the only academic study of long-term book pricing of which we are aware is the Rudd and Zigrand (2017) paper – yet their carefully-constructed index spans only slightly longer than four decades, a period during which book-collecting was in the doldrums. We were also given access to the earlier Rudd (2009) index. We include books as an example of a collectible that had a mediocre financial return.

In contrast, historic cars have recently experienced escalating prices for the best examples. Interest in collectible automobiles has accelerated among UHNW investors. This increased interest has persuaded us to extend the universe we study to include these items, even though the longest available index, compiled by Hatlapa (2014), spans under four decades. We include cars as an example of a collectible that, in retrospect, generated above-average returns. It is hard to discern which collectibles will do best in the future, and we counsel caution to those tempted to extrapolate rare automobile prices into the future.

Finally, we include a relatively short history for jewelry – long an item that was collected, and often with passion. But not necessarily collected as an investment with the potential to generate a meaningful financial return.

[Figure 13](#) shows the cumulative price appreciation of our collectibles. The thinner, colored lines show the capital value of each collectible. Serving as a visual guide, the bold black line is the equally weighted average of the four indexes for which we have data running from 1900 to 2017.

The rare books index is rebased to the average of these four indexes at end-1974, the classic car index is rebased to the average of the same four indexes in 1980, and the jewelry index is similarly rebased at the start of 1986. Over the entire period, the bold black line is the simple average of the first four collectibles listed in [Box 1](#). Many of the original indexes are denominated in GBP, because these assets have historically been traded in London. However, these are portable, internationally traded assets, with buyers from around the world. We have therefore converted all indexes to USD, since this is the “global” currency. We then adjust the series for US inflation to give the real return to a US, or otherwise dollar-denominated, buyer.

Over the entire 118 years, the bold black line in [Figure 13](#) shows that the average collectible rose 30-fold in terms of purchasing power. This is equivalent to an annualized price appreciation of 2.9%. Of the four collectibles for which we have 118 years of data (those incorporated in the average), wine performed best, with an annualized price appreciation of 3.7%, while art experienced the lowest price appreciation of just 1.9% per year. Long-run art returns were thus broadly in line with the real returns on a portfolio of global bonds (2.0% per annum). [Figure 13](#) also shows the long run return, including reinvested dividends, on a global equity portfolio (5.2% per annum). Clearly, and not surprisingly, equities outperformed collectibles. Of the three series for which we have just shorter-run data, classic cars were the star performers, while rare books performed worst. We have already cautioned against extrapolating these returns.

Box 2

Price indexes in GBP for other treasure assets

Rare books: The price index for rare books was estimated by Rudd and Zigrand (2017) using UK and US auction records from rarebookhub.com, and with constituents ranging in value from <GBP1000 to >GBP1 million per book. By value, half the index constituents are books with an inflation-adjusted price of GBP 0.1 million. Individual copies can have attributes that substantial enhance or impair market value, and the authors address this by ensuring the sample of 1,904 repeat sales are of the exact same item. We use the index based on buyer’s prices (hammer price plus buyer’s premium) weighted by the value of each book. We convert to USD and adjusted for US inflation. The index spans 1974–2015.

We thank Jean-Pierre Zigrand for the Rudd–Zigrand data.

Classic cars: Historic cars are evaluated using the monthly HAGI (Historic Automobile Group International) Top Index. The index includes 50 models from 19 different marques; constituents comprise over 21,000 cars in or close to concours condition. Exceptional vehicles sell for over GBP 10 million and the index had an aggregate value in 2013 of GBP 13 billion. It is based on transaction prices from private sales, dealers and global auctions, omitting prices distorted by extraordinary features. During 2009–2017 the index is weighted by market capitalization (i.e. the value of each model multiplied by the number of extant vehicles); for 1980–2008 we use an equally weighted index reported by Hatlapa (2014). Insurance and depreciation is estimated at between 1% (Coutts 2014) and 2.5%–5% (Stanyer and Satchell 2018). For consistency with violins, we deem holding costs to be paid by the user, not by the owner. The index is GBP based, but we convert it to USD and adjust for US inflation.

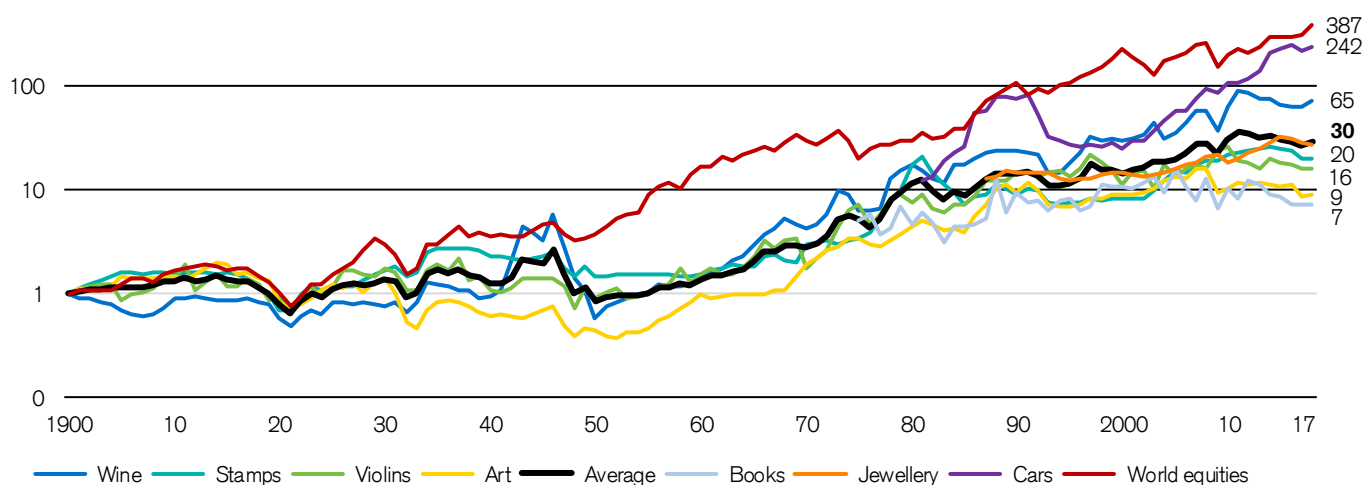
We thank Dietrich Hatlapa for the HAGI data.

Jewelry: A collection of personal ornaments is appraised monthly by Art Market Research (AMR). The index comprises adornments classified in four sectors: antique jewelry, belle époque and art deco jewelry, post-war jewelry, and pearl jewelry. There are ten constituents in each of the first three sectors, and five in the last sector (pearls). A detailed description is available on artmarketresearch.com. Index performance is measured in inflation-adjusted USD. The base date is the end of 1985.

We thank Sebastian Duthy for the AMR data.

Figure 13

Price indexes for collectibles in real USD, 1900–2017



Source: Dimson, Marsh, Spaenjers and Staunton

Figure 14 shows the long-run house price series for our 11 countries, in real, local currency terms. The starting value in 1900 is 100, and the terminal values are shown by the labels on the right-hand side. The corresponding annualized real returns are shown in the legend at the foot of the chart. Clearly, there is a wide dispersion between countries. Australian house prices rose the most, growing by a factor of 13 in terms of local purchasing power, an annualized real return of 2.2%. US homes went up the least, rising by a factor of just 1.39 over the 118 years, an annualized, real USD return of just 0.3%. The heavy black line shows the average experience across the 11 countries, namely a mean annualized real return of 1.3%.

House prices did not grow at a steady rate. The chart shows that over the first half of the 20th century, average house prices did not move at all in real terms. Prices started to rise in the 1950s, with an even stronger showing in the 1960s. However, the highest period of growth was from the mid-1990s until the eve of the Global Financial Crisis, when real house prices rose by 6.2% per year.

Various explanations have been put forward for the evolution of house prices over time. Knoll, Schularick and Steger (2017) decompose prices into the replacement cost of the dwelling and the value of its land parcel. They find that 80% of the increase in house prices since 1950 can be attributed to land prices. They argue that, before World War II, dramatic reductions in transport costs expanded the supply of land and suppressed prices. The lack of comparable advances in the second half of the 20th century, coupled with increased regulations on planning and land usage, pushed up land, and hence, house prices.

While these arguments seem sound, stocks, bonds, bills and collectibles also experienced much lower returns during the first half of the 20th century, compared with those achieved since 1950. We saw in Chapter 1 that low real interest rates tend to be associated with lower subsequent real returns on stocks and bonds. The real, risk-free interest rate is effectively the base line for the expected real return on other assets. This may also help explain the lower returns before 1950 on housing and land. Two world wars and The Great Depression also did little to boost asset returns in the first half of the 20th century.

Long-run returns from housing

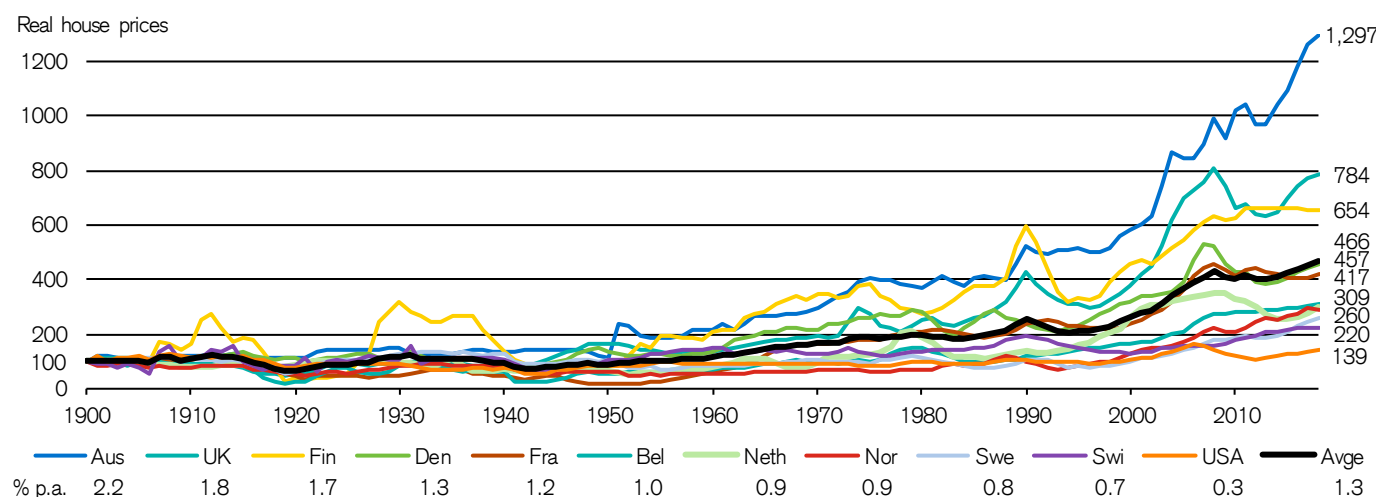
Collectibles and precious metals pay no dividends other than the pleasure and enjoyment owners gain from their collections. Houses are homes and may, like collectibles, bring enjoyment and utility to the owners that transcends monetary considerations. That said, numerous surveys show that virtually all home buyers view their purchasing decision as an investment. Furthermore, housing is different in that it also provides income. For dwellings that are rented out, there is rental income. For owner-occupiers, there is imputed income in the form of rent saved.

In seeking to assess housing as a long-run investment, we need to consider three factors: first, how the long-run price series presented above would have translated into a typical home owner's return experience; second, the quantum of the rental income; and third the risk.

(Extract from Chapter 4.)

Figure 14

Real price of domestic housing in 11 countries, 1900–2017



Sources: Dimson, Marsh and Staunton and see all the sources in Box 4 above

The windfall gain arguments are similar to those we have invoked to suggest that the equity risk premium will be lower in the future than historically (see [Chapter 2](#)). For housing, factors such as transportation costs, land scarcity in major cities, and planning regimes should now be fully encapsulated in house prices, since they are widely understood. Meanwhile, real interest rates remain low, suggesting that the returns on all risky assets will be correspondingly lower over the next few years. For the longer-run future, therefore, we anticipate that house prices will continue to provide an intermediate return and risk level between that on equities and on bonds.

Conclusion

We have assembled long-run records of the performance of private wealth investments, by which we mean durable, nonfinancial assets such as real estate or artworks. These investments are important emotionally since they include peoples' owner-occupied homes and their investments of passion such as collectibles. They are also important financially, and we have presented survey evidence that the value of these assets is, in aggregate, larger than the overall value of financial assets.

There is an important difference between private assets and the financial securities that are the primary focus of our research in the other chapters of this [Yearbook](#). The illiquidity of private investments forces the investor to take a long-term view. Transaction and custody costs for property and collectibles can be large compared to traded financial assets, and this means that the investment horizon should be long. We meet that challenge in this chapter by presenting and analyzing evidence spanning the last 118 years. We quantify returns from treasure assets – investments that do not normally offer a financial reward – and on real estate.

Among the passion investments held by wealthy investors are a wide range of collectibles. These assets reflect the tastes of individuals. A collector of fine sculptures may be unable to discern the beauty of an old postage stamp; a stamp collector may not be attracted to ownership of a barely road-worthy classic car; and both hobbies may be puzzling to someone who prefers to own precious metals. Collectible portfolios, then, must be far more tailored to investor preferences than stock-market portfolios. Yet most high net worth collectors say they are interested in the financial as well as the psychic benefits of their private assets. They are not hoarders and accumulators; they are investor-collectors.

We have documented the long-run performance of those assets for which we have a full 118-year returns history. The lack of income from emotional assets drags down their total return relative to stock-market investment. We have therefore made comparisons not only on a pre-tax basis, but also after taking account of the income tax payable by wealthy investors over the last century.



Shutterstock.com, Sergey Goryachev



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Shutterstock.com, Bodla Photo

An after-tax assessment shrinks the performance gap of cherished assets compared to financial ones. Valuable minerals are also held by high net worth investors. In contrast to passion investments, gold, silver, platinum and diamonds are more readily investible and generally have lower entry and exit costs. Precious metals appreciated strongly in the aftermath of the tech-crash at the start of the 21st century, but they have struggled over the long term to match the investment return on cash.

Even though gold has on average been resistant to the impact of inflation, the high volatility of valuable metals limits their utility as a safe-haven asset for times of economic trauma. There have been long periods when the gold investor was “under water” in real terms. Furthermore, while an inflation-protected portfolio may perform better when there is a shock to the general price level, during disinflationary periods such a portfolio can be expected to underperform, and few assets provide a hedge against deflation (only bonds can do this reliably).

Compared to traded securities, housing appears to be less sensitive to inflation (see the 2012 [Yearbook](#)), though the evidence here is clouded by the smoothed valuations for property. Since a long history of commercial real estate does not yet exist, we highlight the investment performance of residential housing.

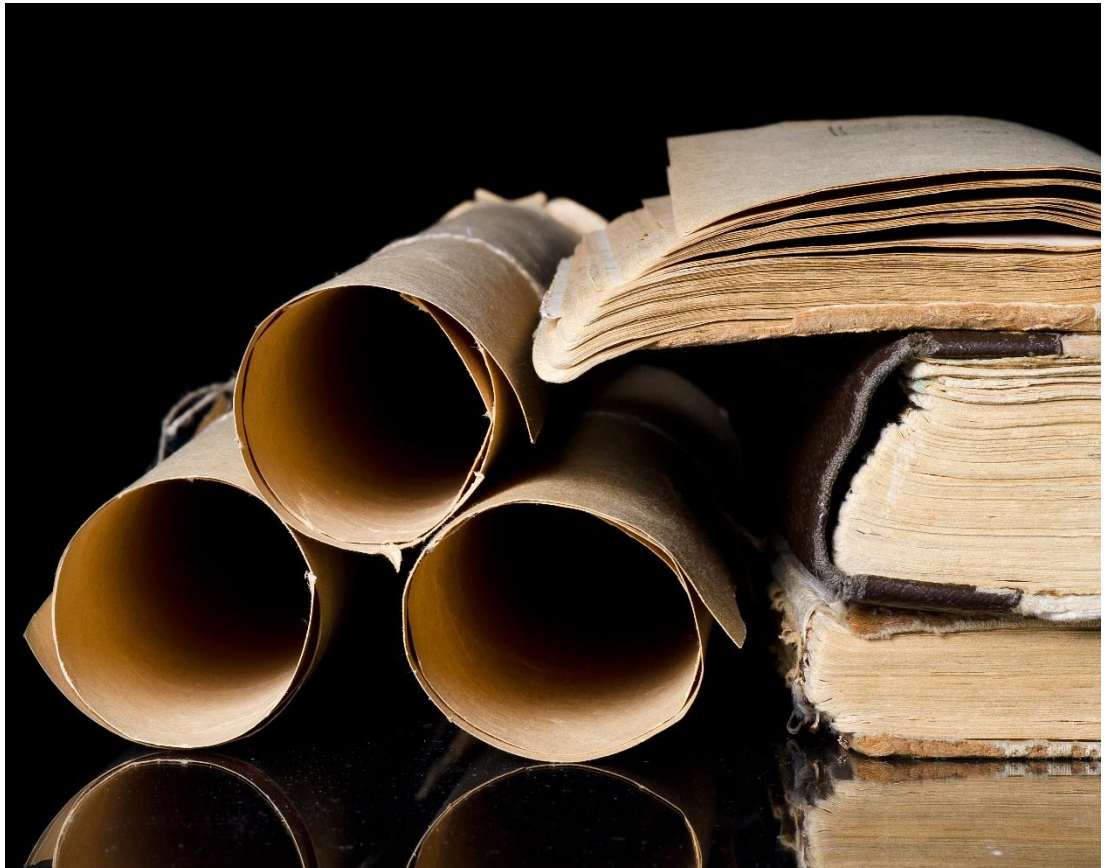
We base our estimates on housing indexes that are largely city-based. On a population-weighted basis, and extrapolating index coverage to rural as well as city locations, real house prices have appreciated by approximately 0.4% per year before costs and quality adjustments.

On a quality-adjusted basis, the net capital gain is approximately –2.1% per year in real terms. We have not risk-adjusted this estimate. However, since most owner-occupiers have very few homes, their portfolios will be undiversified, and they are unlikely to match the index’s return. They are likely to do better or worse than the index.

The case for private wealth assets is that they provide a mix of wealth conservation, financial diversification, and gratification. We support the view that a moderate allocation to tangible alternative assets is appropriate for high net worth investors, and that investment in private residences should be justified by the consumption benefits this provides.

Residential property should not be purchased with an exaggerated expectation of a large risk premium. It is equity assets that provide an expected reward for risk. The real case for equities is that, over the long term, stockholders have enjoyed a large equity risk premium.

[\(End of extract from Chapter 4.\)](#)





Chapter 5: Individual markets

The full 252-page report of the Credit Suisse Global Investment Returns Yearbook comprises 23 countries and three regions, all with index series that start in 1900. The markets comprise two North American nations (Canada and the USA), ten Eurozone states (Austria, Belgium, Finland, France, Germany, Ireland, Italy, the Netherlands, Portugal, and Spain), six European markets that are outside the euro area (Denmark, Norway, Russia, Sweden, Switzerland and the UK), four Asia-Pacific countries (Australia, China, Japan and New Zealand) and one African market (South Africa). In addition, there is a 23-country world index, a 22-country world ex-US index, and a 16-country European index. For each region, there are stock and bond indexes measured in US dollars and weighted by equity market capitalization and gross domestic product (GDP), respectively.

Our 23 countries represent 98% of world equity market capitalization at the start of 1900 and 91% of the investable universe in 2018. More details on the global coverage of the Yearbook and the sizes of each national market are provided in Chapter 1 (starting on page 6). The list of countries included in the Yearbook database has expanded over time, but has been stable since 2015. The underlying annual returns data are redistributed by Morningstar Inc.

Guide to countries and regions

In the full report of the Credit Suisse Global Investment Returns Yearbook, countries are listed alphabetically, followed by three regional groups. There are six pages per market (only three for China and Russia). Each market opens with a short historical overview and economic snapshot. We summarize the evolution of securities exchanges in each individual country, and spotlight a few financial descriptors of the economy in more recent times. We compare the local stock market with other markets around the world, identify industry sectors that are dominant in the country's stock exchange, and identify particular listed companies that are prominent in the national stock market.

The first page for each market includes an overview of the long-term investment performance, encapsulated in two charts. The left-hand chart reports the annualized real returns on equities, bonds and bills over this century, the last 50 years, and since 1900. For the latter two periods, the right-hand chart reports the annualized premiums achieved by equities relative to bonds and bills, by bonds relative to bills, and by the real exchange rate relative to the US dollar. (The periods covered differ for China and Russia, which have breaks in their market histories.)

On the second page for each market, we list our data sources, covering equities, bonds, bills, currencies, and inflation. The primary data sources are cited in the Reference list at the rear of this book. Additional bibliographic references may be found in *Triumph of the Optimists* and in our chapter in *The Handbook of the Equity Risk Premium*, which is listed in the references as Dimson, Marsh, and Staunton (2007).

Our data series are comprehensive. We cover five assets in each of 23 countries. For all 115 asset/market combinations, we estimate total returns for 118 years from the start of 1900 to the end of 2017 (with a gap for each of China and Russia).

Where possible, we use high-quality contemporary return indexes with broad coverage. We link these to data from peer-reviewed academic research or, alternatively, highly rated professional studies. Often we link together a sequence of indexes. We choose the best available indexes for each period, switching when feasible to superior alternatives, as these become available. All indexes incorporate reinvested income. Exchange rates are not described separately; where there is a choice of exchange rates, we use market rather than official rates.

A summary table follows the data description. This provides an overview of the asset returns and risk premiums for that market. For both nominal and real (inflation-adjusted) asset returns and for three risk-premium series, we show the geometric and arithmetic mean return, the standard error of the arithmetic mean, the standard deviation and serial correlation of annual returns and the lowest and highest annual return, together with the dates in which these extremes occurred. We also show the lowest and highest ten-year returns, together with the end-year for those returns, as well as the rank of the most recent year's returns (where the highest return has rank 1, and the lowest, for a country with

a complete history, has rank 118). These statistics are based on the entire period spanned by our study.

The third page for each market shows a graph of the real (inflation-adjusted) returns achieved on equities, bonds, and bills, together with the real exchange rate against the US dollar, all based at the start of 1900 to a value of one. The real exchange rate is defined as the nominal exchange rate against the dollar, adjusted by the inflation rate of the country relative to that of the USA. The vertical axis for these indexes is on the left-hand side of the graph; the scale is logarithmic. The lower part of this chart displays the individual yearly percentage returns on equities and on bonds. Returns are measured in real (inflation-adjusted) terms. The vertical axis for these year-by-year returns is on the right-hand side of the graph; it is an arithmetic scale. For countries with an unbroken history from 1900 to date, there are three further pages, which we describe next.

The fourth page for each market provides “return triangles” of the annualized real returns on each of the principal asset categories, the three premiums relating to equities, bonds, and bills, real and nominal exchange rates against the dollar, plus the annualized inflation rate. These returns span all multiples of a decade from one to twelve decades, including the (partial) decade we are in at present.

The “triangles” table presents returns over individual decades, and returns to date from an initial investment made at the start of 1900, 1910, and so on to the end of 2018. The triangles are divided into two groups of five. The five lower triangular tables on the left (the unshaded triangles) are read from top to bottom; for instance, the annualized real return for Australian equities from the start of 1910 to the start of 1930 was 8.6%. The five (shaded) upper triangular tables on the right are read from left to right; for instance, the annualized equity premium versus bonds for Australia during 1910–70 was 6.9%.

The penultimate page illustrates the dispersion of real returns. The upper chart displays the dispersion of real equity returns, and the lower chart, real bond returns. The vertical axis measures the real return, annualized over intervals of all possible length from 10 to 118 years. We depict the range of real returns that could be computed if data were used as at any year-end between 1909 and 2017. The horizontal axis shows the number of years used to compute the real return. For instance, at the left-hand side of the chart, located against a holding period of 10 years, is the range of ten-year real returns. This part of the chart embraces 109 estimates of the historical real return, where the latter is based on performance over the ten-year intervals 1900–09, 1901–10, and so on to 2007–16 and 2008–17.

The shaded areas run from the maximum (100th percentile) all the way down to the minimum (the 0th percentile) of the distribution of estimated real returns. The depth of the shading denotes five components of the distribution of returns. The top decile (the darker shaded area) represents favorable returns that occur one-tenth of the time. The top quartile (the lighter and darker shaded areas, taken

together) represents favorable returns that occur one-fourth of the time. The interquartile range (the unshaded area in the middle of the chart) represents the middle half of the distribution of returns. The bottom quartile (the lighter and darker shaded areas, taken together) represents unfavorable returns that occur a quarter of the time. The bottom decile (the darker shaded area) represents unfavorable returns that occur one-tenth of the time. The yellow line at the center of the interquartile range shows the median, which is out- or under-performed one-half of the time. The thicker, blue line displays the returns for periods that conclude at the end of 2017. More details are in Dimson, Marsh, and Staunton (2004a).

The final page is split into two halves. The upper half contains a histogram displaying the range of realized annual equity premiums relative to bills. This histogram shows not only the distribution of historical risk premiums, but also the precise years in which premiums of various magnitudes occurred. The premium highlighted in blue corresponds to the year 2017. The premiums highlighted in turquoise are for the years 2000–16. The lower half of the final page lists index levels and returns for all the asset series in nominal and real terms. In this table, index values are provided at intervals of one decade from 1900 to 2010, and then for each year from the start of 2016. Annual percentage returns are also listed for each complete calendar year, from 2005 to date.

As mentioned above, our data descriptions indicate for each country the primary information sources we have used. Additional references may be found in *Triumph of the Optimists* and in Dimson, Marsh, and Staunton (2007). In the case of the United Kingdom, we have constructed an authoritative set of long-run equity, bond, and bill indexes, and the explanation of the primary information sources is built into the country chapter itself. Instead of following the usual six-page format, the data description section for the UK chapter is longer than for other countries, and the UK chapter concludes with a multi-page data listing. Finally, we present three trans-national markets. These are our world market index for all 23 countries, a world index that excludes the USA, and a Europe-only index. Since these indexes are computed from the data for other assets, the world indexes have some special attributes that are described in the text at the start of each of these chapters.

We follow a policy of continuous improvement with our data sources, introducing new countries where this becomes feasible, and switching to superior index series as they become available or when we become aware of them. This year, we have changed our French bills series, revised our Portuguese bond series as well as made minor revisions to our US inflation series.

The following seven individual-market pages provide a cross-section of markets for comparative purposes. Please refer to the full report of the *Credit Suisse Global Investment Returns Yearbook* for the complete analysis of all 23 countries and three regions.

China

The biggest economy



Despite the occasional wobble, China's economic expansion has had a huge cumulative impact. Measured using PPP exchange rates, China now has the world's largest GDP according to the International Monetary Fund. The world's most populous country, China has over 1.3 billion inhabitants, and more millionaires and billionaires than any country other than the USA.

After the Qing Dynasty, it became the Republic of China (ROC) in 1911. The ROC nationalists lost control of the mainland at the end of the 1946–49 civil war, after which their jurisdiction was limited to Taiwan and a few islands. Following the communist victory in 1949, privately owned assets were expropriated and government debt was repudiated.

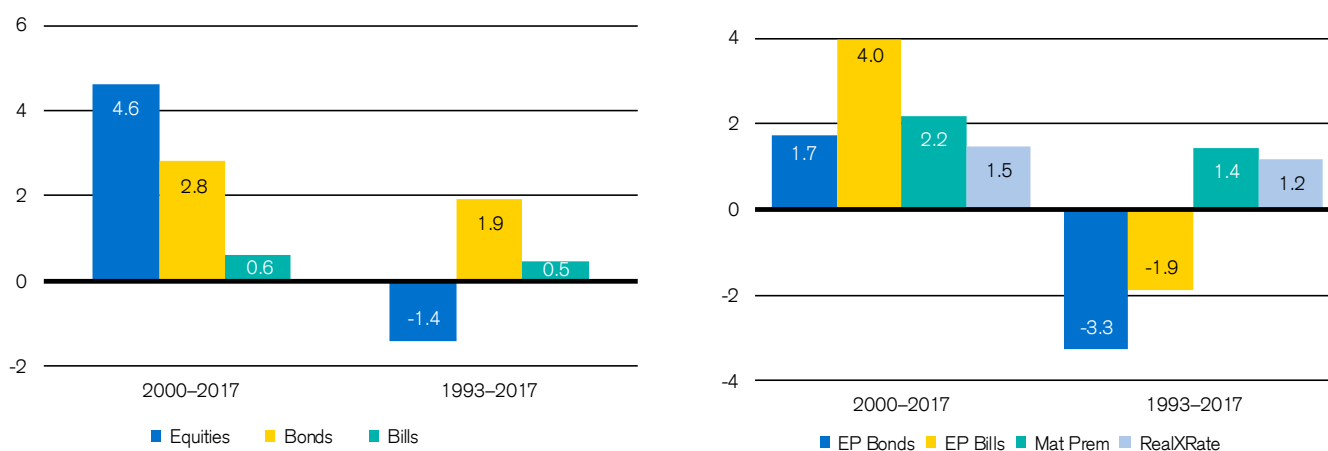
The People's Republic of China (PRC) has been a single-party state since then. We therefore distinguish between (1) the Qing period and the ROC, (2) the PRC until economic reforms were introduced, and (3) the modern period following the second stage of China's economic reforms of the late 1980s and early 1990s.

The communist takeover generated total losses for local investors, although a minuscule proportion of foreign assets retained some value (some UK bondholders received a tiny settlement in 1987). Chinese returns from 1900 are incorporated into the world and world ex-US indexes, including the total losses in the late 1940s.

As discussed in the 2014 Yearbook, China's GDP growth was not accompanied by superior investment returns. Nearly one-third (33%) of the Chinese market's free-float investible capitalization is represented by financials, mainly banks and insurers. Tencent Holdings is the biggest holding in the FTSE World China index, followed by Alibaba Group, China Construction Bank, the Industrial and Commercial Bank of China and then China Mobile.

Figure 15

Annualized real returns on asset classes, (l.h.s.) and risk premiums (r.h.s.) for China, 1993–2017 (%)



Note: Equities are total returns, including reinvested dividend income. Bonds are total return, including reinvested coupons, on long-term government bonds. Bills denotes the total return, including any income, from Treasury bills. All returns are adjusted for inflation and are expressed as geometric mean returns.

Note: EP Bonds denotes the equity premium relative to long-term government bonds; EP Bills denotes the equity premium relative to Treasury bills; Mat Prem denotes the maturity premium for government bond returns relative to bill returns; and RealXRate denotes the real (inflation-adjusted) change in the exchange rate against the US dollar.

Source: Elroy Dimson, Paul Marsh and Mike Staunton, *Triumph of the Optimists*, Princeton University Press, 2002, and subsequent research.

Japan

Birthplace of futures



Looking forward, Japan is ranked by the Future Brand Index as the world's number one country brand. But futures have a long history in financial markets and, by 1730, Osaka started trading rice futures. The city was to become the leading derivatives exchange in Japan (and the world's largest futures market in 1990 and 1991), while the Tokyo Stock Exchange, founded in 1878, was to become the leading market for spot trading.

From 1900 to 1939, Japan was the world's second-best equity performer. But World War II was disastrous and Japanese stocks lost 96% of their real value. From 1949 to 1959, Japan's "economic miracle" began and equities gave a real return of 1,565% over this period. With one or two setbacks, equities kept rising for another 30 years.

By the start of the 1990s, the Japanese equity market was the largest in the world, with a 41% weighting in the world index compared to 30% for the USA. Real estate values were also riding high: a 1993 article in the *Journal of Economic*

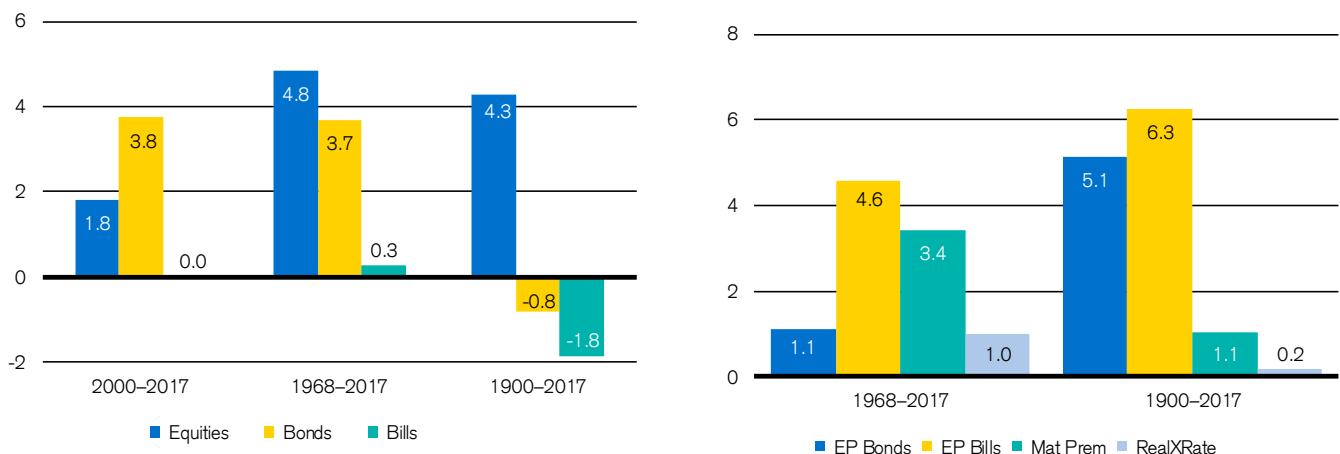
Perspectives reported that, in late 1991, the land under the Emperor's Palace in Tokyo was worth about the same as all the land in California.

Then the bubble burst. From 1990 to the start of 2009, Japan was the worst-performing stock market. At the start of 2018, its capital value is still close to one-third of its value at the beginning of the 1990s. Its weighting in the world index fell from 41% to 9%. Meanwhile, Japan has suffered a prolonged period of stagnation, banking crises and deflation. Hopefully, this will not form the blueprint for other countries.

Despite the fallout after the asset bubble burst, Japan remains a major economic power. It has the world's second-largest equity market as well as its second-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. One-quarter of the market comprises consumer goods.

Figure 16

Annualized real returns on asset classes (l.h.s.) and risk premiums (r.h.s.) for Japan, 1900–2017 (%)



Note: Equities are total returns, including reinvested dividend income. Bonds are total return, including reinvested coupons, on long-term government bonds. Bills denotes the total return, including any income, from Treasury bills. All returns are adjusted for inflation and are expressed as geometric mean returns.

Note: EP Bonds denotes the equity premium relative to long-term government bonds; EP Bills denotes the equity premium relative to Treasury bills; Mat Prem denotes the maturity premium for government bond returns relative to bill returns; and RealXRate denotes the real (inflation-adjusted) change in the exchange rate against the US dollar.

Source: Elroy Dimson, Paul Marsh and Mike Staunton, *Triumph of the Optimists*, Princeton University Press, 2002, and subsequent research.

Switzerland

Traditional safe haven



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 in the global financial stakes.

The Swiss stock market traces its origins to exchanges in Geneva (1850), Zurich (1873), and Basel (1876). It is now the world's eighth-largest equity market, accounting for 2.7% 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 one of the world's three best-performing government bond markets, with an annualized real return of 2.3%. The country also had the world's lowest 118-year inflation rate of just 2.2%.

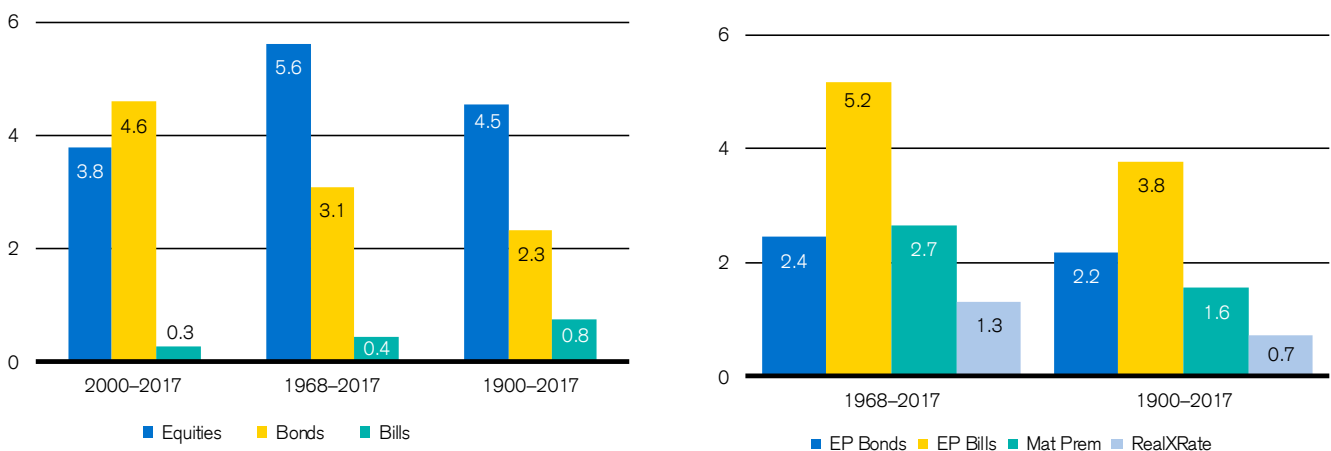
Switzerland is one of the world's most important banking centers, and private banking has been a major Swiss competence for over 300 years. Swiss neutrality, sound economic policy, low inflation and a strong currency have bolstered the country's reputation as a safe haven.

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

Switzerland's pharmaceutical sector accounts for a third (32%) of the value of the FTSE Switzerland index. Nestle (21%), and Novartis and Roche (each 15%) together account for over half of the index's value.

Figure 17

Annualized real returns on asset classes (l.h.s.) and risk premiums (r.h.s.) for Switzerland, 1900–2017 (%)



Note: Equities are total returns, including reinvested dividend income. Bonds are total return, including reinvested coupons, on long-term government bonds. Bills denotes the total return, including any income, from Treasury bills. All returns are adjusted for inflation and are expressed as geometric mean returns.

Note: EP Bonds denotes the equity premium relative to long-term government bonds; EP Bills denotes the equity premium relative to Treasury bills; Mat Prem denotes the maturity premium for government bond returns relative to bill returns; and RealXRate denotes the real (inflation-adjusted) change in the exchange rate against the US dollar.

Source: Elroy Dimson, Paul Marsh and Mike Staunton, *Triumph of the Optimists*, Princeton University Press, 2002, and subsequent research.

United Kingdom

Global center for finance



Organized stock trading in the United Kingdom dates from 1698, and the London Stock Exchange was formally established in 1801. By 1900, the UK equity market was the largest in the world, and London was the world's leading financial center, specializing in global and cross-border finance. Early in the 20th century, the US equity market overtook the UK and, nowadays, New York is a larger financial center than London. What continues to set London apart, and justifies its claim to be the world's leading international financial center, is the global, cross-border nature of much of its business.

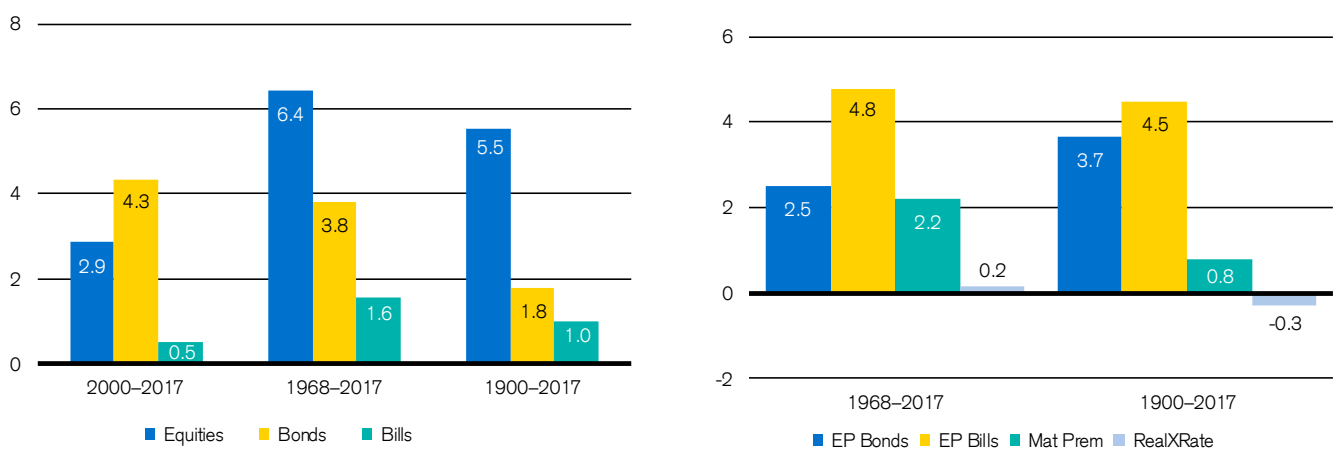
Today, London is ranked as the top financial center in the Global Financial Centers Index, Worldwide Centers of Commerce Index, and Forbes' ranking of powerful cities. It is the world's banking center, with 550 international banks and 170 global securities firms having offices in London. The UK's foreign exchange market is the biggest in the world, and Britain has the world's number-three stock market, number-three insurance market, and the fourth-largest bond market.

London is the world's largest fund management center, managing almost half of Europe's institutional equity capital and three-quarters of Europe's hedge fund assets. More than three-quarters of Eurobond deals are originated and executed there. More than a third of the world's swap transactions and more than a quarter of global foreign exchange transactions take place in London, which is also a major center for commodities trading, shipping and many other services.

Royal Dutch Shell is the largest UK stock by market capitalization. Other major companies include British American Tobacco, BP, HSBC, Diageo, Glaxo SmithKline, and Astra Zeneca.

Figure 18

Annualized real returns on asset classes (l.h.s.) and risk premiums (r.h.s.) for the UK, 1900–2017 (%)



Note: Equities are total returns, including reinvested dividend income. Bonds are total return, including reinvested coupons, on long-term government bonds. Bills denotes the total return, including any income, from Treasury bills. All returns are adjusted for inflation and are expressed as geometric mean returns.

Note: EP Bonds denotes the equity premium relative to long-term government bonds; EP Bills denotes the equity premium relative to Treasury bills; Mat Prem denotes the maturity premium for government bond returns relative to bill returns; and RealXRate denotes the real (inflation-adjusted) change in the exchange rate against the US dollar.

Source: Elroy Dimson, Paul Marsh and Mike Staunton, *Triumph of the Optimists*, Princeton University Press, 2002, and subsequent research.

United States

Financial superpower



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. The International Energy Agency predicted recently that the USA could pass Saudi Arabia in 2018 to become the world's number one oil producer.

The USA is also a financial superpower. It has the world's largest economy, and the dollar is the world's reserve currency. Its stock market accounts for 51% of total world value (on a free-float, investible basis), which is six times as large as Japan, its closest rival. The USA also has the world's largest bond market.

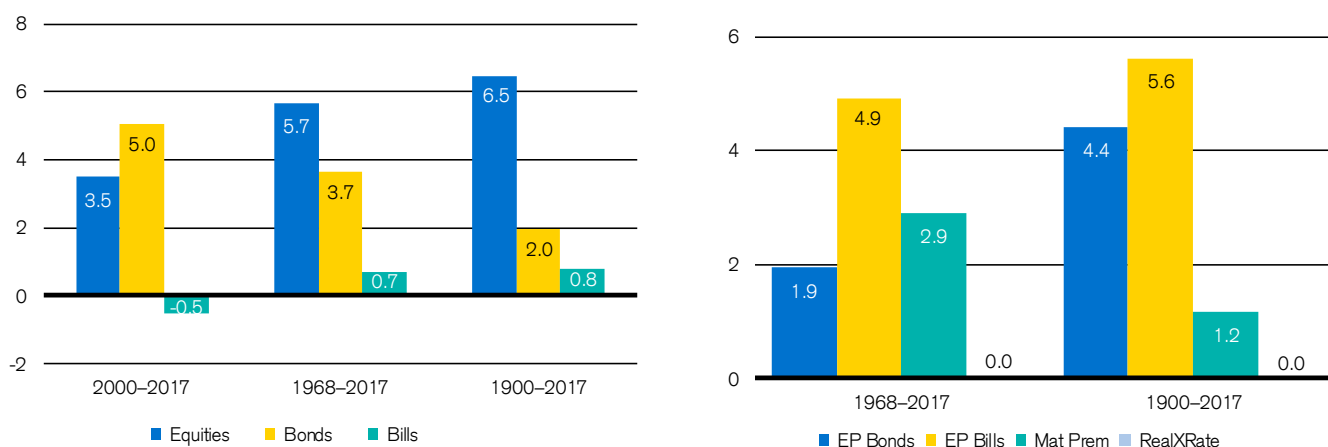
US financial markets are by far the best-documented in the world and, until recently, most of the long-run evidence cited on historical investment performance drew almost exclusively on the US experience. Since 1900, equities and government bonds in the USA have given annualized real returns of 6.5% and 2.0%, respectively.

There is an obvious danger of placing too much reliance on the excellent long-run past performance of US stocks. The New York Stock Exchange traces its origins back to 1792. At that time, the Dutch and UK stock markets were already nearly 200 and 100 years old, respectively. Thus, in just a little over 200 years, the USA has gone from zero to more than a majority share of the world's equity markets.

Extrapolating from such a successful market can lead to "success" bias. Investors can gain a misleading view of equity returns elsewhere, or of future equity returns for the USA itself. That is why this Yearbook focuses on global investment returns, rather than just US returns.

Figure 19

Annualized real returns on asset classes (l.h.s.) and risk premiums (r.h.s.) for the USA, 1900–2017 (%)



Note: Equities are total returns, including reinvested dividend income. Bonds are total return, including reinvested coupons, on long-term government bonds. Bills denotes the total return, including any income, from Treasury bills. All returns are adjusted for inflation and are expressed as geometric mean returns.

Note: EP Bonds denotes the equity premium relative to long-term government bonds; EP Bills denotes the equity premium relative to Treasury bills; Mat Prem denotes the maturity premium for government bond returns relative to bill returns; and RealXRate denotes the real (inflation-adjusted) change in the exchange rate against the US dollar.

Source: Elroy Dimson, Paul Marsh and Mike Staunton, *Triumph of the Optimists*, Princeton University Press, 2002, and subsequent research.

World

Globally diversified



It is interesting to see how the Credit Suisse Global Investment Returns Yearbook countries have performed in aggregate over the long run. We have therefore created an all-country world equity index denominated in a common currency, in which each of the 23 countries is weighted by its starting-year equity-market capitalization.

We also compute a similar world bond index, weighted by GDP. These indexes represent the long-run returns on a globally diversified portfolio from the perspective of an investor in a given country. The charts below show the returns for a US global investor. The world indexes are expressed in US dollars, real returns are measured relative to US inflation, and the equity premium versus bills is measured relative to US Treasury bills.

Over the 118 years from 1900 to 2017, the left-hand chart shows that the real return on the world index was 5.2% per year for equities and 2.0% per year for bonds. The right-hand chart shows that the world equity index had an annualized equity risk premium, relative to Treasury bills,

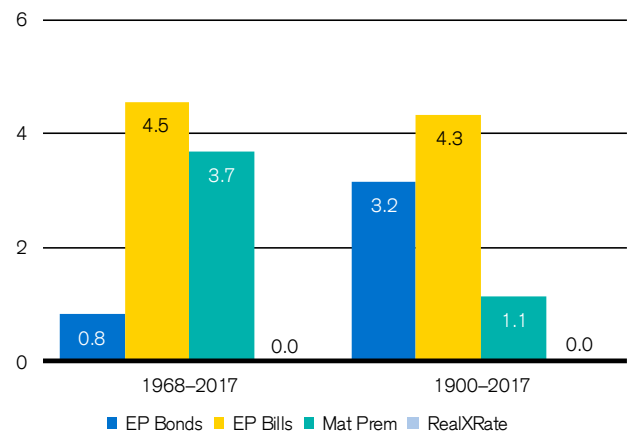
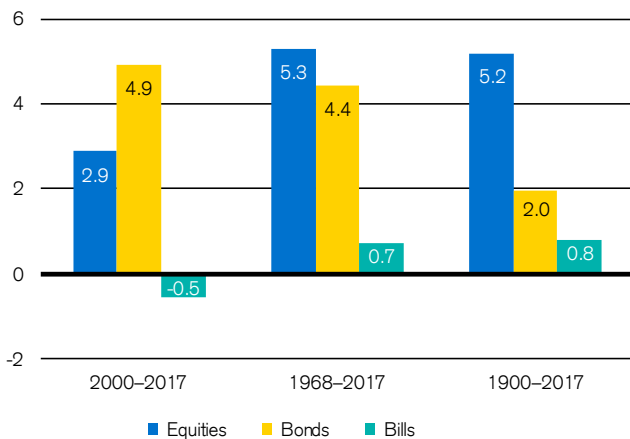
of 4.3% over the last 118 years, and a similar premium of 4.5% per year over the most recent 50 years.

We follow a policy of continuous improvement with our data sources, introducing new countries when feasible, and switching to superior index series as they become available. Most recently, we have added Austria, Portugal, China and Russia. Austria and Portugal have a continuous history, but China and Russia do not.

To avoid survivorship bias, all these countries are fully included in the world indexes from 1900 onward. Two markets register a total loss – Russia in 1917 and China in 1949. These countries then re-enter the world indexes after their markets reopened in the 1990s.

Figure 20

Annualized real returns on asset classes (l.h.s.) and risk premiums (r.h.s.) for the World index, 1900–2017 (%)



Note: Equities are total returns, including reinvested dividend income. Bonds are total return, including reinvested coupons, on long-term government bonds. Bills denotes the total return, including any income, from Treasury bills. All returns are adjusted for inflation and are expressed as geometric mean returns.

Note: EP Bonds denotes the equity premium relative to long-term government bonds; EP Bills denotes the equity premium relative to Treasury bills; Mat Prem denotes the maturity premium for government bond returns relative to bill returns; and RealXRate denotes the real (inflation-adjusted) change in the exchange rate against the US dollar.

Source: Elroy Dimson, Paul Marsh and Mike Staunton, *Triumph of the Optimists*, Princeton University Press, 2002, and subsequent research.

Europe

The Old World



The Yearbook documents investment returns for 16 European countries, most (but not all) of which are in the European Union. They comprise ten EU states in the Eurozone (Austria, Belgium, Finland, France, Germany, Ireland, Italy, the Netherlands, Portugal, and Spain), three EU states outside the Eurozone (Denmark, Sweden and the UK), two European Free Trade Association states (Norway and Switzerland), and the Russian Federation. Loosely, we might argue that these 16 countries represent the Old World.

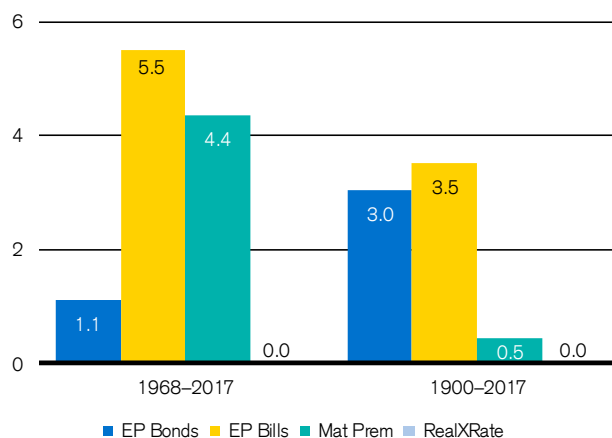
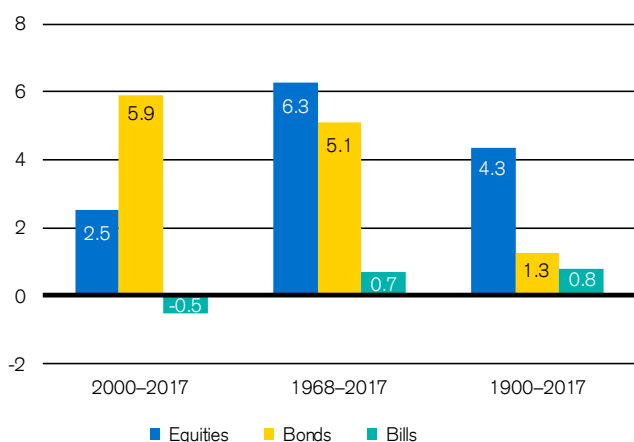
It is interesting to assess how well European countries as a group have performed, compared with our world index. We have therefore constructed a 16-country European index using the same methodology as for the world index. As with the latter, this European index can be designated in any desired common currency. For consistency, the figures on this page are in US dollars from the perspective of a US international investor.

The left-hand chart below shows that the real equity return on European equities was 4.3%. This compares with 5.2% for the world index, indicating that the Old World countries have underperformed. This may relate to some nations' loss of imperial powers and colonial territories, the destruction from the two world wars (where Europe was at the epicenter), the fact that many New World countries were resource-rich, or perhaps to the greater vibrancy of New World economies.

We follow a policy of continuous improvement with our data sources, introducing new countries when feasible, and switching to superior index series as they become available. As we noted above, we recently added three new European countries, Austria, Portugal and Russia. Two of them have a continuous history, but Russia does not; however, all of them are fully included in the Europe indexes from 1900 onward, even though Russia registered a total loss in 1917. Russia re-enters the Europe index after its markets reopened in the 1990s.

T 21

Annualized real returns on asset classes (l.h.s.) and risk premiums (r.h.s.) for Europe, 1900–2017 (%)



Note: Equities are total returns, including reinvested dividend income. Bonds are total return, including reinvested coupons, on long-term government bonds. Bills denotes the total return, including any income, from Treasury bills. All returns are adjusted for inflation and are expressed as geometric mean returns.

Note: EP Bonds denotes the equity premium relative to long-term government bonds; EP Bills denotes the equity premium relative to Treasury bills; Mat Prem denotes the maturity premium for government bond returns relative to bill returns; and RealXRate denotes the real (inflation-adjusted) change in the exchange rate against the US dollar.

Source: Elroy Dimson, Paul Marsh and Mike Staunton, *Triumph of the Optimists*, Princeton University Press, 2002, and subsequent research.

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The complete list of references is provided in the full report, [Credit Suisse Global Investment Returns Yearbook 2018](#).

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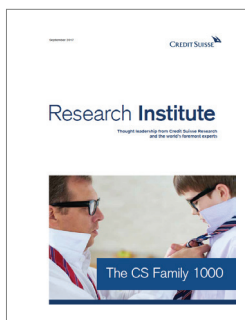
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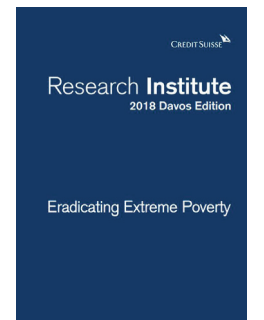
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