SECTION 3

Centuries of US and Global Returns

CHAPTER 10. US STOCKS AND BONDS BEFORE 1926

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Roger Ibbotson and Rex Sinquefield's "Stocks, Bonds, Bills, and Inflation: Year-by-Year Historical Returns (1926–1974)" (Ibbotson and Sinquefield 1976) can fairly be said to have launched the history of capital market returns as we know it today, influencing a generation of future scholars who came of age after its publication. As it became established through the annual publication of increasingly prominent Stocks, Bonds, Bills, and Inflation (SBBI®) yearbooks, historical inquiry began to widen beyond the calculation of risk premiums to include broader questions of what I will call "stationarity." For instance, by the 1990s, one could read in the financial press that since 1926, stocks have returned about 10% per year. Had it always been that way? Or had stock returns been different in the nineteenth century? In the same vein, the twentieth century saw a return on equities about 5 percentage points per year higher than on long-term bonds.[1] Had stocks always beat bonds by that much?

Jeremy Siegel (1994, 2022) gave a preliminary answer based on the early compilers of data that were available to him. He found stationary results back through the nineteenth century, reporting that the long-term return on stocks had always been between 6.5% and 7% in real (inflation-adjusted) terms, corresponding to the 10% nominal return seen in SBBI starting in 1926. And he found that stocks had almost always returned considerably more than bonds over multidecade holding periods. In time, Siegel's narrative came to be widely accepted. In his telling, the complete financial history of the United States appeared to be a superset of the period starting in 1926 that is chronicled in SBBI, not different in any material respect.

Unfortunately, some of Siegel's sources proved to be problematic. He relied on Smith and Cole (1935), Macaulay (1938), and Cowles (1939).[2] More recent data collection has challenged his synthesis.

Return to Primary Sources

New data collection began to gather steam in the late 1990s. Goetzmann, Ibbotson, and Peng (2001) were the first researchers in the 60 years since Cowles (1939) to go back to primary sources for nineteenth century data. They identified a key publication from 1815: *The New York Shipping and Commercial List*.[3] It recorded stock prices on the New York Stock Exchange and starting in 1825 regularly reported dividends. None of Siegel's sources prior to Cowles (1939),

[1] In the formal academic literature, "equity excess return" generally refers to the return in excess of short-term Treasury bills. Here, however, we mean the return in excess of long-term Treasury bonds.

[2] Other compilers drawing on these resources include Ibbotson, Siegel, and Love (1985) and Ibbotson and Brinson (1987, 1991).

[3] The first page of the issue for 21 February 1815 is reproduced in Forsyth (1964, p. 48). It shows stock prices from the day before, with 17 stocks listed, mostly bank and insurance firms, 13 of which included a price, along with four federal bonds and two city issues.

with his 1871 start date, had compiled a dividend series; early editions of Siegel had to infer dividend yields for 1802–1870.

Tabulation of prices and returns compiled by the Goetzmann team first appeared in Goetzmann et al. (2001). In fact, Siegel (2014) switched to their series for the 1825–70 period beginning with the fifth edition of his book.

As decades passed, limits of the Goetzmann et al. (2001) return series began to emerge.

- They did not find sufficient information on the capitalization of the stocks included and chose to use price weighting to calculate their index.
- The dividend record had many omissions.
- In the early years, a good proportion of stock trading took place on the street, after the auction calls on the exchange had identified who might want to buy or sell at what price. Confining the newspaper record to a single publication reporting the official record, as the Goetzmann team did, obscured the extent of early stock trading.
- The team also made the choice to compile only end-of-month prices. Because many stocks in the era did not trade every week or even every month—and certainly not in the official record—the Goetzmann et al. (2001) price record proved quite sparse relative to what could be found using a more relaxed criterion.[4]
- Last, the team projected the twentieth century dominance of the New York Stock Exchange back in time to the beginning. It later became apparent that before the Civil War, New York was only one stock market among several, with stocks listed on other exchanges accounting for the majority.

The next key data collection effort, which became available some years after Goetzmann et al. (2001), was led by Richard Sylla of New York University. Sylla undertook a broader canvas of newspapers back to the 1790s and searched for stock trading records in Philadelphia, Boston, and Baltimore, as well as New York (Sylla, Wilson, and Wright 2005).[5] Notably, the Sylla team also compiled federal, municipal, and corporate bond prices. Finally, the Sylla team took a catholic approach to stock price collection, not confining themselves to official exchange reports, end-of-month trades, or trade prices at all but also accepting bid–ask quotes and dealer price sheets as they appeared. They compiled a roughly weekly price series, with some stocks having an entry almost every week and others featuring a sparser record.

The resulting price record dramatically expanded the pre-1860 compilation of Goetzmann et al. (2001), with dozens of stocks in contrast to their handful and hundreds when they had dozens, as well as good coverage back an additional two decades to the early 1790s across multiple exchanges.

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[4] Thus, the Goetzmann et al. (2001) file has price quotes for only 7 of the 13 stocks with prices in the 21 February 1815 issue of the *New York Shipping and Commercial List*, which would not have been end of month.

[5] There were still other exchanges, and US stocks also traded in London, but these three markets in addition to New York accounted for the bulk of the record.

The new Sylla et al. (2005) record suffered from several of the same limits as the Goetzmann et al. (2001) record, however: There was still no information on share count to allow weighting of returns by market capitalization and in the Sylla case, no dividend compilation at all. The Sylla team also chose to leave the price record in raw form and did not construct an index as the Goetzmann team had done.

Arriving on the scene two decades later, I enjoyed a crucial advantage over previous compilers: the ongoing digitization of (almost) everything. It was no longer necessary to send teams of research assistants into the dusty archives to turn the pages of crumbling newspapers and peruse them one by one in search of a dividend announcement or stock price. Historical newspaper databases had proliferated, with vast quantities of scanned text now searchable by keyword. And not only newspapers: I found almanacs, registers, municipal histories, railroad manuals, and more in one digital archive or another.

Given these new resources, I set out to cull and curate the raw Sylla price data into a capitalization-weighted index of price return, using almanacs and other resources to track down the share counts that had been missing from prior work. I also found that the custom in the early decades was to publish a dividend announcement in the format of what we would call a classified ad. A simple keyword search, pursued across cities and years, in conjunction with early dividend compilations dating to 1819, produced hundreds of additional dividends to supplement those in the Goetzmann et al. (2001) database. Using the newly collected data, I constructed a capitalization-weighted index of total return for a broad stock market index dating from January 1793, which I linked first to the Cowles (1939) record beginning in 1871 and then to the CRSP record at the end of 1925, producing a stock return series now more than 230 years in length (McQuarrie 2024a).

Stock returns are generally best reported on a closing-price to closing-price basis (month-end close in the case of monthly data). In constructing pre-1926 stock returns, however, I found that in many cases, stock prices were reported infrequently, either because the stocks themselves traded infrequently or for other reasons, such as delayed or insufficient reporting. Given these constraints, I had to resort to other methods. Because close-of-year quotes are not always available, any December quote that is available could be out of date and not capture the year-end total return. So, I used January because it does capture the year-end; and to arrive at a January quote, I took an average of the price quotes in January or an average of the January low and high, depending on the source. As a result, returns reported for a given year—say, 1793—are January 1793 to January 1794.

In the spirit of SBBI, I also set out to compile a bond return index that could be compared to the new stock return index, allowing an assessment of the excess return on equities over a much longer timespan. On the first pass, I included corporate bonds, which began to appear in the 1830s and which dominated trading in the US fixed-income markets from the 1880s until World War I (McQuarrie 2024a). However, I received criticism that corporate bonds, with their idiosyncratic risks, were inappropriate in studies of the equity excess return or risk premium. I later redid my bond index to consist exclusively of government bonds, targeting a maturity of

20 years, which could be linked to the SBBI long government bond series that starts in January 1926 (McQuarrie 2024b).[6]

The remainder of this chapter examines these updated two-century records of stock and bond returns in the United States, with a focus on stationarity: what elements stay the same across the December 1925 boundary and what aspects are different or distinctive in the newly compiled pre-1926 record.

Comparability of Pre-1926 and Post-1926 Data

Before proceeding to the new pre-1926 data, the reader needs to be cautioned about the data's comparability to the post-1926 SBBI data compiled by Ibbotson and Sinquefield. The SBBI data begin in 1926 for a reason. Ibbotson and Sinquefield believed that the stock market was different enough in the early twentieth century that collecting data from that period might be fruitless or misleading. To go back yet another 50 or 100 years would mean studying a very different stock market. If anything, the government bond market of the 1800s was even more alien, relative to the vast, liquid twentieth century Treasury market, with its fully populated maturity spectrum and a minimum of risk.

At the beginning of the nineteenth century, the United States was an emerging nation and its bonds, although guaranteed by the full faith and credit of the Treasury, then as now, can hardly be treated as risk-free instruments.[7] There were only a few bonds outstanding at any point, almost all bonds were long bonds at issue, and early bonds had no stated maturity. There were no Treasury bills. Under the gold standard, a Treasury default was both conceivable and something to be feared. A Treasury bond was designed to pay in gold and be redeemed for gold. If the government vaults did not have enough gold—and there were several close calls in the nineteenth century—default would occur, in a way that cannot happen under today's fiat currency, which can be printed as needed. In short, whether issued by the government or not, these bonds should be regarded entirely as *risky* instruments, in no way a proxy for the risk-free rate of return.

The stock returns that follow are, like today's returns, based on the common shares of enterprises that were legally structured in much the same way as today's corporations. Thus, at first glance, the stocks of 1825 look more similar to today's stocks than the government bonds of 1825 do to today's bonds.

But a closer examination reveals a wider gap. By 1926, there was a Standard Statistics index of 90 stocks spread across several dozen sectors, along with well-populated Dow Jones averages separately calculated for industrial, railroad, and utility stocks. A hundred years prior, however, there were just a few dozen banks, each (other than the Second Bank of the United States) a single-branch local bank, along with a couple of canals and a scatter

[6] In this second effort, I drew primarily on the compilation of Hall, Payne, and Sargent (2018), who had assembled and organized federal bond data from the beginning through 1925 using the Sylla et al. (2005) compilation, the *Commercial and Financial Chronicle*, and other sources.

[7] There are also gaps in the series for which municipal bonds had to be substituted for Treasuries (McQuarrie 2024b).

of turnpikes.[8] The entire transportation sector had the capitalization of a single large city bank at that time.

Later, by 1850, banks no longer traded on the exchanges, canals and turnpikes had succumbed to railroads, and the US stock market consisted of a single sector: railroads. Railroad stocks would dominate exchange listings until the 1890s, when industrials began to proliferate. There is a good reason the Dow Jones Industrial Average dates back only to 1896: Before that point, there were not enough industrials trading in New York City to make up an index.

Just as a Treasury bond with no maturity date issued by an emerging nation under the gold standard is very different from a US Treasury bond in 2025, so also a 26-mile single track railroad running between Boston and Lowell, Massachusetts, is very different from a company such as Sears, Roebuck & Co., selling every product imaginable to a nationwide market. And perhaps even more so, a local bank in Philadelphia is different from a global bank, such as JPMorgan Chase.

After some debate, I decided to present the data on stock and bond returns before 1926, for what they are worth, on the theory that it is better to make them available for the reader to scrutinize than to ignore or exclude them—caveat lector.

Equity and Bond Returns Compared

Exhibit 10.1 shows real wealth indices for stocks and bonds, assuming an investment of $1 in January 1793 held through December 2023, with a vertical line drawn at 31 December 1925.

It is apparent at a glance that stock and bond returns look very different on either side of the year-end 1925 line. On the more familiar right side, stocks return far more than bonds, as the two wealth lines diverge. Stock wealth accumulated through the first 150 years was about double that of bonds, but over the most recent eight decades, the wealth gap in favor of stocks grew to almost 300 times.

In the nineteenth century, the performance of stocks and bonds resembled a horse race, with one moving ahead and then the other. Only after 1900 did stocks move into an apparently permanent lead, except for the bottom of the Great Crash in 1932. And only after World War II did the return on stocks soar far above the return on bonds.

Exhibit 10.1 indicates that the excess return on stocks has not been stationary over time. Note that I am not referring here to the equity risk premium (ERP) as defined in this book; the realized ERP is the total return on stocks minus the *yield*, not the total return, on bonds (see Chapter 9).

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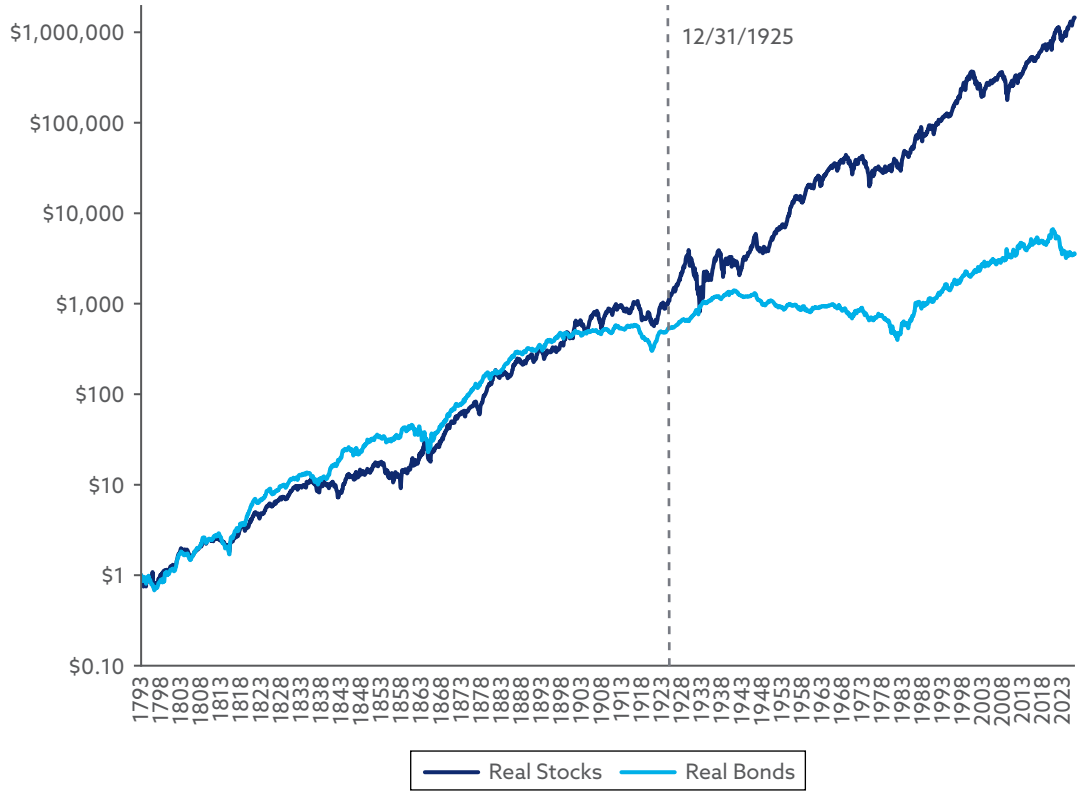
[8] There were also insurance stocks, especially in New York (see Goetzmann et al. 2001). I excluded these in McQuarrie (2024a) out of concern that the Great Fire of December 1835—which caused the bankruptcy of nearly all the fire insurance firms in the city, with share prices going to zero—would depress market returns in a way that might not be pertinent to the present day. Subsequently, I found that on a total return basis, adding back the insurance sector would have only mildly depressed reported market returns, by 0.07 percentage points annualized over 1799–1845 (McQuarrie 2025).

Exhibit 10.1. Stock and Bond Returns, January 1793–December 2023



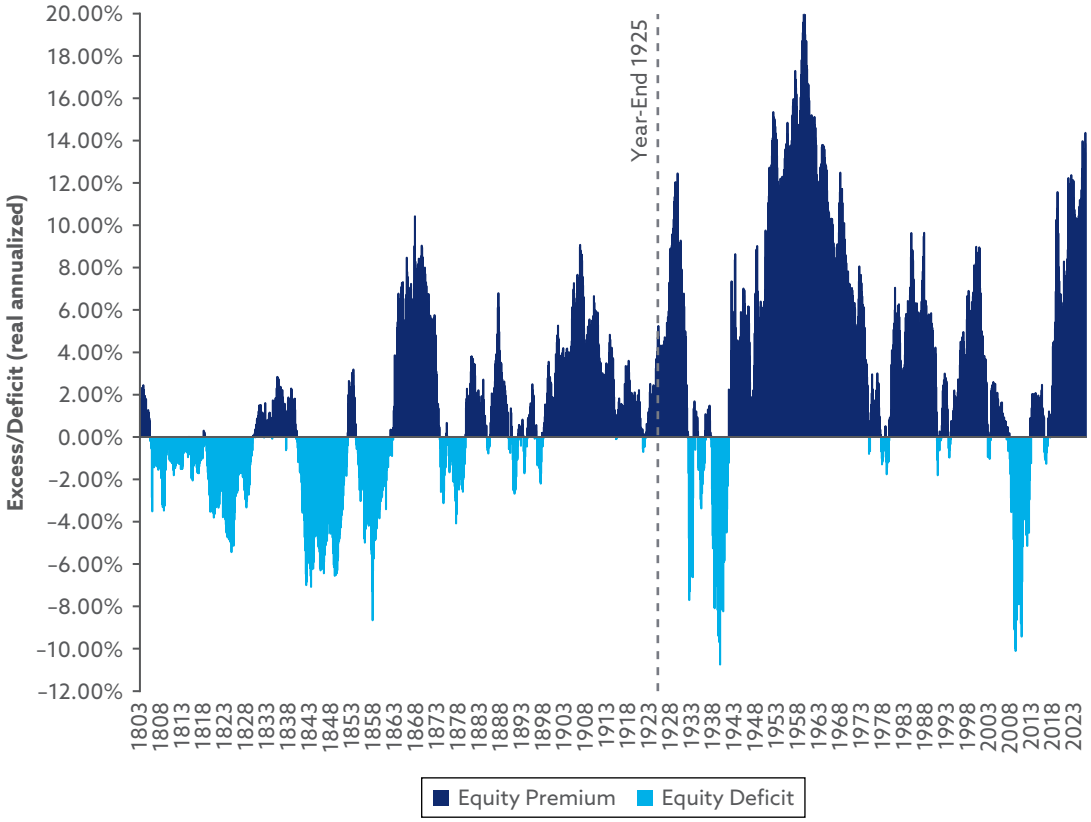
Sources: McQuarrie (2024a, 2024b).

Notes: These are the stock returns from McQuarrie (2024a), re-expressed monthly, and the long government bond returns from McQuarrie (2024b), collected at a monthly frequency. These are real returns, deflated by the Warren and Pearson (1935) index of wholesale prices until 1913 and the CPI thereafter. Note that McQuarrie (2024a), like Siegel (1994) and unlike SBBI, uses the CRSP total market index for stock returns starting in 1926, not the S&P 90 or S&P 500. Government bond returns in this exhibit are lower before and after 1900 than the corporate bond returns used in McQuarrie (2024a). The *y*-axis is a logarithmic scale.

Exhibit 10.2 provides a more fine-grained exploration of how the excess equity return has fluctuated. For this exhibit, the annualized real return on stocks and bonds was computed over the trailing 120 months, and then the bond return was subtracted from the stock return. There are 2,652 such rolls.

It was already apparent in Exhibit 10.1 that December 1925 does not mark the exact turning point or change in regime. Exhibit 10.2 indicates more clearly that the regime change occurred at about the turn of the century, as stocks moved into the lead after decades of underperforming bonds. The 10-year excess or deficit of the equity return looks quite different before and after 1900. During the nineteenth century, an equity *deficit*, in which stocks returned less than bonds over the trailing 120 months, was about as common as an excess. The cumulative excess equity return did not turn positive until just after 1900. Before then, given an anchoring

Exhibit 10.2. Historical Equity Premium over the Trailing 120 Months, January 1803–December 2023



Sources: McQuarrie (2024a, 2024b).

in January 1793, there had been a cumulative equity deficit. Stocks in the nineteenth century suffered setbacks after the Panic of 1819, the Panic of 1837, the Panic of 1857, the Panic of 1873, and the Panic of 1893. As Exhibit 10.1 showed, each time stocks came close to overcoming bonds, a panic got in the way, until about 1900.

After 1900, substantial equity deficits have occurred only in times of great crisis, as in the 1930s or in 2007–2009. Even modest equity deficits, such as the one in the late 1970s, are uncommon relative to the nineteenth century experience. Conversely, an excess return on equities, as expected by theory, became the norm, and several of the bars in Exhibit 10.2 after 1900 stretch higher than anything seen in the nineteenth century, such as for the 10 years ending in 1959—a blowout where the excess equity return reached almost 20 percentage points. Even when not so extreme, after 1900, equity excess returns are common, sometimes persisting for decades, in stark contrast to the nineteenth century experience.

Inflation

The results in Exhibit 10.1 are in real terms, after adjusting for inflation. One possible explanation for why the pre-1926 results look so different is the very different behavior of price inflation under the gold standard that prevailed until February 1934 in the United States. The course of prices across the watershed event of the end of the gold standard is so different that two charts are required, given that the second requires a scale 7 times that of the first. Panel A of **Exhibit 10.3** shows the course of inflation from 1793 to 1934. During the War of 1812 and the Civil War, prices doubled or even tripled but then fell back to the starting point. Over the entire 141 years, the value of the inflation index was confined between 0.70 and 2.40 (January 1793 = 1.0).

World War I saw the same tripling of prices. In contrast to the War of 1812 and the Civil War, however, that price peak was never entirely undone, declining only 40% from the 1920 peak to the 1933 low. The nineteenth century pattern of abrupt inflation during war and slow and relentless deflation during peacetime had been broken. In fact, President Franklin Roosevelt's purpose in devaluing the dollar was to break the deflationary spiral.

Exhibit 10.3. Inflation and Deflation During and After the Gold Standard Era

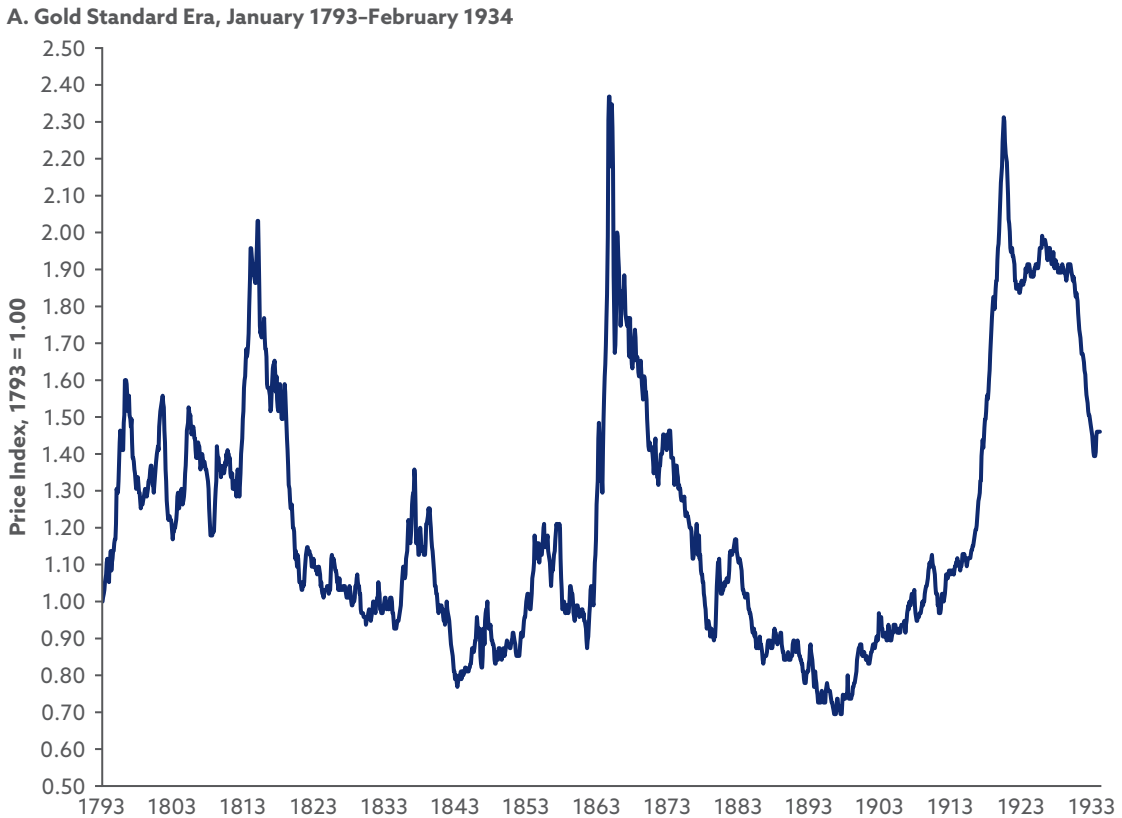
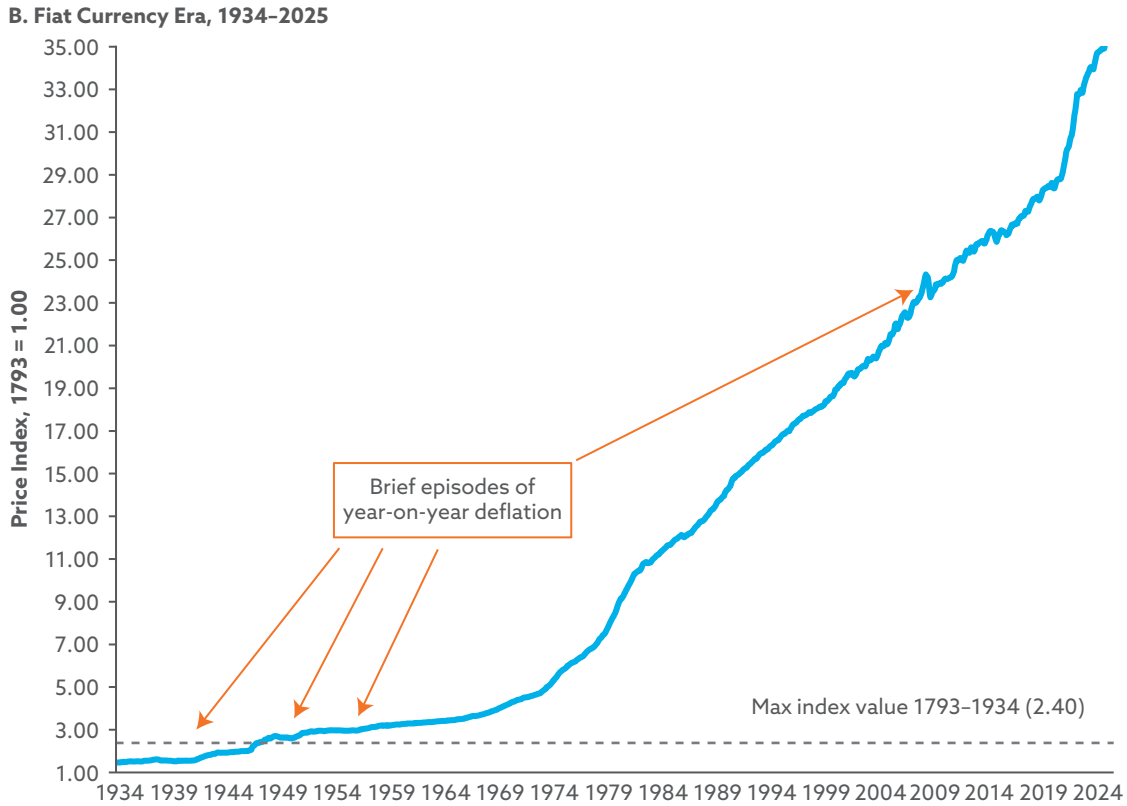


Exhibit 10.3. Inflation and Deflation During and After the Gold Standard Era (*continued*)



Sources: Series CPIAUCNS obtained from FRED. Calculations by the author.

Note: The four deflationary episodes saw maximum 12 month drops of 4.11%, 2.87%, 0.74%, and 2.10%.

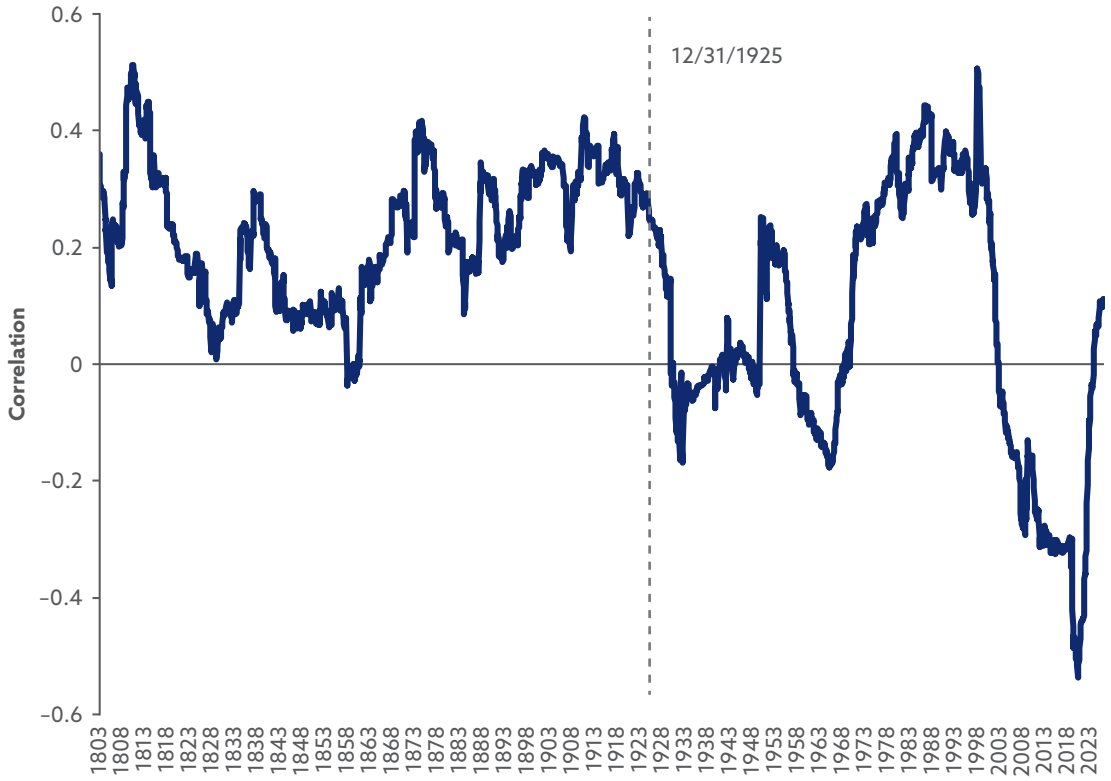
Under the fiat currency in force since 1934, the pattern of inflation looks very different (Panel B of Exhibit 10.3). With the exception of a few brief episodes, deflation has been banished. Prices only go up, at a pace that varies. The regime has changed. It appears that deflation cannot be sustained in a fiat currency system.

In a two-century view, the presence of sustained deflation emerges as a condition required for an excess return on equities (McQuarrie 2026).

More Evidence of Nonstationarity

Exhibit 10.4 shows the correlation between stocks and bonds over the trailing 120 months, with the chart again divided before and after 1926. As with the equity excess return over bonds, a change of regime seems to have occurred. Before about 1926, the stock and bond correlation varied within a relatively tight range centered on $r = 0.20$, with only a few

Exhibit 10.4. Correlation Between Stocks and Bonds over the Trailing 120 Months, January 1803–December 2023



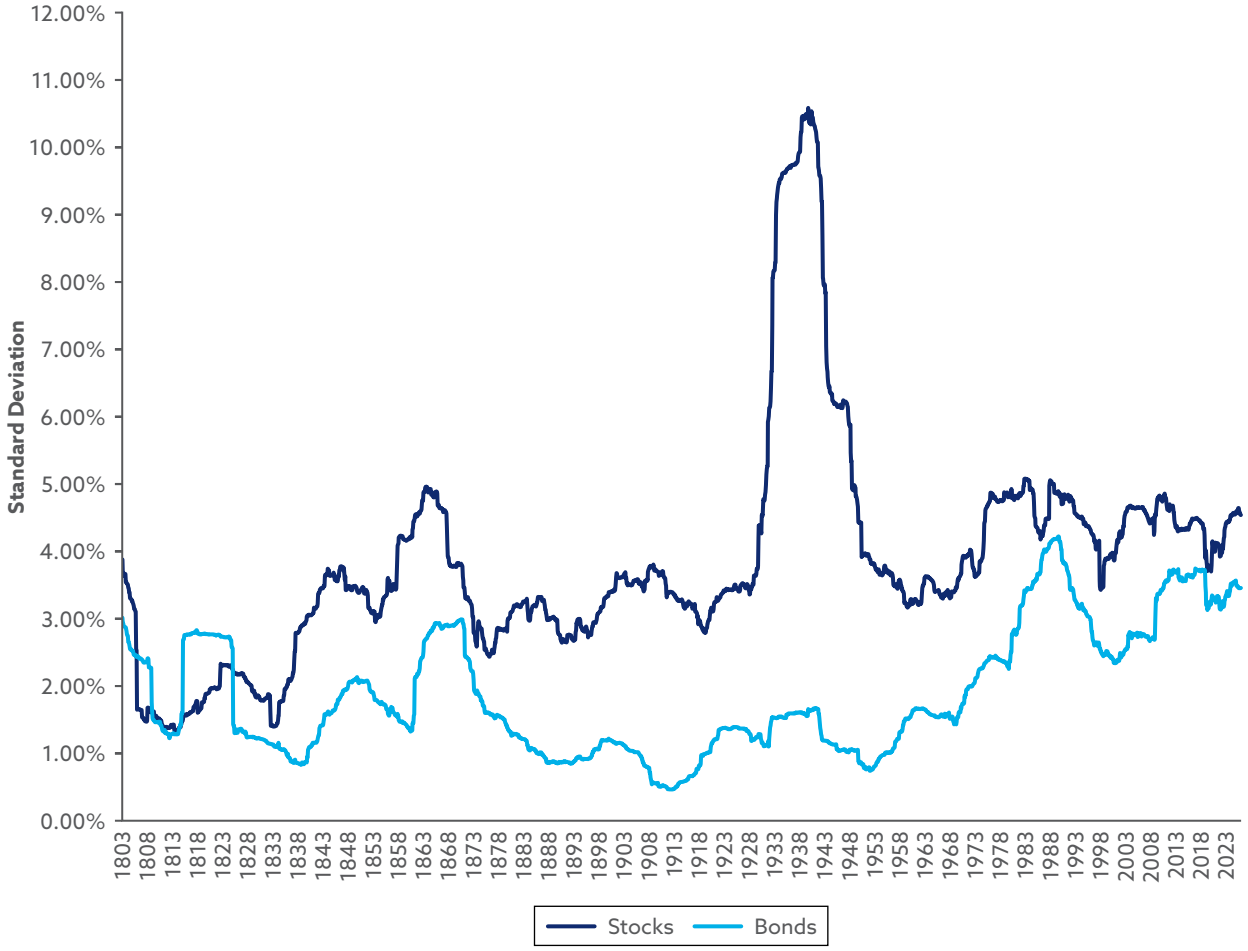
Sources: McQuarrie (2024a, 2024b).

cases where it fell toward zero. After 1926, the correlation began to swing more and more wildly, dropping well below zero, then surging, then dropping even further below zero, then surging, and then plunging again, with abrupt changes in direction over the course of a brief interval.

Clearly, the stock–bond correlation has not been stationary over the trailing two centuries, even when measured over 120 monthly observations. And as with the equity excess return, there appears to have been a change in regime.

Exhibit 10.5 shows the standard deviation of stock and bond returns over the trailing 120 months. There is again evidence of nonstationarity, but the picture is more complex, especially for stocks. Taking the simpler bond pattern first, one can observe a long stretch of very low volatility across the decades before and after 1900, punctuated before and after by sharp upswings and downswings, some associated with wars and some not. In recent decades, bond volatility has been sustained at levels seldom seen in the past.

Exhibit 10.5. Standard Deviation of Stock and Bond Returns over the Trailing 120 Months, January 1803–December 2023

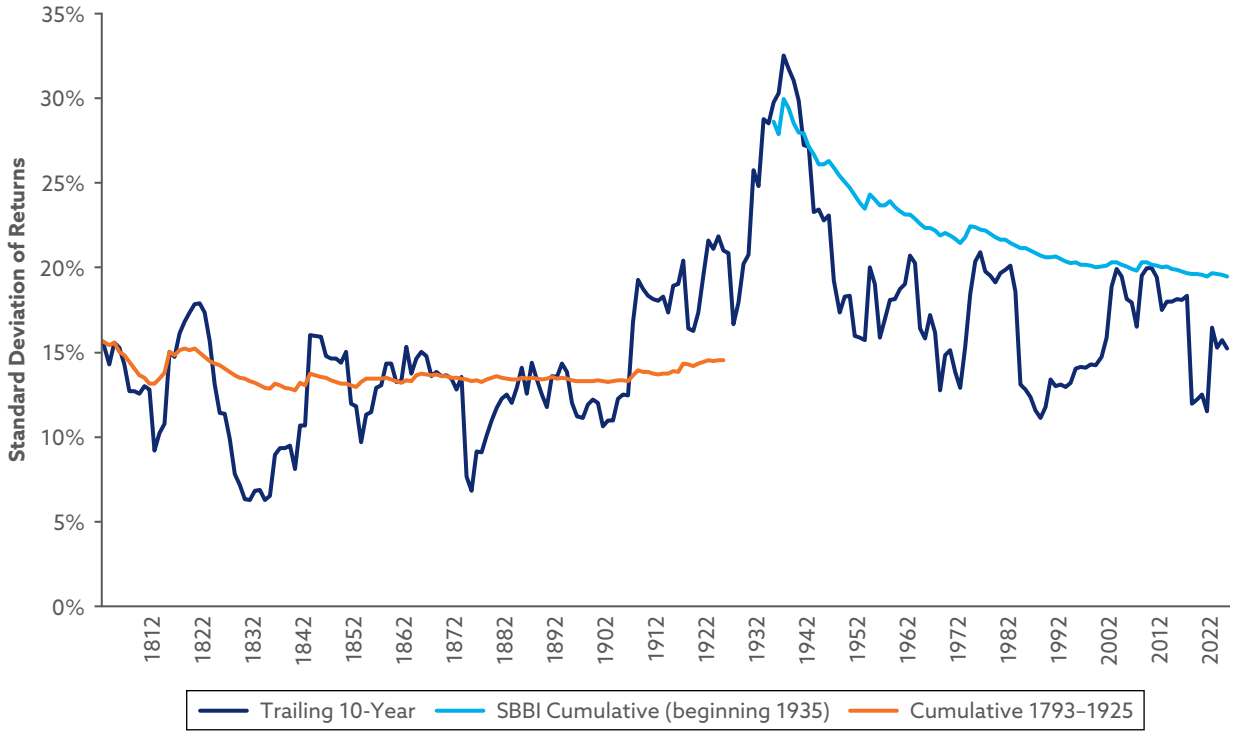


Sources: McQuarrie (2024a, 2024b).

Notes: These are monthly standard deviations. See Exhibit 10.6 for an annual representation for stocks.

Stock volatility is the puzzle. The stock line gives the impression of a rude gesture. To probe further, **Exhibit 10.6** reverts to the more familiar pattern of the standard deviation (SD) of annual returns, now over the trailing 10 years.

Exhibit 10.6. Annual Standard Deviation of Returns on Stocks Before and During the SBBI Period, January 1803–December 2023



Sources: McQuarrie (2024a, 2024b).

The orange line in Exhibit 10.6 shows the volatility of stocks over the first 133 years as it would have appeared to an observer as of year-end 1925. That volatility measure is itself volatile over any given 10-year period (dark blue line) but averages on the low side, under 15%. Then, beginning in the 1920s, volatility soared to a peak never before seen. Stocks went way up from 1924 to 1929, way down from 1929 to 1933, way up from 1933 to 1936, and then suffered one of their worst single-year plunges in 1937.

The light blue line picks up the story as it would appear to an observer whose time horizon began at the end of 1925 (i.e., one who had only the SBBI data available). The first estimate of trailing 10-year volatility available to that observer is December 1935, the leftmost value on the light blue line. Realized volatility rather quickly declines after the 1930s (dark blue line), reaching the low nineteenth century levels by the 1960s. But the light blue line, which shows average volatility anchored to a 1926 start, stays high for a long time. Observers who could only observe data starting in 1926 readily concluded that stocks were by their nature very volatile, with a standard deviation on the order of the 22% initially reported in Ibbotson and Sinquefield (1976). In fact, a truncated history made it impossible to see how that estimate of long-run volatility was biased upward by a single outlier event.

The standard deviation results show the biasing power of a short but extreme regime shift. Not even 100 years' time has sufficed to dilute out the extreme volatility of the 1930s. The nonstationarity of stock volatility parallels that of the equity excess return, with the one-off blowout around 1959—an equity excess return of 20 percentage points per year over 10 years—likewise acting to bias the 100-year estimate of the equity excess return over 1925–2025.

Limitations of Pre-1926 Data

In this section, I examine the shortcomings of stock and bond data prior to 1926.

Stocks

The first stock data limitation is statistical: Estimates of stock return prior to 1926 are at best monthly, and the monthly observation is often not a closing price but an average of prices in the month, with monthly return based on a comparison of those two monthly averages. The trade record was too sparse and spotty to permit anything more exact.[9] This procedure tends to blunt measured variance (Schwert 1990). Variance is further blunted by the use of interpolation to fill gaps in the price data. Generally speaking, analyses that require precise estimates of the volatility of point-sampled prices cannot be performed on pre-1926 stock data as currently compiled.[10]

The second limitation concerns imprecision more broadly. The ex-dividend date is not observed prior to 1926. Prices averaged over the month may thus include with-dividend and ex-dividend prices. There may also have been no trade in the stock for several months, requiring interpolation. As noted, the Sylla et al. (2005) series that I curated contains a mix of "prices." Almost all the raw entries are paired, representing a bid–ask spread, the weekly high or low, or some other combination, rather than a single closing trade price. These too are averaged, further obscuring the exact character of short-term price movements.

The third limitation is the small number of stocks trading at most points in the nineteenth century. Cowles (1939) started in 1871 with 48 stocks and did not include 100 until about 1900. McQuarrie (2024a) started with 4 stocks in 1793, had dozens by about 1802, and had more than 100 briefly during the 1830s. After trading in bank stocks dried up following the Panic of 1837, there were only railroad stocks, again with a few dozen to start, increasing to more than 50 by the 1860s.

A concomitant limitation concerns sectors. The McQuarrie index is mostly a single-sector index for the first three decades (banks), briefly a two-sector index in the 1830s and 1840s (banks and transportation), and once again a single-sector index through the Civil War (railroads). From the beginning, Cowles sought a three-sector index—railroads, utilities, and industrials—hence the choice of the 1871 start point, as far back as Cowles thought he could go and still have three sectors. His effort succeeded, but only if one accepts a canal as a utility and a coal mine as an

[9] For what it is worth, Cowles (1939) also took monthly prices to be the midpoint of the high and low price, and Shiller's (2015) version of the S&P indices continues that procedure to the present day.

[10] A promising avenue for research on volatility would be to return to the raw Sylla et al. (2005) data, which are often weekly, and develop an estimation procedure that respects the warts and flaws in those data, such as varying frequency of observation and many missing values.

Exhibit 10.7. Detail of Bonds Included in US Government Bond Returns, 1793–2023

Bond Name	Period Included	Maturity Range	Notes
Hamilton 6s	1793–1816	?	No maturity date
War 6s	1816–1824	?	The bond issued in 1813 with redemption "after 1826" was used until redemption seemed certain
Hamilton 3s	1824–1829	?	Better trading record than the 4.5s and 5s
Philadelphia 5s	1829–1843	?	Best trading record among the nondefaulting, highly rated municipal bonds in Sylla et al. (2005)
US 6s issued 1842–43	1843–1848	20–15	Replaced to extend maturity
US 6s maturing 1868	1848–1859	20–9	Held until nine years remaining, waiting for 5s of 1874 to become available
US 5s maturing 1874	1859–1862	15–12	Replaced after a higher-coupon, longer-maturity bond became available
US 6s maturing 1881	1862–1871	19–10	Held until 10 years to maturity; alternatives were callable
US Consol 6s due 1888	1871–1877	17–11	Swapped out at 11 years because new 4.5s outperformed from the outset
US 4.5s due 1891	1877–1880	15–11	Later swapped for a similar coupon and much later maturity
US 4s due 1907	1880–1896	27–11	Later swapped for a much longer maturity
US 4s due 1925	1896–1902	29–23	Held until yield gap under municipals widens
S&P municipals	1902–1908	10	Returns calculated from yields according to Shiller's formula; maturity imputed not observed
NYC 4.5s of 1957	1908–1919	49–38	Observed price, liquid trading, and longer maturity argued for replacement of Standard & Poor's municipals
Fourth Liberty bonds (4.25s due 1938, callable 1933)	1919–1923	19–15	Most suitable of the new Liberty bonds
4.25s due 1952, callable 1947	1923–1926	29–26	Extend maturity

Source: McQuarrie (2024b).

Notes: See McQuarrie (2024b) for more details. All periods run from January to January.

industrial. Only after 1900 can multiple sectors, as we would use the term today, be identified on the NYSE, with multiple subgroups of industrials.

Bonds

The situation is somewhat better for the government bond data, which are typically end-of-month prices. But even here, there are numerous instances where linear interpolations had to be made across missing months. The fact that Treasury bonds could go months without a recorded trade serves as a reminder of how different the US bond market was before the supply of Treasuries exploded during and after World War I.

A second limitation is that although all bonds in the new series are government bonds, that label obscures the heterogeneity of the constituents (see **Exhibit 10.7**). The Hamilton bonds that anchored the series before 1829 had no stated maturity. President Andrew Jackson paid off the debt in 1835, and that imminent payoff was taken as a given upon his election in late 1828, rendering all federal bonds short term in fact. No long Treasuries were traded again until 1842. A Philadelphia bond series was substituted, also without a maturity date. It was one of the very few municipal bonds with a good price record that did not default or plunge in price to a level indicating an expected default during the crisis of 1837–1842.

After 1842, there is a good record of federal bonds through the end of the century. By 1902, however, the Treasury market had almost dried up, as banks bought Treasuries to secure note circulation, and yields were depressed below economic values (Macaulay 1938). A municipal index with unknown constituents, coupons, and maturities was substituted until 1911, followed by a single municipal issue until 1918, when the Liberty bonds became available. Starting in 1922, the series used the long bond initially included in SBBI and then continued with the SBBI long bond series. As with the SBBI series, the bond index uses one government bond at a time, except in 1902–1911. A bond was replaced whenever the addition would lengthen the maturity back out to near 20 years. The goal was an index of long bond returns comparable to the later SBBI series.

A third limitation concerns early quoting practices. It is unknown which prices were flat and which were with interest.[11] Spreading each coupon across the six months and reinvesting it at the observed month-end price or an interpolation of the price is hardly an exact measure on par with the CRSP Treasury database that starts in 1926.

A final noteworthy characteristic is the focus on long bonds and the commitment to total return as the metric. T-bills did not exist before the 1920s, and short-term Treasuries were rare before 1926. Nor was anything like an intermediate series available; 10-year Treasuries were issued now and then over the decades but never regularly or repeatedly, such that no series could be compiled.[12] No long-duration bond, government or otherwise, can be regarded as risk free. Waves of capital appreciation and depreciation are the order of the day in any refreshed index of long bonds.

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[11] A bond price that is quoted "with interest" includes interest accrued since the last coupon date. A bond price quoted without accrued interest is known as the "flat price."

[12] The 10-year government bond series reported in Shiller (2015) uses a proxy before 1954, when the Constant Maturity series was launched by the Treasury. The proxy measure is particularly problematic before the 1890s because of how the source (Macaulay 1938) transformed the raw data. It is also not without problems on either side of the advent of the income tax in 1913, because it uses a municipal series until 1920. See McQuarrie (2024b) for an extended discussion.

More generally, government bonds in the United States in the nineteenth century must be regarded as riskier than contemporary Treasuries. The United States before 1871 might best be characterized as an emerging market with uncertain prospects. In addition, under the gold standard, government default is always a possibility. Given the many risks, nineteenth century investors arguably should have demanded a higher return from sovereign bonds.

The overall limitation of the bond series reported in this chapter is thus its risky character. That feature makes it unsuitable for calculating the ERP as that term is used elsewhere in this volume.

In sum, the nineteenth century data are sufficiently detailed to provide a rough estimate of the level of returns, to enable comparison of stock and bond returns, and to show nonstationarity between one century and another. But the use of total returns instead of yields and the presence of currency and default risk place the bond series at three removes from what would be required to estimate an equity risk premium.

Annual total returns (nominal) for US stocks and bonds, as well as inflation rates, appear in **Exhibit 10.8** for the reader to study and use.

Exhibit 10.8. Inflation and Annual Total Returns (Nominal) on US Stocks and Bonds

Year*	Stocks	Bonds	Inflation	Year*	Stocks	Bonds	Inflation
A. 1793–1874							
1793	–8.26%	–1.10%	11.58%	1812	10.74%	5.68%	18.11%
1794	20.95%	15.40%	16.98%	1813	7.63%	–0.38%	24.00%
				1814	–8.10%	–11.23%	3.76%
1795	10.35%	–4.69%	13.71%				
1796	–3.94%	–0.91%	–0.71%	1815	13.56%	36.06%	–17.10%
1797	14.01%	9.60%	–9.29%	1816	4.80%	6.80%	–5.00%
1798	8.84%	10.31%	–2.36%	1817	26.00%	13.18%	–1.97%
1799	6.27%	8.28%	2.42%	1818	–14.63%	0.51%	–5.37%
				1819	–5.44%	9.51%	–19.15%
1800	14.29%	19.33%	10.24%				
1801	13.88%	16.81%	–10.00%	1820	6.55%	11.63%	–12.28%
1802	14.88%	7.84%	–10.32%	1821	12.24%	4.42%	9.00%
1803	4.40%	2.65%	8.85%	1822	–4.21%	2.69%	–4.59%
1804	0.16%	2.69%	13.82%	1823	7.48%	5.93%	–5.77%
				1824	14.90%	16.29%	–1.02%
1805	0.14%	7.90%	–2.14%				
1806	11.08%	13.21%	–4.38%	1825	2.29%	–4.32%	6.19%
1807	0.30%	4.38%	–5.34%	1826	5.43%	1.27%	–3.88%
1808	15.46%	12.91%	0.00%	1827	4.01%	10.64%	–1.01%
1809	7.74%	5.49%	3.23%	1828	4.22%	0.58%	4.08%
				1829	5.24%	7.65%	–10.78%
1810	–2.42%	5.55%	3.12%				
1811	2.78%	3.06%	–3.79%	1830	12.89%	5.18%	0.00%

(*continued*)

Exhibit 10.8. Inflation and Annual Total Returns (Nominal) on US Stocks and Bonds (*continued*)

Year*	Stocks	Bonds	Inflation	Year*	Stocks	Bonds	Inflation
1831	5.03%	5.65%	9.89%	1853	–10.76%	6.43%	9.38%
1832	1.48%	7.19%	–4.00%	1854	–12.07%	0.92%	1.90%
1833	1.06%	2.72%	–4.17%				
1834	10.58%	–0.32%	0.00%	1855	–2.03%	5.11%	0.93%
				1856	14.65%	6.25%	2.78%
1835	11.28%	0.19%	16.30%	1857	–15.00%	0.93%	–16.22%
1836	2.07%	3.88%	14.95%	1858	11.35%	2.00%	2.15%
1837	–2.76%	–0.43%	–8.94%	1859	0.73%	2.31%	–1.05%
1838	9.13%	7.74%	4.46%				
1839	–16.49%	1.61%	–15.38%	1860	18.93%	–1.99%	–2.13%
				1861	4.32%	–9.45%	6.52%
1840	–4.90%	6.91%	–6.06%	1862	75.84%	11.80%	28.57%
1841	–31.24%	6.25%	–3.23%	1863	28.40%	23.50%	21.43%
1842	–5.82%	–3.51%	–15.56%	1864	5.91%	15.39%	45.75%
1843	40.24%	20.27%	0.00%				
1844	10.21%	5.70%	3.95%	1865	4.35%	4.11%	–18.83%
				1866	5.68%	12.83%	–7.18%
1845	6.43%	–0.28%	12.66%	1867	11.47%	11.52%	–6.55%
1846	4.65%	–1.33%	–5.62%	1868	22.91%	8.00%	–1.27%
1847	5.44%	2.34%	1.19%	1869	2.37%	13.22%	–8.39%
1848	–0.61%	16.81%	–2.35%				
1849	2.99%	7.91%	0.00%	1870	1.08%	1.84%	–7.75%
				1871	17.38%	8.96%	1.53%
1850	23.08%	9.12%	4.82%	1872	16.58%	10.11%	2.26%
1851	–3.91%	5.62%	–4.60%	1873	–5.59%	6.81%	–4.41%
1852	20.65%	8.39%	15.66%	1874	4.03%	7.50%	–6.92%
B. 1875–1925							
1875	6.11%	8.86%	–5.79%	1886	10.58%	6.85%	0.00%
1876	–12.43%	–0.23%	0.88%	1887	–2.29%	1.15%	4.76%
1877	–0.98%	0.90%	–15.65%	1888	1.88%	4.90%	–4.55%
1878	15.38%	6.96%	–10.31%	1889	8.20%	–0.21%	–4.76%
1879	47.99%	5.52%	20.69%				
				1890	–5.49%	0.50%	2.50%
1880	26.98%	12.13%	–5.71%	1891	16.80%	–0.30%	–6.10%
1881	0.45%	7.93%	8.08%	1892	5.44%	1.45%	7.79%
1882	2.13%	4.67%	–1.87%	1893	–19.31%	3.42%	–13.25%
1883	–9.16%	7.43%	–7.62%	1894	2.66%	2.21%	–4.17%
1884	–14.52%	1.48%	–10.31%				
				1895	5.46%	–0.39%	1.45%
1885	29.69%	5.41%	–3.45%	1896	0.50%	11.85%	–2.86%

(*continued*)

Exhibit 10.8. Inflation and Annual Total Returns (Nominal) on US Stocks and Bonds (*continued*)

Year*	Stocks	Bonds	Inflation	Year*	Stocks	Bonds	Inflation
1897	20.29%	7.39%	2.94%	1912	7.08%	2.01%	7.29%
1898	29.81%	3.61%	1.43%	1913	–4.89%	4.23%	2.04%
1899	4.06%	6.71%	16.90%	1914	–5.77%	4.09%	1.00%
1900	20.68%	6.59%	–2.41%	1915	31.44%	6.35%	2.97%
1901	19.23%	3.71%	2.47%	1916	9.21%	7.98%	12.50%
1902	8.30%	2.55%	9.64%	1917	–17.38%	–9.20%	19.66%
1903	–17.20%	1.48%	–4.40%	1918	16.93%	10.64%	17.86%
1904	31.53%	4.45%	2.30%	1919	19.05%	0.72%	16.97%
1905	21.73%	2.85%	0.00%	1920	–14.26%	–0.05%	–1.55%
1906	0.61%	1.51%	4.49%	1921	9.28%	16.42%	–11.05%
1907	–24.42%	0.32%	–2.15%	1922	29.29%	6.56%	–0.59%
1908	39.20%	9.25%	3.30%	1923	5.46%	4.61%	2.98%
1909	17.00%	1.22%	10.64%	1924	26.87%	8.53%	0.00%
1910	–3.81%	2.53%	–6.73%	1925	23.59%	7.16%	3.47%
1911	3.52%	4.55%	–1.03%				

Sources: McQuarrie (2024a, 2024b).

*The year designation (say, 1793) refers to the return from January of the stated year to January of the following year, rather than over the stated calendar year. The January price may be the average of the January high and low, an average of January daily prices, or another estimate.

Conclusion

When Ibbotson and Sinquefield (1976) was published, to have compiled a 50-year record of stock and bond returns represented an extraordinary achievement. The authors had good reason to expect that as the sample size of observations increased further, now out to 100 years, increasingly precise estimates of the true expected return on stocks and bonds would be gained.

When Cowles' (1939) work reemerged, adding 55 years to the Ibbotson and Sinquefield (1976) stock record, these expectations were further supported. The decades of additional US data compiled in subsequent SBBI editions did the same. Initial work by Dimson, Marsh, and Staunton (2002), with data out to the peak of the dot-com boom in 2000, was not unsupportive of the idea that return estimates would indeed settle down and become more precise as the quantity of historical data increased.

The situation began to change as Dimson, Marsh, and Staunton (2025) moved to address challenges to the survivorship bias in their initial work, adding more and more stock markets that had performed quite poorly and separating out world ex-US returns, where wealth gained from

a long-term investment in stocks proved to be an order of magnitude lower than in the case of the United States.[13]

Confidence in the power of a larger sample size to make estimates more precise was further upended by McQuarrie (2024a, 2024b). These studies showed markedly poorer returns on US stocks prior to 1871 and markedly better returns on US bonds prior to 1900. US returns starting in 1926 have now emerged as quite distinct in a multicentury, multimarket view.

It is questionable whether enlarging a time sample has the same beneficial effect on statistical power as enlarging a sample of people. That effect can only hold true if the underlying process that generates returns is stationary. That appears not to be the case when stock and bond returns before 1926 are compared with more recent returns.

Key Takeaways

- Reasonably good data on US stock and bond returns back through 1793 are now available. The new nineteenth century data suggest that patterns in the data starting in 1926, featured in the original Ibbotson and Sinquefield (1976) study and subsequent SBBI yearbooks, may be unusual rather than typical and may be specific to that era rather than broadly representative.
- The nineteenth century data show a smaller and more variable performance difference between stocks and bonds. For long periods, government bonds had higher returns than common stocks.
- One explanation for the comparatively stronger performance of bonds in the nineteenth century is the very different inflation history in that century. Multiple instances of deflation appear in the earlier record, in which prices fell for over a decade, with a total decline greater than 50% on more than one occasion. No such deflation occurred in the fiat currency period starting in 1934.
- In general, the key elements used in asset allocation decisions have not been stationary across centuries. In addition to stock and bond returns, the correlation between stocks and bonds and their respective standard deviations have varied over a wide range. Nonstationarity calls into question the expectation that longer time samples can lead to more precise estimates of long-term portfolio returns.

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[13] Dimson et al. (2002) had reported only a world index. Because the United States had an approximately 50% weight in the world index, the extent of the contrast between US and international returns was obscured.

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CHAPTER 11. GLOBAL MARKETS OVER THE LAST 126 YEARS

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To understand risk and return, we must examine long periods of history in many countries. We do so because asset returns and especially equity returns are volatile: They vary over time, and different markets experience contrasting financial outcomes. This volatility is readily illustrated by recent history: In 2000, the twenty-first century began with a severe bear market. By March 2003, US stocks had fallen 45%, UK equity prices had halved, and German stocks had declined by two-thirds.

Markets then staged a remarkable recovery, hitting new highs in October 2007, only to plunge again into another epic bear market fueled by the global financial crisis (GFC). Markets bottomed out in March 2009 and subsequently rose, with relatively few setbacks, for more than a decade. Volatility stayed low, with only occasional spikes. When markets are calm, we know there will be a return to more volatile and challenging times, although we cannot know when.

"When" proved to be March 2020. The COVID-19 pandemic sent stocks reeling again, falling by more than a third. Volatility skyrocketed to a level even higher than it did during the GFC. The world experienced its third bear market in less than 20 years. Markets staged a rapid recovery and volatility again fell. However, 2022 saw yet another bear market, with both stocks and bonds falling sharply on inflation and rate hike worries and concerns over the Russia–Ukraine war. Stocks recovered, but in 2025, the "Liberation Day" tariffs sent stocks lower again, although they rapidly regained their poise. In 2026, the world was hit by conflict in the Middle East and renewed uncertainties for long-term investors.

The volatility of markets means that, even over long periods, there can be "unusual" returns. Consider, for example, a global investor at the start of 2000 who looked back at the 10.5% real annualized return on global equities over the previous 20 years and regarded it as "long-run" history that offered guidance for the future. Over the next decade, they would have earned a negative real return of −0.6% per year.

A Long-Term and Global Perspective

Investors who hold equities anticipate reaping a reward for their exposure to risk. At the end of 1999, investors could not have expected, let alone required, a negative real return from equities.

Editor's note: Much of the text in this chapter is adapted from Dimson, Marsh, and Staunton (2026b). This chapter copyright the authors.

If they had, they would have avoided them and equity prices would have been lower. Looking in isolation at the returns over the first 10 or 20 years of the twenty-first century could tell us little about the future risk premium. In the first decade, investors were unlucky, suffering two deep bear markets. This experience served as a brutal reminder that the very existence of the risk for which they sought a reward meant that events could turn out poorly, even over multiple years. In the second decade and beyond, markets recovered quickly from the GFC.

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

Long periods of history are also needed to understand bond returns. Over the 40 years until the end of 2021, the Dimson–Marsh–Staunton (DMS) world bond index provided an annualized real return of 6.3%, not far below the 7.4% real return from the DMS world equity index. Extrapolating bond returns of this magnitude into the future would be foolish. With almost continually falling interest rates, those 40 years were a golden age for bonds, just as the 1980s and 1990s were a golden age for equities. In fact, the real return on the DMS world bond index in 2022 was −27%.

Golden ages, by definition, are exceptions. To understand investment risk and return—a key goal of our long-term dataset—we must examine periods much longer than 20 or 40 years. This is because stock and bond returns are volatile, with major year-to-year and even decade-to-decade variation. Very long time series are needed to make inferences about investment returns.

Since 1900, there have been several golden ages and many bear markets; periods of great prosperity and recessions, financial crises, and the Great Depression; periods of peace and episodes of war. Lengthy historical records hopefully balance the good times with the bad times, offering a more realistic understanding of what long-run returns can tell us about the future. This focus on very long-run returns is a recurring theme throughout this volume: see especially Ibbotson, Manninen, and Goetzmann (2026) in chapter 4 and Chambers, Dimson, Ilmanen, and Rintamäki (2026) in chapter 17.

The DMS Dataset

This chapter draws on a long-run history of stocks, bonds, bills, and inflation since 1900. It expands on and updates work reported in Dimson, Marsh, and Staunton (2002, 2021) and in other publications. Our research is primarily based on investment returns for 35 markets (the DMS 35 indices) and five composite indices. For 23 countries, we have a 126-year financial market history starting in 1900, and for another 12 markets, we have data that span at least 50 years.

The DMS 23 consists of two North American markets (the United States and Canada), 10 eurozone countries (Austria, Belgium, Finland, France, Germany, Ireland, Italy, the Netherlands, Portugal, and Spain), six other European countries (Denmark, Norway, Russia, Sweden, Switzerland, and the United Kingdom), four Asia-Pacific markets (Australia, China, Japan, and New Zealand), and one African market (South Africa). Included in the DMS 23 are two countries with 1900 start dates but with long breaks in their histories (Russia and China).

Our dataset also includes a further 12 markets with a financial history of at least half a century. The DMS 12 markets include seven in Asia, one in North America, three in South America, and one in Europe. Additional details and comprehensive data sources are listed in Dimson, Marsh, and Staunton (2026b, chapters 11 and 12). Unlike the DMS 23, these markets' history starts not in 1900 but in the second half of the twentieth century. All 12 were emerging markets at their start dates. However, two (Hong Kong SAR and Singapore) were long ago reclassified as developed markets.

In addition, we monitor 55 additional markets for which we have equity return data for periods ranging from 15 to 50 years. We also have inflation, currency, and market capitalization data but not yet bond or bill return data. These 55 countries, in conjunction with the DMS 35, provide a total of 90 developed and emerging markets (the DMS 90), which we use for constructing our composite equity series: the world, world ex-US, Europe, developed market, and emerging market indices.

Equity Returns Since 1900

Panel A of **Exhibit 11.1** shows the cumulative nominal return from stocks, bonds, and bills, as well as the inflation rate, since 1900 in the world's leading capital market, the United States. Equities performed best. An initial investment of $1 grew to $124,854 in nominal terms by year-end 2025. Long bonds and Treasury bills provided lower returns, although they beat inflation. Their respective index levels at the end of 2025 were $284 and $69, with the inflation index ending at $38. The chart's legend shows the annualized returns: 9.8% for equities versus 4.6% on bonds, 3.4% on bills, and inflation of 2.9% per year.

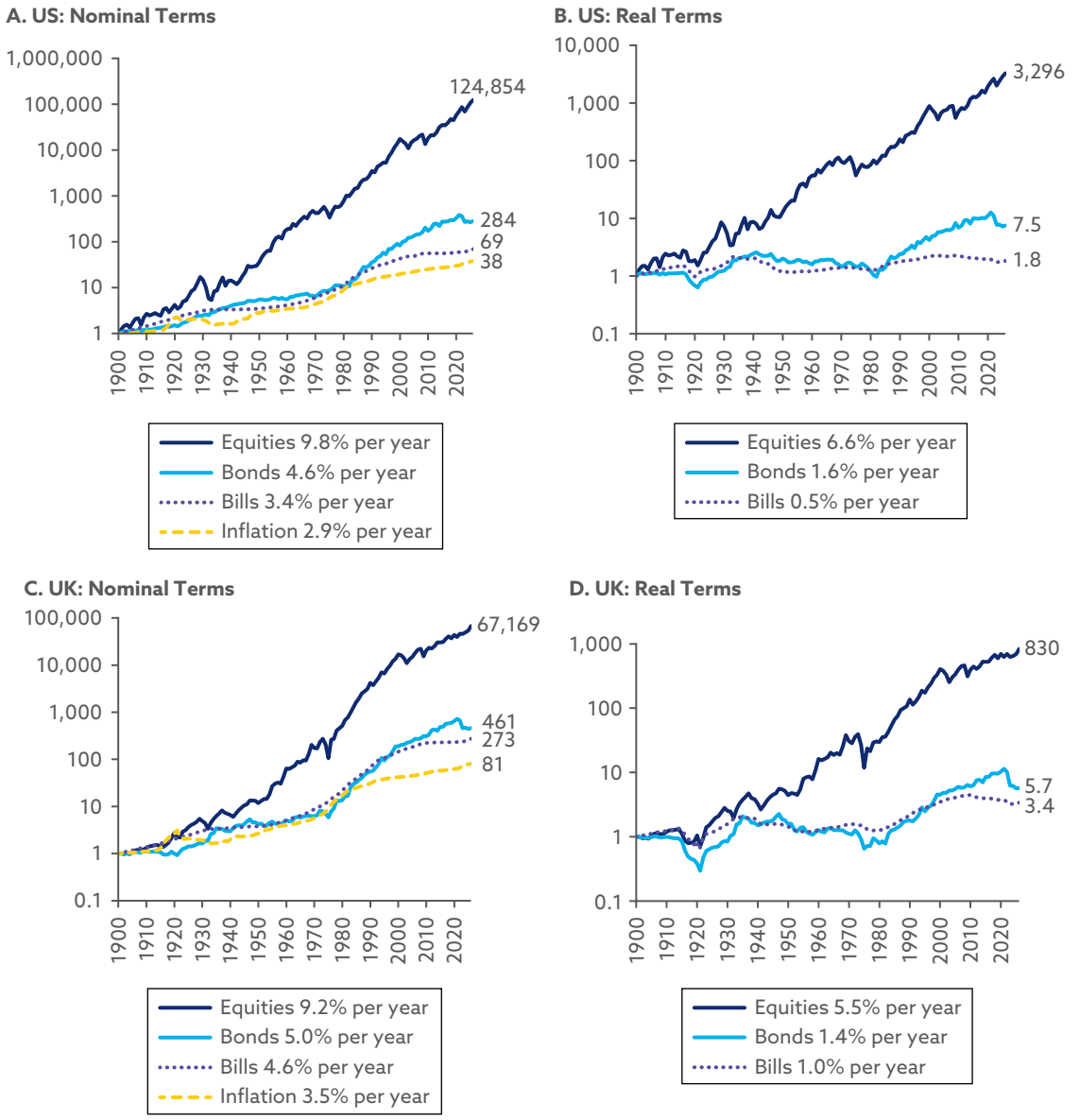
Because US prices rose 38-fold over this period, it is more helpful to compare returns in real terms. The real returns on US equities, bonds, and bills are shown in Panel B of Exhibit 11.1. Over the 126 years, an initial investment of $1 with dividends reinvested would have grown in purchasing power by 3,296 times. The equivalent multiples for bonds and bills are 7.5 and 1.8 times. These terminal wealth figures correspond to annualized real returns of 6.6% on equities, 1.6% on bonds, and 0.5% on bills.

Exhibit 11.1 shows that US equities dominated bonds and bills. There were severe setbacks, of course, most notably during World War I; the 1929–32 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 four notable bear markets so far during the twenty-first century. Each shock was severe at the time. At the depths of the 1929–32 crash, US equities had fallen by 79% in real terms. Many investors were ruined, especially those who bought stocks with borrowed money. The crash lived on in the memories of investors for at least a generation, with many shunning equities.

Panels A and B of Exhibit 11.1 place the 1929–32 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. The COVID-19 crisis, for instance, is imperceptible because the plot shows only annual data; the market recovered and hit new highs by year-end. The bursting of the technology bubble in 2000, the GFC of 2007–2009, and the 2022 bear market are barely discernible. Exhibit 11.1 sets the bear markets of the past in perspective. Events that were traumatic at the time now appear only as setbacks within a longer-term secular rise.

We caution, however, about generalizing from the United States. Over the twentieth century, the United States rapidly emerged as the world's foremost political, military, and economic

Exhibit 11.1. Cumulative Returns on US and UK Asset Classes in Nominal and Real Terms, 1900–2025



Sources: DMS Database, Dimson, Marsh, and Staunton (2026a); Dimson, Marsh, and Staunton (2026b). Not to be reproduced without written express permission from the authors.

power. By focusing on the world's most successful economy, investors could gain a misleading impression of equity returns elsewhere or of future returns for the United States.

Panels C and D of Exhibit 11.1 show the corresponding charts for the United Kingdom. Panel D shows that although the real return on UK equities was negative over the first 20 years of the

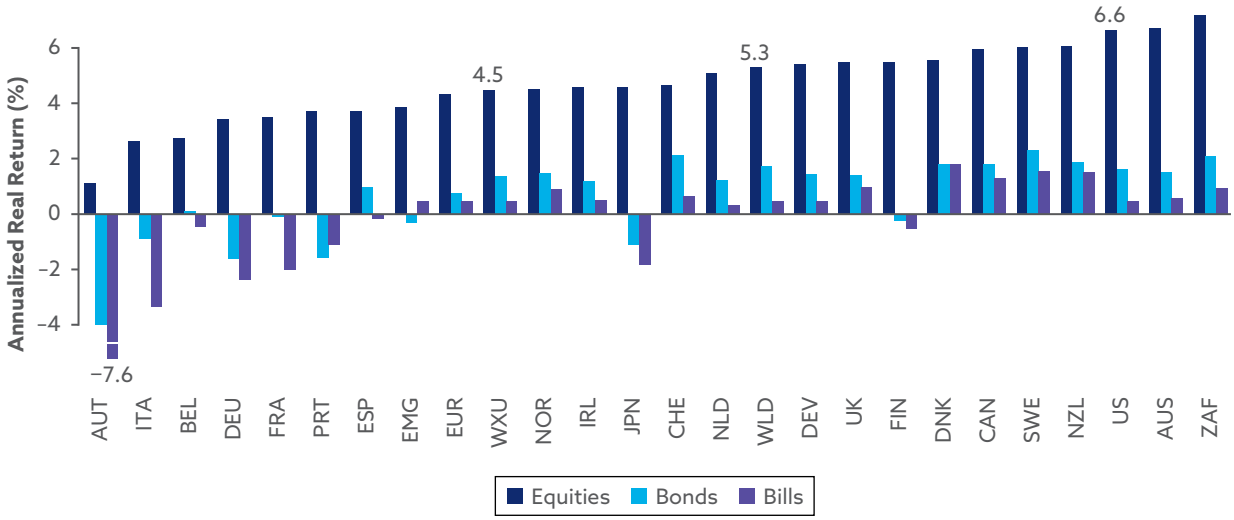
twentieth century, the story thereafter was one of steady growth broken by periodic setbacks. Unlike the United States, the worst setback was not during the 1929–32 period but instead in 1973–1974, the period of the first OPEC oil squeeze following the 1973 October War in the Middle East. UK bonds also suffered in the mid-1970s in response to inflation peaking at 24% in 1975.

Exhibit 11.1 shows that investors who kept faith in UK equities and bonds were eventually vindicated. Over the full 126 years, the annualized real return on UK equities was 5.5%, versus 1.4% on bonds. As in the United States, equities greatly outperformed bonds, which beat bills. These returns are high, but they are below those for the United States.

Asset Returns Around the World

Exhibit 11.2 shows annualized real local-currency equity, bond, and bill returns over the last 126 years for the 21 DMS countries with continuous investment histories plus the five composite indices—the world (WLD), world ex-US (WXU), Europe (EUR), developed market (DEV), and emerging market (EMG) indices—ranked in ascending order of equity market performance. The real equity return was positive everywhere, typically around 3%–6% per year.

Exhibit 11.2. Annualized Real Returns (%) on Equities, Bonds, and Bills, 1900–2025



AUT – Austria	ITA – Italy	BEL – Belgium	DEU – Germany	FRA – France	PRT – Portugal
ESP – Spain	NOR – Norway	IRL – Ireland	JPN – Japan	CHE – Switzerland	NLD – Netherlands
UK – United Kingdom	FIN – Finland	DNK – Denmark	CAN – Canada	SWE – Sweden	NZL – New Zealand
US – United States	AUS – Australia	ZAF – South Africa			

Sources: DMS Database, Dimson, Marsh, and Staunton (2026a); Dimson, Marsh, and Staunton (2026b). Not to be reproduced without written express permission from the authors.

Notes: German bonds and bills exclude 1922–1923. WLD = world, WXU = world ex United States, EUR = Europe, DEV = developed markets, EMG = emerging markets.

Equities were the best-performing asset class everywhere. Bonds beat bills in every market except Portugal. This pattern is what we would expect over the long haul because equities are riskier than bonds and bonds are riskier than cash. Our findings thus support one of the lasting laws of finance—the law of risk and return—and the idea that risk bearing should carry an expected reward.

Exhibit 11.2 shows that although most national markets experienced positive real bond returns, seven had negative returns. Mostly, countries with poor bond returns were also among the worst equity performers. Their poor performance arose during the first half of the twentieth century. These were the economies that suffered most from the ravages of war and from periods of high inflation or hyperinflation associated with the wars and their aftermath.

Exhibit 11.2 shows that the United States performed well, ranking third for equity performance (6.6% per year) and eighth for bonds (1.6% per year). These are local-currency real returns, however. As we show later, in common-currency terms, US equities were the world's best performers (closely followed by Australia), and US bonds ranked fourth in the world. This result confirms our earlier conjecture that US returns would be high because the US economy has been such an obvious success story, making it unwise for investors around the world to base future projections solely on US evidence.

The 6.6% annualized real return on US equities contrasts with the 4.5% real US dollar return on the world ex-US equity index. This difference of 2.1 percentage points, when compounded over 126 years, leads to a large difference in terminal wealth. A dollar invested in US equities in 1900 resulted in a terminal value of $3,296 in terms of real purchasing power (see Exhibit 11.1). The same investment in stocks from the rest of the world provided a terminal value of $248, less than 8% of the US value.

A common factor among the best-performing equity markets is that they tended to be resource-rich and/or New World countries. The worst-performing markets were those most afflicted by wars.

Long-Run Real Equity Returns

Exhibit 11.3 provides statistics on long-run real (inflation-adjusted) equity returns. The table shows the 21 countries and five composite indices for which we have continuous histories from 1900 to 2025.[1] The geometric means in the second column show the 126-year compound annual returns, and these are the numbers plotted in Exhibit 11.2. The arithmetic means in the third column show the average annual returns over the 126-year period for each national market or composite index.

The arithmetic mean of a sequence of different returns is always larger than the geometric mean. For example, if a stock doubles one year (+100%) and halves the next (−50%), the investor is back where he or she started and the annualized or geometric mean return is zero. The arithmetic mean, however, is one-half of (100 – 50), which is +25%. The more volatile the returns, the greater the amount by which the arithmetic mean exceeds the geometric mean. This observation is supported by the fifth column of Exhibit 11.3, which shows the standard deviation of each market's returns.

[1]Similar results are available in Dimson, Marsh, and Staunton (2026b) for stock markets that do not have a full 126-year history.

Exhibit 11.3. Real Equity Returns for Indices with Continuous Histories, 1900–2025

Country/Index	Geometric Mean (%)	Arithmetic Mean (%)	Std. Error (%)	Std. Dev. (%)	Min. Return (%)	Min. Year	Max. Return (%)	Max. Year
Australia	6.7	8.2	1.5	17.2	−42.5	2008	51.5	1983
Austria	1.1	5.4	2.7	30.9	−63.2	2008	132.7	1921
Belgium	2.7	5.3	2.1	23.1	−48.9	2008	105.1	1919
Canada	5.9	7.3	1.5	16.7	−33.8	2008	55.2	1933
Denmark	5.5	7.4	1.8	20.6	−49.2	2008	107.8	1983
Finland	5.5	9.2	2.6	29.2	−59.7	1918	161.7	1999
France	3.5	5.9	2.0	22.5	−41.5	2008	66.1	1954
Germany	3.4	8.0	2.7	30.7	−90.8	1948	154.6	1949
Ireland	4.6	7.1	2.0	22.6	−65.4	2008	68.4	1977
Italy	2.6	6.4	2.5	28.0	−72.9	1945	120.7	1946
Japan	4.6	8.9	2.5	28.6	−85.5	1946	121.1	1952
Netherlands	5.1	7.1	1.9	20.8	−50.4	2008	101.6	1940
New Zealand	6.1	7.7	1.7	19.0	−54.7	1987	105.3	1983
Norway	4.5	7.2	2.3	25.9	−53.6	2008	166.9	1979
Portugal	3.7	8.3	3.0	33.2	−76.6	1978	151.8	1986
South Africa	7.2	9.2	1.9	21.3	−52.2	1920	101.2	1933
Spain	3.7	5.7	1.9	21.0	−43.3	1977	99.4	1986
Sweden	6.0	8.1	1.9	20.9	−42.5	1918	67.5	1999
Switzerland	4.6	6.4	1.7	19.1	−37.8	1974	59.4	1922
United Kingdom	5.5	7.2	1.7	19.3	−56.3	1974	100.2	1975
United States	6.6	8.6	1.8	19.8	−38.6	1931	55.8	1933
Europe	4.3	6.1	1.8	19.7	−47.9	2008	75.9	1933
World ex-US	4.5	6.1	1.7	18.8	−46.0	2008	80.1	1933
World	5.3	6.8	1.5	17.3	−42.9	2008	67.8	1933
Developed markets	5.4	6.9	1.6	17.4	−41.3	2008	65.1	1933
Emerging markets	3.8	6.4	2.0	22.6	−63.0	1945	94.0	1933

Sources: DMS Database, Dimson, Marsh, and Staunton (2026a); Dimson, Marsh, and Staunton (2026b). Not to be reproduced without written express permission from the authors.

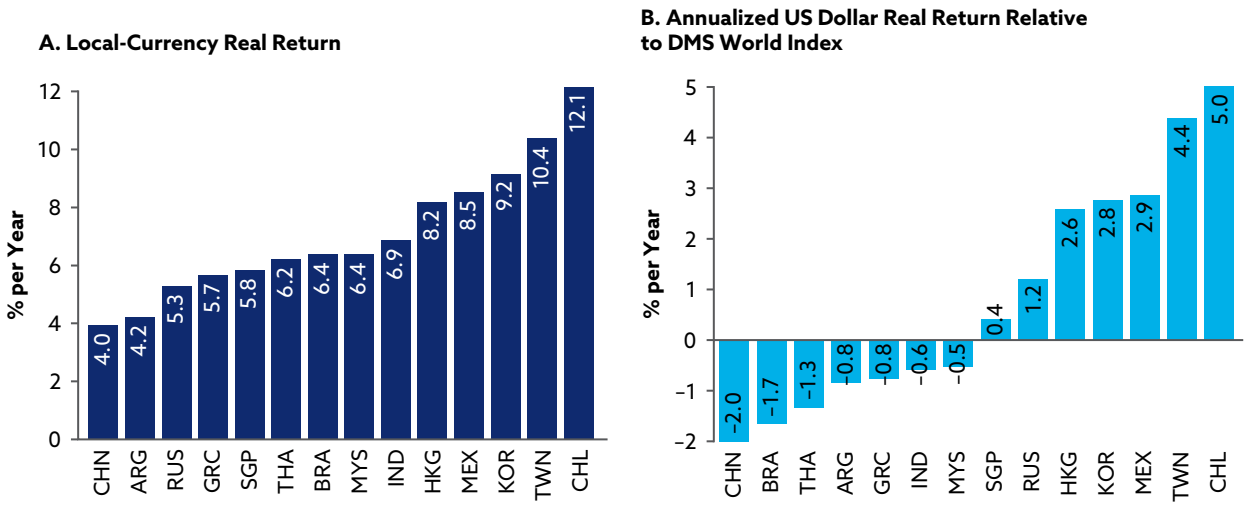
The US stock market's standard deviation of 19.8% places it among the lower-risk markets, ranking sixth after Canada (16.7%), Australia (17.2%), New Zealand (19.0%), Switzerland (19.1%), and the United Kingdom (19.3%). The average standard deviation for the 21 markets in the table is 23.4%. The 17.3% standard deviation for the world index shows the power of global diversification in reducing risk.

The most volatile markets were Portugal (33.2%), Germany (30.7%), Austria (30.9%), Finland (29.2%), Japan (28.6%), and Italy (28.0%). These economies were the most seriously affected by the depredations of war, civil strife, and inflation. In Finland's case, the high volatility reflects its concentrated stock market during some recent periods. Exhibit 11.3 shows that, as one would expect, the markets with the highest standard deviations experienced the greatest range of returns. In other words, they had the lowest minimums and the highest maximums.

Bear markets underline the risk of equities. Even in a low-volatility market, such as the United States, losses can be huge. Exhibit 11.3 shows that the worst calendar year for US equities was 1931, with a real return of –39%. During the 1929–32 crash period, however, US equities fell by 79% in real terms from peak to trough. The worst period for UK equities was the 1973–74 bear market, when stocks fell 73% in real terms from peak to trough and 57% in one year, 1974. For 9 of the 21 countries, 2008 was the worst year. Over intervals of more than a year, many markets have experienced even more extreme returns, both on the downside and the upside.

Panel A of **Exhibit 11.4** shows annualized local-currency real equity returns from the markets for which we have shorter histories. Comparisons are difficult because of their different start dates.

Exhibit 11.4. Annualized Local-Currency Real Equity Returns and Relative Returns over Matching Periods by Market



CHN – China	ARG – Argentina	RUS – Russia	GRC – Greece	SGP – Singapore
THA – Thailand	BRA – Brazil	MYS – Malaysia	IND – Indonesia	HKG – Hong Kong SAR
MEX – Mexico	KOR – South Korea	TWN – Taiwan	CHL – Chile	

Sources: DMS Database, Dimson, Marsh, and Staunton (2026a); Dimson, Marsh, and Staunton (2026b). Not to be reproduced without written express permission from the authors.

In Panel B, we therefore show each country's real US dollar return relative to the return on the DMS world index over the same period.

Exhibit 11.4 shows that the annualized local-currency real returns range from the Chinese Mainland's 4.0% to Chile's 12.1%. Panel B shows that Chile was also the best relative performer, beating the world index by 5.0% per year since its 1960 start date. Taiwan, Mexico, South Korea, and Hong Kong SAR also outperformed strongly.

The worst performer was the Chinese Mainland, which, since its 1993 start date, underperformed the world index by 2.0% per year, despite unprecedented growth in the Chinese Mainland's real GDP since 1990—8.7% per year versus 2.5% for the United States. This serves as a reminder of the lack of a relationship between long-term GDP growth and stock price performance, as documented in Dimson, Marsh, and Staunton (2002, 2014).

Long-Run Real Bond Returns

Exhibit 11.5 shows that the 126 years from 1900 to 2025 were not especially kind to investors in government bonds. Across the 21 continuous-history markets, the average annualized real (inflation-adjusted) return was 0.6% (0.8% excluding Austria's very low figure).[2] Although this return exceeds the average real return on cash by 1.2%, bonds had much higher risk.

Real bond returns were negative in seven of the markets in Exhibit 11.5. German bonds performed worst, and their volatility was even higher than revealed in the table because the statistics exclude 1922–1923. In 1923, hyperinflation resulted in an almost total real loss for German bond investors. In the United States, the annualized real bond return was 1.6%, a little higher than the United Kingdom's 1.4%. These findings suggest that for the full 126-year period, real bond returns in many markets were below investors' prior expectations, with the largest differences occurring in the highest-inflation economies.

Particularly in the first half of the twentieth century, several countries experienced extreme and disappointingly low returns arising from wars and extreme inflation. These low returns were followed by a degree of reversal, with the countries experiencing the lowest returns in the first half of the twentieth century being among the best performers thereafter.

Sweden had the highest long-run real bond return, 2.3% per year, followed by Switzerland and South Africa (2.1%), New Zealand (1.9%), and Canada and Denmark (1.8%). Exhibit 11.5 shows that New Zealand bonds had the lowest standard deviation of returns, 9.0%, followed by Swiss (9.6%) and Spanish (9.9%) bonds.

Since 1900, the average standard deviation of real bond returns across countries was 13.1%, versus 23.0% for equities and 7.5% for bills (these averages exclude Austria). Although bonds have generally been much less volatile than equities, they have experienced some protracted periods of very low or high returns.

In **Exhibit 11.6**, we divide the period from 1900 to 2025 into four subperiods for bond returns: 1900–1949, 1950–1981, 1982–2021, and 2022–2025. We also show the 126-year return from 1900 to 2025. Within each period, we report the annualized return on bonds for the United States, the United Kingdom, Europe, and all 21 markets with continuous histories. For Europe and for the all-market average, we show the average annualized return for the individual countries.

[2]Similar results are available in Dimson, Marsh, and Staunton (2026b) for bond markets that do not have a full 126-year history.

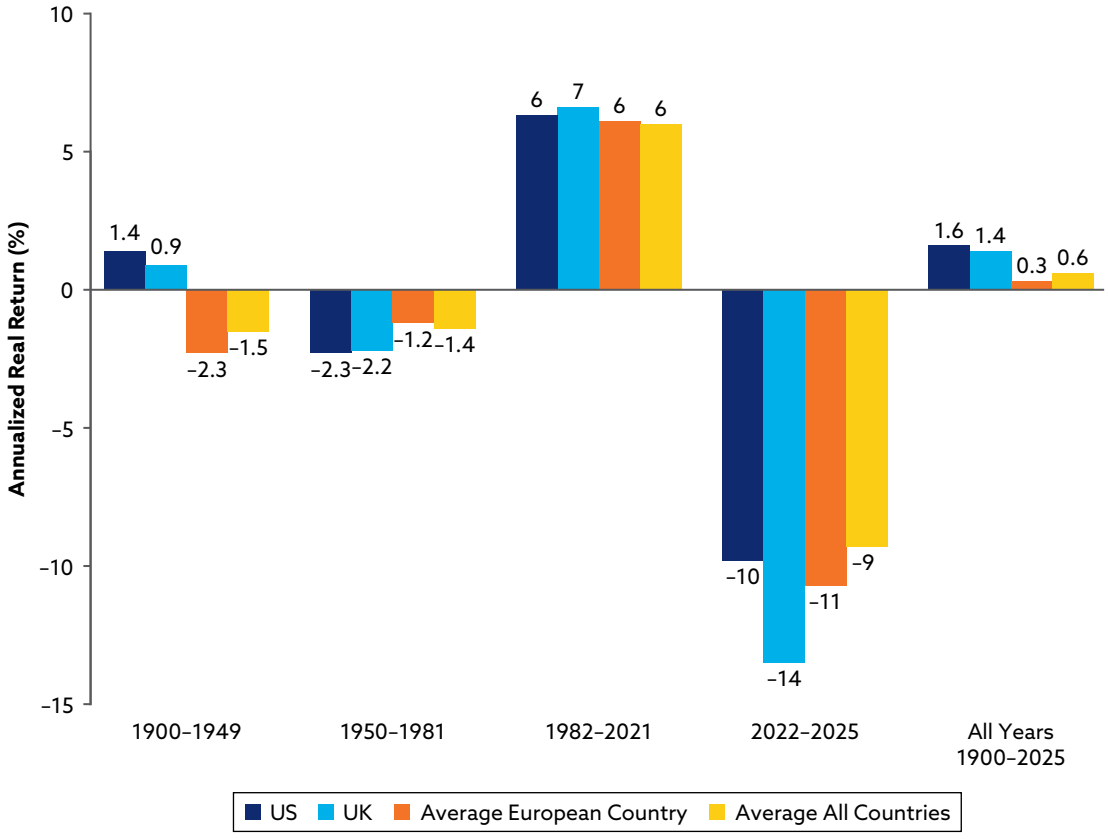
Exhibit 11.5. Real Bond Returns for Indices with Continuous Histories, 1900–2025

Country/Index	Geometric Mean (%)	Arithmetic Mean (%)	Std. Error (%)	Std. Dev. (%)	Min. Return (%)	Min. Year	Max. Return (%)	Max. Year
Australia	1.5	2.3	1.2	13.2	−26.6	1951	62.2	1932
Austria	−4.0	4.1	4.7	52.3	−94.7	1945	484.8	1926
Belgium	0.1	1.3	1.4	15.2	−45.6	1917	62.3	1919
Canada	1.8	2.3	0.9	10.5	−27.7	2022	41.7	1921
Denmark	1.8	2.6	1.2	13.7	−37.0	2022	63.6	1983
Finland	−0.2	1.0	1.2	13.8	−69.5	1918	30.2	1921
France	−0.1	0.8	1.2	13.2	−43.5	1947	35.9	1927
Germany*	−1.6	1.1	1.4	15.8	−100.0	1923	62.5	1932
Ireland	1.2	2.3	1.3	15.1	−37.2	2022	61.2	1921
Italy	−0.9	0.5	1.4	15.4	−64.3	1944	40.0	1996
Japan	−1.1	1.3	1.7	19.0	−77.5	1946	69.8	1954
Netherlands	1.2	1.8	0.9	10.4	−38.3	2022	32.8	1932
New Zealand	1.9	2.3	0.8	9.0	−23.7	1984	34.1	1991
Norway	1.5	2.1	1.0	11.7	−48.0	1918	62.1	1921
Portugal	−1.6	0.0	1.6	18.1	−45.1	1923	90.6	1986
South Africa	2.1	2.6	0.9	10.4	−32.6	1920	42.1	1921
Spain	0.8	1.3	0.9	9.9	−34.8	2022	36.2	1993
Sweden	2.3	3.1	1.1	12.8	−37.0	1939	68.2	1921
Switzerland	2.1	2.6	0.9	9.6	−25.9	2022	56.1	1922
United Kingdom	1.4	2.2	1.2	13.7	−38.5	2022	59.4	1921
United States	1.6	2.1	0.9	10.7	−30.6	2022	35.2	1982
Europe	0.8	2.1	1.5	16.3	−53.7	1919	72.9	1933
World ex-US	1.4	2.4	1.3	14.6	−46.8	1919	76.7	1933
World	1.7	2.3	1.0	11.2	−32.1	1919	46.8	1933
Developed markets	1.4	2.0	1.0	11.1	−33.5	2022	34.7	1933
Emerging markets	−0.3	1.7	1.7	18.5	−76.4	1949	87.3	1933

Sources: DMS Database, Dimson, Marsh, and Staunton (2026a); Dimson, Marsh, and Staunton (2026b). Not to be reproduced without written express permission from the authors.

*German means, standard deviation, and standard error are based on 124 years, excluding 1922–1923.

Exhibit 11.6. Real Bond Returns over Subperiods, 1900–2025



Sources: DMS Database, Dimson, Marsh, and Staunton (2026a); Dimson, Marsh, and Staunton (2026b). Not to be reproduced without written express permission from the authors.

In the first half of the twentieth century, annualized real bond returns were positive but quite low in the United States and the United Kingdom; and they were negative in Europe and when averaged across all countries. These disappointing returns largely resulted from high inflation during and in the aftermath of the two world wars. There were, however, periods in the first half of the twentieth century when investors enjoyed high real bond returns, especially the deflationary period from 1926 to 1933 (see Dimson, Marsh, and Staunton 2026b).

The second set of bars in Exhibit 11.6 shows real bond returns from 1950 to 1981. Returns were negative in the United States and the United Kingdom and, on average, across Europe and all 21 markets. A major culprit was the inflationary 1970s.

The next subperiod shown in Exhibit 11.6 covers the four decades from 1982 to 2021. Over this period, real bond returns were astonishingly high. This was the golden age of bonds. In the early 1980s, governments started to tackle inflation using short-term interest rates as a policy instrument. This approach succeeded in reducing inflation, inflationary expectations, and the risk premium bond investors require for inflation risk, thereby boosting bond prices.

Over time, real interest rates also fell from their high levels in the early and mid-1980s, giving a further boost to bond prices. During the early twenty-first century, bonds benefited from their safe-haven status, from policy interest rates being kept low to support economies, and from quantitative easing. Investors became used to these high returns, but projecting them into the future was clearly inappropriate. This is another example of the importance of looking at long periods of history to understand markets. Even a period of four decades can be misleading if naively extrapolated.

The final subperiod shown in Exhibit 11.6 covers annualized real bond returns from 2022 to 2025. For investors who had grown used to high bond returns and who saw bonds as a safe asset, the returns in 2022 were shocking. The real returns on long-term US and UK bonds were −31% and −39%, respectively. The average return across European countries was −35%, while across all 21 countries it was −31%. Eight countries, including the United States, the United Kingdom, and Switzerland, experienced their worst year ever, as did the DMS developed market index. The era of easy money was over, and inflation and rising real interest rates had taken their toll. The year 2023 was better, but 2024 was disappointing.

The final set of bars in Exhibit 11.6 shows the full 126-year record. Since 1900, the average annualized real bond return across the 21 countries with continuous histories was just 0.6%, with disappointing returns in many markets.

Bill Returns and Real Interest Rates

Treasury bills are an important asset class. They indicate the return on cash and provide a benchmark for the riskless rate of interest. **Exhibit 11.7** shows the annualized real (inflation-adjusted) returns on bills—the realized short-term rate of interest, adjusted for inflation—in the 21 countries and five composite indices for which we have continuous histories from 1900–2025.[3]

Since 1900, US and UK short-term bill investors earned annualized real returns of 0.5% and 1.0%, respectively. Investors in eight countries—Austria, Belgium, Finland, France, Germany, Italy, Portugal, and Japan—earned negative real returns. Almost all of them experienced high inflation at some stage.

For Germany, Exhibit 11.7 excludes 1922–1923, and its full 126-year record is far worse than recorded because in 1923, German bill (and bond) investors lost virtually everything. Although we can generally regard short-dated government bills as riskless, this assumption ceases to be true during hyperinflation. More recently, investors re-learned during the eurozone debt crisis from 2009–2012 that even sovereign bills of developed countries can carry credit risk.

In the first half of the twentieth century, little relationship existed between interest rates and inflation in the United States or elsewhere. From the 1950s onward, however, they have generally had a close relationship. In every country, a breakpoint in the real rate of interest occurred at the end of the 1970s, with real rates thereafter being appreciably higher. A second breakpoint happened in 2008, when rates fell sharply.

[3] Similar results are available in Dimson, Marsh, and Staunton (2026b) for markets that do not have a full 126-year history.

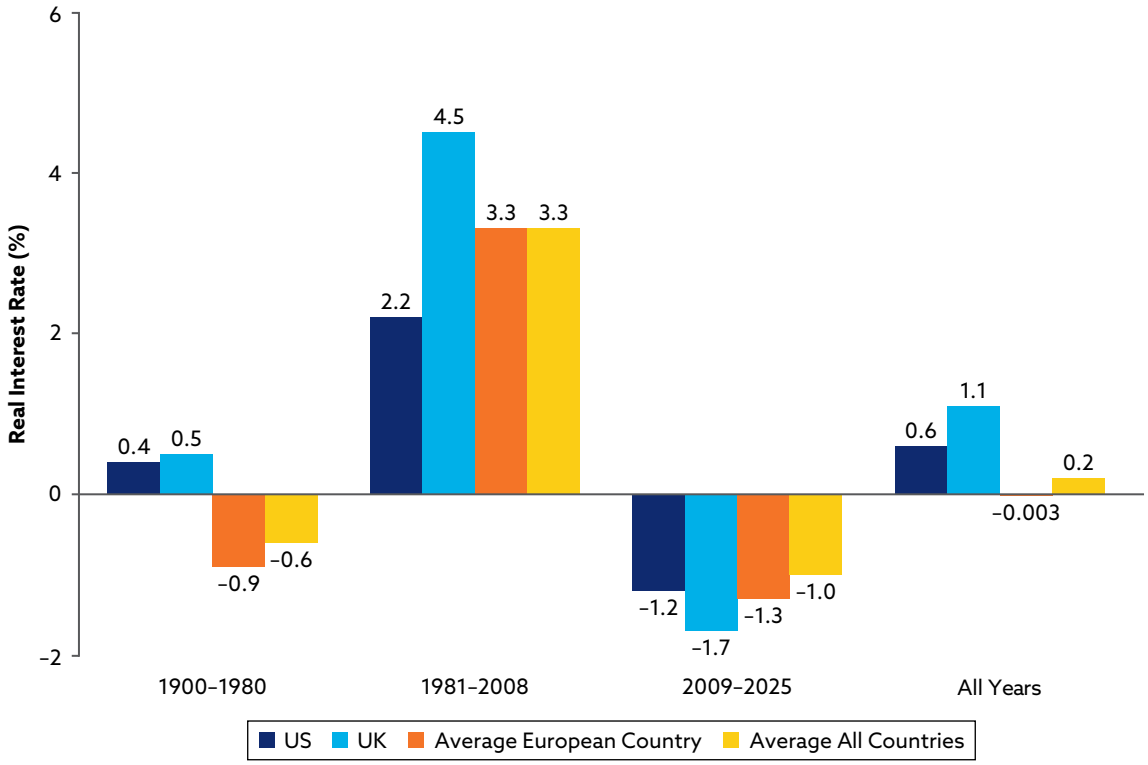
Exhibit 11.7. Real Bill Returns/Interest Rates for Countries with Continuous Histories, 1900–2025

Country	Geometric Mean (%)	Arithmetic Mean (%)	Std. Error (%)	Std. Dev. (%)	Min. Return (%)	Min. Year	Max. Return (%)	Max. Year
Australia	0.6	0.7	0.5	5.1	−15.5	1951	18.5	1921
Austria	−7.6	−3.9	1.6	17.8	−96.4	1922	12.2	1931
Belgium	−0.4	0.4	1.1	12.2	−46.6	1941	69.0	1919
Canada	1.3	1.4	0.4	4.7	−12.5	1947	27.1	1921
Denmark	1.8	2.0	0.5	5.9	−15.8	1940	25.1	1921
Finland	−0.5	0.4	1.0	11.2	−69.2	1918	19.9	1919
France	−2.0	−1.6	0.8	9.1	−38.5	1946	29.7	1921
Germany*	−2.4	−0.6	1.1	12.6	−100.0	1923	38.8	1924
Ireland	0.5	0.7	0.6	6.4	−15.5	1915	42.2	1921
Italy	−3.4	−2.4	1.0	10.9	−76.6	1944	14.2	1931
Japan	−1.8	−0.4	1.2	13.1	−77.5	1946	29.8	1930
Netherlands	0.3	0.4	0.4	4.8	−12.7	1918	19.6	1921
New Zealand	1.5	1.6	0.4	4.5	−8.1	1951	21.1	1932
Norway	0.9	1.1	0.6	6.8	−25.4	1918	31.2	1921
Portugal	−1.1	−0.6	0.8	9.3	−41.6	1918	23.8	1948
South Africa	0.9	1.1	0.5	5.8	−27.8	1920	31.9	1921
Spain	−0.2	0.0	0.5	5.6	−24.3	1946	11.9	1921
Sweden	1.5	1.7	0.6	6.4	−23.2	1918	42.7	1921
Switzerland	0.6	0.8	0.4	4.7	−16.5	1918	25.8	1922
United Kingdom	1.0	1.1	0.5	6.1	−15.7	1915	43.0	1921
United States	0.5	0.6	0.4	4.4	−15.0	1946	17.6	1921

Sources: DMS Database, Dimson, Marsh, and Staunton (2026a); Dimson, Marsh, and Staunton (2026b). Not to be reproduced without written express permission from the authors.

*German means, standard deviation, and standard error are based on 124 years, excluding 1922–23.

Exhibit 11.8. Real Interest Rates over Subperiods, 1900–2025



Sources: DMS Database, Dimson, Marsh, and Staunton (2026a); Dimson, Marsh, and Staunton (2026b). Not to be reproduced without written express permission from the authors.

Exhibit 11.8 focuses on these three periods: 1900–1980, 1981–2008, and 2009–2025. It shows the arithmetic average annual real rate of interest in each period (and for the full 126 years) for the United States and the United Kingdom and the average for all European and DMS markets with continuous 126-year histories. In the United States, the average real interest rate was 0.4% from 1900 to 1980, compared with 2.2% from 1981 to 2008 and −1.2% since then. In the United Kingdom, the pre-1980 average annual real rate was 0.5%, versus 4.5% from 1981 to 2008 and −1.7% since 2009.

The average annual real interest rate was clearly very low—indeed, negative—following the GFC. Since 2022, real interest rates have risen. Investors are now asking whether real rates have returned to normal, which raises the question, What is normal? Unfortunately, many investors' view of normality is heavily conditioned by the period before the crisis. Exhibit 11.8 suggests, however, that although the very low post-GFC real rates were clearly not normal, neither were the very high real rates over the 28-year period before the financial crisis. This is yet another example of the need to look at very long periods of history to gain perspective on important current investment questions.

Emerging vs. Developed Market Returns

Emerging markets tend to be associated with rapid growth and hence are often perceived as offering investment rewards higher than in developed markets. We explore whether this has been the case over the last 126 years by comparing the performance of the DMS emerging market and developed market indices, for both equities and bonds.

The DMS emerging markets equity index is constructed from the DMS 90 database. Starting in 1900, markets are classified as emerging or developed at the beginning of each year. All markets for which we have data and that are deemed to be emerging are included in the index, weighted by each market's capitalization. From the start of MSCI's emerging markets index in 1987, we adopt its annual classification to determine which markets were developed. We do not use MSCI index values. Prior to 1987, we use our own algorithm to determine which markets were developed. This is based on GDP per capita, as described by Dimson, Marsh, and Staunton (2026b).

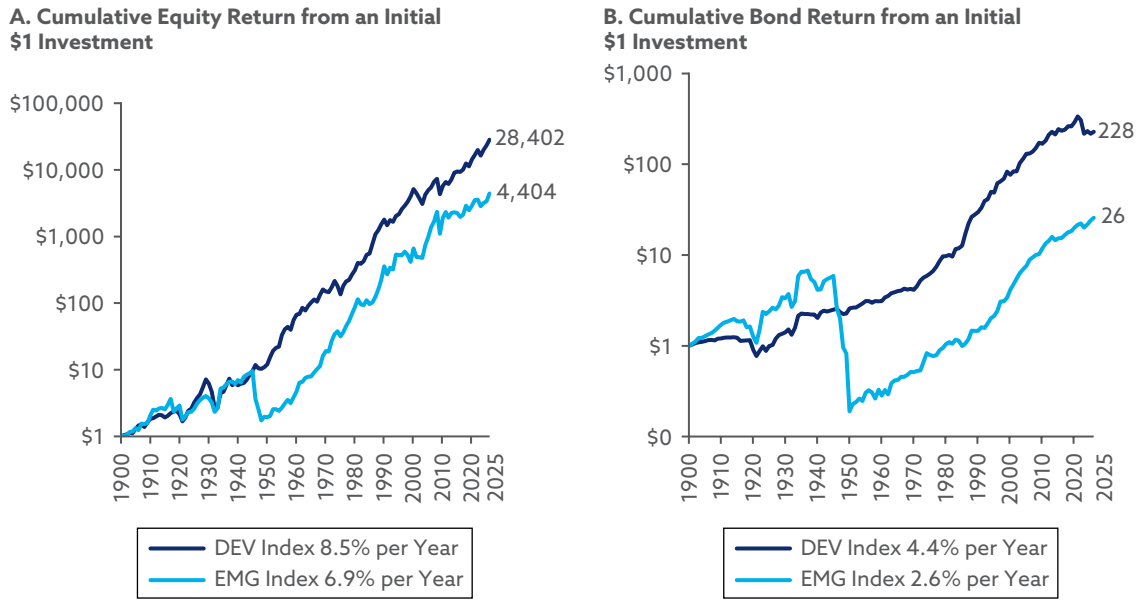
We do not distinguish between emerging, frontier, other, or unclassified markets. Our focus is simply on the split between markets that are deemed developed and those with developing status. We group together all the latter markets as a single cohort and refer to them generically as "emerging." In 1900, the DMS emerging markets equity and bond indexes were based on seven countries. We add other markets once return data become available. Thus, we add Brazil in 1951, India in 1953, Greece in 1954, Chile in 1960, South Korea and Hong Kong (now Hong Kong SAR) in 1963 (until the latter moved to developed status in 1977), Singapore in 1966 (until it moved to developed status in 1980), Mexico in 1969, Malaysia in 1970, Argentina, Thailand, and Zimbabwe in 1976, and so on. We continue bringing other markets into the emerging market index until we reach 2025. Markets leave if they are promoted to developed status. By 2025, the number of constituents in the emerging markets equity index had grown to 66 countries.

The DMS developed markets index is created using the same rule. This index had 16 constituents in 1900 and was joined by Finland in 1932, Argentina in 1960 (until it moved to emerging status in 1976), Japan in 1966, Spain in 1974, Hong Kong (now Hong Kong SAR) in 1977, Singapore in 1980, Luxembourg in 1982, Portugal in 1998, Greece from 2002 to 2013, and Israel in 2011. The developed markets index is computed annually based on all markets deemed to be developed at the start of the year in question. The indices are estimated in common currency—namely, US dollars—although they can readily be converted to an alternative common currency. These indices enable us to compare emerging and developed market performance over the full period of 126 years spanned by the DMS database.

The long-run performance of emerging versus developed market equities is plotted in Panel A of **Exhibit 11.9**. Emerging markets outperformed early in the twentieth century but were hit badly by the October 1917 revolution in Russia, when investors in Russian stocks lost everything. Emerging markets underperformed in the global bull market of the 1920s but were less severely affected than developed markets by the subsequent crash. From the mid-1930s until the mid-1940s, they moved in line with developed markets.

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

Exhibit 11.9. Long-Run Returns on Emerging and Developed Market Equities and Bonds, 1900–2025



Sources: DMS Database, Dimson, Marsh, and Staunton (2026a); Dimson, Marsh, and Staunton (2026b). Not to be reproduced without written express permission from the authors.

After 1960, emerging markets staged a long fight back, albeit with periodic setbacks. From 1960 to 2025, their annualized return was 10.9%, versus 9.6% from developed markets. This gain was insufficient, however, to make up for their precipitous decline in the 1940s. The full 126-year graph shows that the terminal wealth from an initial investment of $1 in emerging markets was $4,404. This amount is appreciably below that of developed markets, which had a terminal value of $28,402.

The annualized return from investing in emerging markets over 1900–2025 was 6.9%, compared with 8.5% for their developed counterparts. The DMS world index, which includes every stock market in the DMS 90 in every year for which data are available, had an annualized return of 8.4% over that period. For a global investor, the impact from including or excluding particular emerging markets has been small. The rules for market classification and the dangers of survivorship bias also have a negligible impact on estimated equity returns or premiums.

The long-run performance of emerging versus developed market bonds is plotted in Panel B of Exhibit 11.9. These long-run bond indices are constructed using the same principles as the equity indices but are based on the 35-market DMS 35 dataset because we do not yet have bond data for the supplementary 55 (almost entirely emerging) markets. The emerging market bond index thus has fewer constituents, starting with seven markets in 1900 and ending with 16 in 2025.

Exhibit 11.9 shows that emerging market bonds were ahead of developed market bonds until the 1940s, when they plummeted. As with emerging market equities, the largest contributor to this decline was Japan, where bonds lost 99% of their value in US dollar terms. Another contributor was China. Spanish bonds also performed poorly in the wake of the Spanish Civil War.

A recovery followed in the second half of the twentieth century. Emerging market bonds outperformed developed market bonds from 1950 to 2025, with the same being true for start dates of 1960 and 1980 (but not 1970). Emerging market bonds have also outperformed DM bonds over the last 40, 30, 20, and 10 years. Over the full 126 years, they gave an annualized US dollar return of just 2.6%, compared with 4.4% for developed market bonds. These returns are nominal, and after adjusting for US inflation, a US investor in emerging market bonds would have lost money in real terms, with an annualized real return of −0.3%, versus +1.4% for developed market bonds. These results are unsurprising, given the crises of the 1940s and the high inflation rates since then in many countries.

Twenty-First Century Returns

The twenty-first century is now 26 years old. Our first book on global investment returns (Dimson, Marsh, and Staunton 2002) reported on a century of data since 1900. We can now compare investment returns over the entire period—more than a century and a quarter—since 1900. **Exhibit 11.10** shows asset returns for the 21 markets with a continuous long-term history. For comparability across countries, the annualized real returns on stocks, bonds, and bills are shown in common currency (US dollars). We also show annualized inflation.

American exceptionalism is clear: The United States enjoyed the highest equity returns (ranked first in the rank column), and US bonds were in fourth place. The last two columns show that stocks were the best asset class everywhere, while bills were the worst (except in Portugal, where bonds performed the worst).

Despite the recent spike in inflation, the twenty-first century has predominantly been a period of low inflation. The average annualized inflation rate for the 21 countries over the last 26 years was just 2.2%, compared with 5.6% over the twentieth century. The average annualized bill return was also lower, at −0.4% compared with −0.6% over 1900–1999. These results reflect the long period of very low and sometimes negative short-term nominal interest rates. Over the last 26 years, the annualized real return on the world bond index was 1.1% higher than it was during the twentieth century. This result is attributable to the steady decline in real interest rates—which reversed in 2022.

The annualized real return on the world equity index was 1.6 percentage points lower over the last 26 years than during the twentieth century. Four notable bear markets in 26 years, two of them among the deepest in history, have contributed to this.

The annualized US real equity return was 5.2% over the last 26 years, and although lower than the 7.0% over the preceding 100 years, this return is still excellent. US equities ranked ninth among the 21 markets, but apart from Australia, the markets that ranked higher were small. Twenty-first century global equity performance was driven by the United States, and over the last 26 years, the world ex-US index gave an annualized return of just 2.9%. Equity returns in Germany, France, Japan, and the United Kingdom for the same period were all disappointing.

Exhibit 11.10. Real Common-Currency Returns on Stocks, Bonds, and Bills for Indices with Continuous Histories, 1900–2025

Country/Index	Real USD Equity Return (% per year)	Rank	Real USD Bond Return (% per year)	Rank	Real USD Bill Return (% per year)	Inflation (% per year)	Best	Worst
Australia	6.5	2	1.3	10	0.3	3.7	Equities	Bills
Austria	0.3	21	−4.7	21	−8.3	12.0	Equities	Bills
Belgium	3.1	19	0.5	14	−0.1	4.9	Equities	Bills
Canada	5.7	5	1.6	5	1.1	3.0	Equities	Bills
Denmark	5.8	4	2.1	2	2.1	3.6	Equities	Bills
Finland	5.4	8	−0.3	15	−0.6	6.7	Equities	Bills
France	3.2	18	−0.4	16	−2.3	6.5	Equities	Bills
Germany*	3.5	17	−2.4	20	−3.1	4.5	Equities	Bills
Ireland	4.6	12	1.3	9	0.6	4.0	Equities	Bills
Italy	2.6	20	−0.9	17	−3.4	7.6	Equities	Bills
Japan	4.4	14	−1.3	18	−2.1	6.3	Equities	Bills
Netherlands	5.3	10	1.4	6	0.5	2.9	Equities	Bills
New Zealand	5.6	7	1.4	7	1.0	3.6	Equities	Bills
Norway	4.4	13	1.4	8	0.8	3.6	Equities	Bills
Portugal	3.7	16	−1.6	19	−1.1	7.0	Equities	Bonds
South Africa	6.2	3	1.2	11	0.1	5.0	Equities	Bills
Spain	3.7	15	0.8	13	−0.2	5.4	Equities	Bills
Sweden	5.7	6	2.0	3	1.2	3.3	Equities	Bills
Switzerland	5.3	9	2.8	1	1.3	2.1	Equities	Bills
United Kingdom	5.0	11	1.0	12	0.6	3.5	Equities	Bills
United States	6.6	1	1.6	4	0.5	2.9	Equities	Bills
World ex-US	4.5		1.5					
World	5.3		1.7					

Sources: DMS Database, Dimson, Marsh, and Staunton (2026a); Dimson, Marsh, and Staunton (2026b). Not to be reproduced without written express permission from the authors.

*German bond and bill returns are based on 124 years, excluding 1922–1923.

Despite this uneven performance, global investors in world equities enjoyed creditable returns over the period since we published our first study of long-term asset returns (Dimson, Marsh, and Staunton 2002). Over the last 26 years, they have enjoyed an annualized real US dollar return of 4.0% and an equity premium relative to bills of 4.7%.

Conclusion

Real equity returns since 2000 have been strong but below their historical averages. Four notable bear markets in 26 years have provided a timely reminder of the considerable risk involved in equity investment. Investors were spoiled by high returns in the 1980s and 1990s, when equities seemed to guarantee high returns.

We have stressed the importance of taking a long-term view when seeking to understand the nature of risk and return in the world's markets. It is important because equity and bond markets are volatile. We have shown that in the long run, equity returns have dominated bond and bill returns. Over the 126 years since 1900, equities have outperformed bonds, bills, and inflation in all 21 markets for which we have a continuous history.

For the world as a whole, equities have outperformed bills by 4.8% per year and bonds by 3.5% per year. This result provides a reassuring reminder that in the long run, there has been a reward for taking the higher risk of investing in stocks. Similarly, riskier bonds have outperformed close-to-riskless bills, again indicating a reward for risk. In our most recent Yearbook (Dimson, Marsh, and Staunton 2026b), we looked more closely at these risk premiums and estimated how large we can expect them to be in the future.

Key Takeaways

- Many people consider the long term to be 10 or 20 years. But markets are volatile, and longer periods are needed to understand the risk and return from stocks and bonds. Over the last 126 years, equities dominated government bonds, while bonds outperformed Treasury bills. In the long run, the law of risk and return therefore held: The riskiest assets provided the highest return, and riskless bills gave the lowest return.
- The US stock market has done especially well. However, we caution against extrapolating from the American experience. We quantified the long-run investment performance of 35 different stock and bond markets and presented local-currency returns adjusted for each market's inflation. In a comparison of investment performance since 1900 in common currency, the United States had the highest stock market return and Switzerland had the highest bond market return.
- Developed markets dramatically outperformed emerging markets. Over the period since 1900, a diversified developed market equity portfolio would have grown to more than six times the value of a diversified emerging market equity portfolio. Over the same 126-year interval, a diversified developed market bond portfolio would have grown to more than eight times the value of a diversified emerging market bond portfolio.

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This chapter (or an unabridged version thereof) originally appeared in Elroy Dimson, Paul Marsh and Mike Staunton, 2026, Global Investment Returns Yearbook 2026, Zurich: UBS AG. ISBN 978-1-0369-5522-9.

[4]Extensive additional references and data sources are provided in Dimson, Marsh, and Staunton (2026b, pp. 291–300).

CHAPTER 12. THE LONDON MARKET, 1870–1929

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Introduction

The London Exchange was an important public capital market through much of the nineteenth and twentieth centuries. *The Investor's Monthly Manual* (*IMM*) published monthly price records and related information for many of the domestic and international securities that traded on the London Exchange over a 60-year period from 1869 to 1929. We constructed UK and ex-UK capitalization-weighted return indices for corporate stocks, bonds, preferred shares, municipal bonds, and sovereign debt. We matched corporate securities of various types by firm to test the implications of contingent claims theory for the risk and return of subordinated claims. We find a realized equity return of more than 6% and an equity risk premium of more than 3%. We also document significant differences in mean and standard deviation conditional on relative position in the firm's capital structure.

The Investor's Monthly Manual

The Investor's Monthly Manual was a statistical supplement to *The Economist*, published monthly from 1864 to 1870 and less frequently through 1930. The purpose of the supplement was not to provide a continuous, comprehensive, and consistent historical record for posterity but, rather, to be useful to market participants and observers of the day. As such, it is not an official record of securities traded on the London Exchange, but it is nevertheless extensive, with more than 9,000 securities and more than 1.5 million security/month observations. An ongoing project at the International Center for Finance at the Yale School of Management has made the digitized security-level price and dividend data available for research.

Testing Capital Structure Theory

The London capital market provides a rich dataset to test a basic hypothesis about the relative risk and return of structured claims on the value and cash flows of corporations. The stocks, bonds, preferred shares, and other contingent securities for each firm are listed together in the manual, making it possible to inspect the entire capital structure without matching across disconnected data sources.

Contingent claims theories of the firm (e.g., Black and Scholes 1973; Merton 1974; Bhamra, Kuehn, and Strebulaev 2010) make sharp predictions about the relative risk and expected return of corporate securities, conditional on priority position. Equity represents the most junior claim, followed by preferred shares and corporate debt, with senior debt enjoying priority in default states. Because junior claims absorb losses in adverse states and exhibit greater exposure to firm-value volatility, they are inherently riskier and more sensitive to macroeconomic shocks and should earn higher expected returns.

Although Modigliani and Miller (1958, 1963) emphasized that leverage reallocates risk without altering total firm value, the contingent claims framework clarifies how this reallocation generates a strict hierarchy of risk and expected returns across claims. We test this prediction using long-horizon realized returns as proxies for expected returns.

Stocks, Bonds, Bills, and Inflation

Ibbotson and Sinquefield (1976a) is a landmark article in the application of modern portfolio theory to the practice of investment management. It was motivated in part by the need to calculate the risk, return, and correlations for the major US asset classes that dominated institutional investment portfolios at the time. Their analysis was particularly valuable to professional investment managers, who had only recently adopted quantitative methods of portfolio optimization. What was lacking at the time were reliable inputs to the mean–variance model. Ibbotson and Sinquefield (1976a) showed that despite the turbulent performance of equities in the early 1970s, the long-term perspective demonstrated that equity investors could have earned a substantial premium over bonds.

In a companion article, Ibbotson and Sinquefield (1976b) developed a decomposition of expected returns based in part on capital structure theory and in part on the theory of factor premiums. They postulated a small stock premium, an equity premium, a default premium, a horizon (term) premium, and a real (inflation-adjusted) return. The authors found that each of these premiums was positive over the 50-year sample, consistent with the hypothesis that investors require compensation for holding each type of risk. They showed how to use this building block model to forecast future asset class returns via simulation methods.

We do not use precisely the same premiums as Ibbotson and Sinquefield (1976b). First, we forgo the calculation of a small stock premium. Although market commentators in the late nineteenth and early twentieth centuries recognized some shares as more speculative than others, they did not typically differentiate on the basis of capitalization; late twentieth-century interest in small stocks as an asset class stems from the foundational academic research on factor premiums by Banz (1981) and Reinganum (1981).

Instead, we calculate two additional premiums: a preferred share premium, which we call a *priority premium*, and a municipal bond premium over long-term government bond returns. The prevalence of preferred shares in the *IMM* database gives us more power to test whether seniority in the corporate capital structure is associated with lower realized returns. The prevalence of municipal bonds in the database allows us to test a different but interesting hypothesis—whether UK government debt at the time had a lower risk and return than municipal debt had. Finally, we calculate an equity risk premium in two ways: using long-term government debt and a proxy for the short-term riskless security.

Methodology

The London market listed and traded securities of issuers from all over the world, enabling us to compare the performance of UK-only portfolios with that of ex-UK portfolios. We construct annual cap-weighted indexes of each corporate asset class based on the securities issued by the 100 largest companies each year. To do this, we identified the 100 largest firms by equity capitalization at the end of each year. We then found the corporate bonds and preferred shares of these firms.

We calculated a cap-weighed equity return, a cap-weighted bond return, and a cap-weighted preferred share return over the next year. We calculated premiums by taking the differences between these indexes. We used December prices to calculate capital appreciation and price returns. We summed the dividends over the year to calculate income returns and added price return and income return together to calculate total return. If prices were missing for the December issue, we used the price from the latest available month. Because not all companies in a given year have bonds or preferred shares trading, these asset classes may contain fewer securities. This approach has the benefit of measuring the stock–bond premium on the same companies.

Both domestic and foreign municipal debt are represented in our sample, as is foreign sovereign debt. For each of these asset classes, we calculated cap-weighted indexes. For domestic long-term debt, we formed portfolios of long-term government bonds consisting of consols and other long-maturity Treasuries. It is difficult to find a perfect proxy for a short-term risk-less security available to investors. UK Treasury bills did not exist over much of the period of analysis; we followed other authors and used the UK prime commercial bill rate. Inflation and production data are from the Bank of England website.

Summary Statistics

Exhibit 12.1 reports summary statistics for three sets of data: the UK only, world ex-UK, and world portfolios. The exhibit reports the results over the full 60-year time period (1870–1929) for the geometric annual return (GM), arithmetic annual return (AM), standard deviation (SD), and Sharpe ratio (SR), where the commercial bill rate is taken to be the riskless rate.

The annual arithmetic mean return for the UK equity index over the 60-year period is 7.34%. This figure is significantly lower than the large-cap US index return over the post-1925 period documented by Ibbotson and Sinquefield (1976a) and the post-1900 period studied by Dimson, Marsh, and Staunton (2023) for UK equities. The volatility of the returns from the pre-1930 equity data is lower as well, however: 7.77% compared with equity index volatility near 20% for most twentieth-century markets. This risk difference may result from the fraction of income return versus capital appreciation. Much of the return in the *IMM* period (1865–1929) was from dividends, and although variable, they were smoother than price changes. As a result, the Sharpe ratio for the *IMM* sample, measured conservatively by using the commercial paper rate as the riskless rate, is 0.45.

Notice the near-monotonic decline in both the risk and return of the basic series in the UK market as one proceeds through the capital structure. The preferred stock return is lower than the common stock return, the corporate bond return is lower than the preferred stock return, the municipal bond return is lower than the corporate bond return, and the government bond

Exhibit 12.1. Asset Returns by Category for the UK, World Ex-UK, and World Portfolios

Asset Class	GM	AM	SD	SR	*t*-Statistic
A. United Kingdom					
Common stock	7.06	7.34	7.77	0.45	7.32
Preferred stock	4.01	4.18	6.01	0.08	5.38
Corporate bond	3.50	3.62	4.90	–0.01	5.71
Municipal bond	3.27	3.36	4.36	–0.06	5.97
Government bond	2.78	2.88	4.39	–0.16	5.08
Commercial paper	3.66	3.67	1.19	–	23.84
Inflation	1.00	1.18	6.31	–	–
B. World Excluding United Kingdom					
Common stock	5.62	6.01	9.09	0.25	5.12
Preferred stock	5.21	5.39	6.04	0.27	6.90
Corporate bond	4.47	4.57	4.70	0.17	7.54
Municipal bond	5.12	5.21	4.37	0.31	9.24
Government bond	4.54	4.64	4.52	0.19	7.96
C. World					
Common stock	6.62	6.88	7.35	0.41	7.25
Preferred stock	4.38	4.49	4.87	0.15	7.14
Corporate bond	3.72	3.82	4.61	0.03	6.41
Municipal bond	3.88	3.95	3.88	0.06	7.89
Government bond	3.89	3.96	3.88	0.06	7.91

Notes: All returns are annualized percentages; *t*-statistics are for the AM. The commercial paper and inflation series are available only for the United Kingdom.

return is lower than the municipal bond return. The only surprise is the higher commercial paper rate compared with the government bond return. Odlyzko (2016) argues that the high price of UK consols in the nineteenth century resulted from their role as a benchmark safe asset in the global capital market.

The monotonic relationship among UK corporate securities does not hold for the other portfolios. For example, Panel B of Exhibit 12.1 shows the summary statistics for the ex-UK

portfolios. The common stock return and the Sharpe ratio for the world ex-UK portfolio are both much lower relative to the UK portfolio. Interestingly, the returns to ex-UK preferred stock, municipal bonds, and government bonds are all higher relative to the UK asset classes. The returns across all the ex-UK asset classes are compressed.

Summary statistics differ somewhat for the world portfolio, which was constructed by applying the top 100 rule to equities from the entire sample of companies listed in the *IMM* database. The common stock row for the world category represents the annual average return to a capital-weighted portfolio of the largest stocks reported in the *IMM* database each year, and as before, the preferred stock and corporate bonds are those issued by these same top 100 firms. Ex-UK government bonds represent the returns to a cap-weighted portfolio of sovereign debt of more than 20 countries.

Exhibit 12.2 shows the market share by asset class over the 60-year period and the total capitalization of the market. The market grew fourfold from 1870 to 1929, with long periods in

Exhibit 12.2. Market Share of UK Securities by Asset Class and Total Market Capitalization, 1870–1929

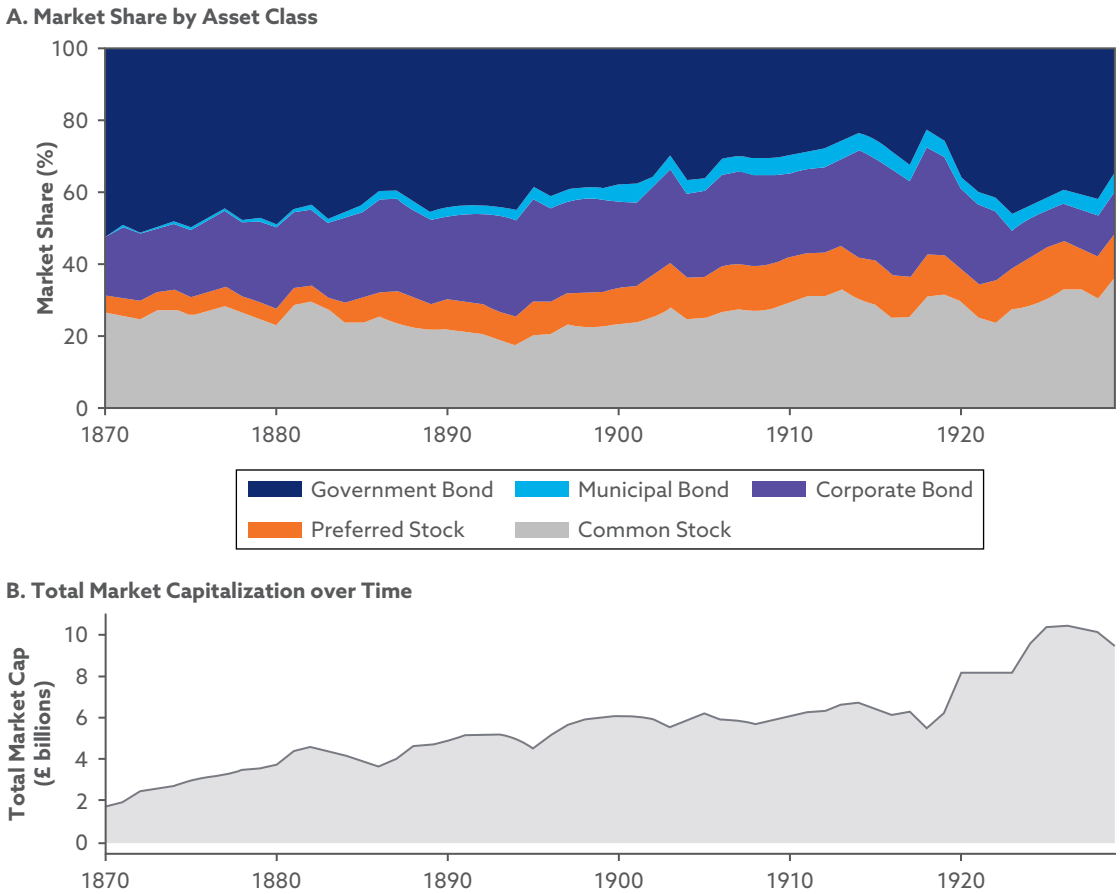
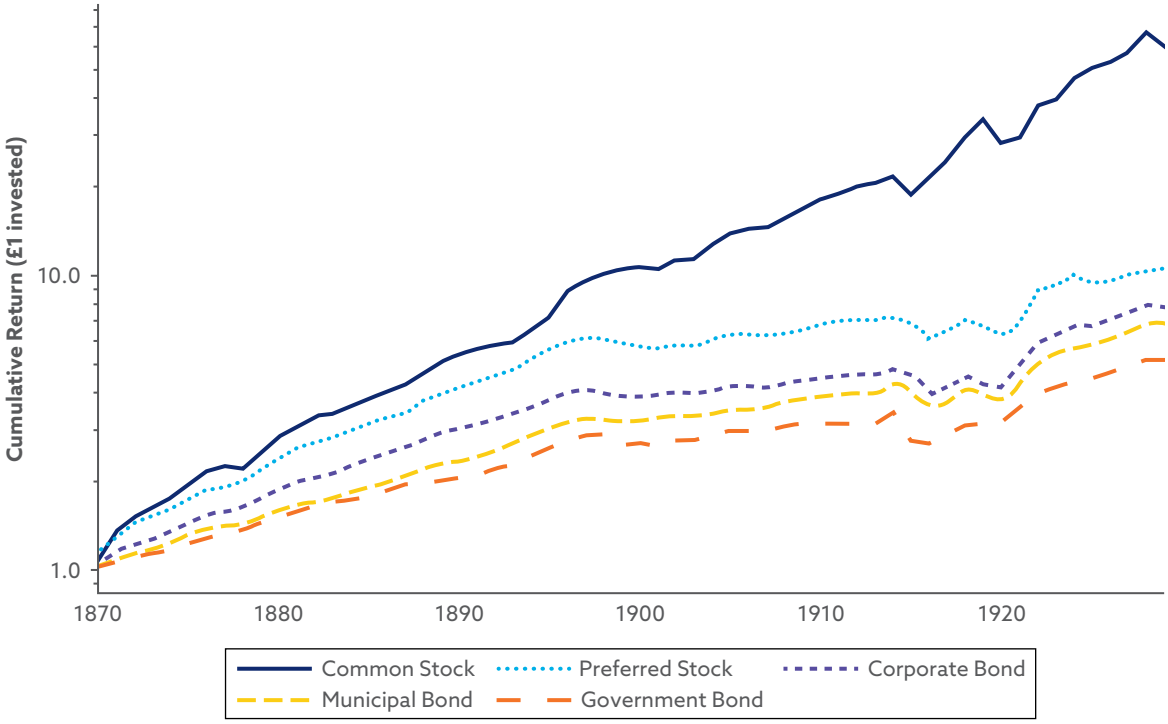


Exhibit 12.3. Cumulative Total Returns by UK Asset Class, 1870–1929



which the capitalization growth was under 3%. This finding is consistent with consumption of a substantial component of total return each period. The exhibit also shows that the fraction of common stock remained fairly stable, growing only slightly in the 1920s.

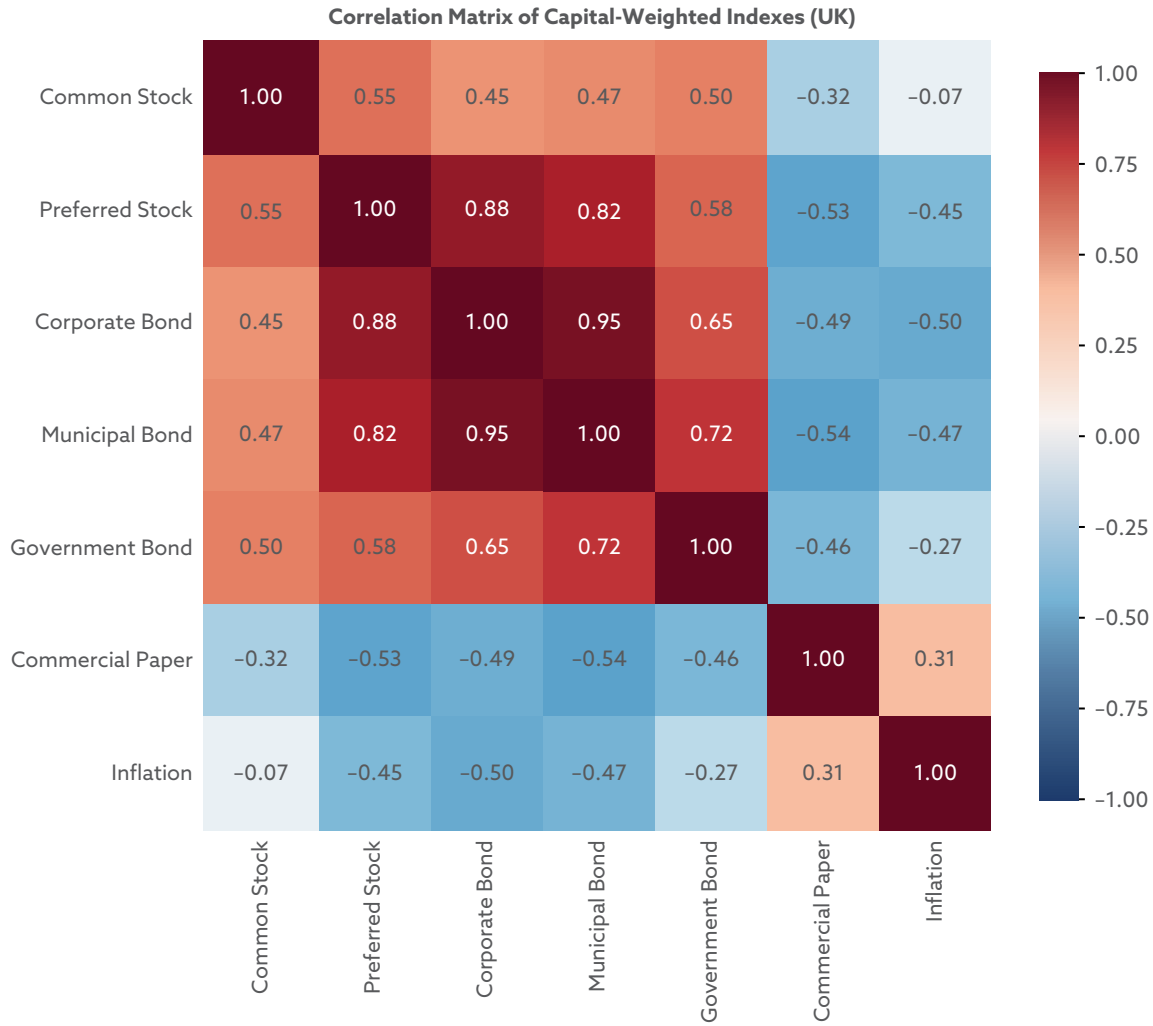
Exhibit 12.3 shows the 60-year cumulative return for stocks, the various corporate asset classes, and long-term government bonds. The risk–return tradeoff for equities versus senior securities is clear, as is the sensitivity of equities to shocks, such as World War I, the recession of 1920–1921, and the crash of 1929.

Exhibit 12.4 is a color-coded correlation matrix of asset class returns, with positive correlation in red and negative correlation in blue, coded as a heat map. Notice that UK equities are highly (but not perfectly) correlated with non-UK equities, moderately correlated with fixed-income securities, and negatively correlated with commercial paper and inflation. Among fixed-income securities, preferred stock and corporate bonds are highly correlated, as predicted by theory.

Risk Premiums

As described previously, premiums are calculated as the difference between the annual return series of two value-weighted portfolios (one for each asset type). For corporate securities, conditioning on the set of top firms each year largely controls for cross-sectional firm

Exhibit 12.4. Correlation Matrix of Capitalization Indexes by Asset Class (UK Portfolio)



differences in underlying risk and provides an accurate test for the significance of corporate risk premiums. **Exhibit 12.5** shows these various premiums.

For the UK portfolio, the equity risk premium is computed two ways: first with respect to the returns on commercial paper and second with respect to returns on a portfolio of long-term UK government bonds, mostly consols. The latter may be appropriate given the similar duration of cash flows from equity and long-term bonds, as well as the fact that the British consol was a reference security; during the period of our data, it was widely regarded as a safe investment. The equity premium over commercial paper is 3.7% and over government bonds is 4.5%, both with *t*-statistics greater than 3. Similarly, the equity premium over all other corporate securities is statistically significant.

Exhibit 12.5. Premium Estimates by Category for the UK, World Ex-UK, and World Portfolios (Full Sample)

Premium	GM	AM	SD	*t*-Statistic
A. United Kingdom				
Equity – commercial paper	3.34	3.68	8.23	3.46***
Equity – long-term government bond	4.25	4.46	6.72	5.14***
Equity – all corporate securities	3.23	3.45	6.74	3.96***
Priority (preferred stock – corporate bond)	0.52	0.56	2.92	1.49
Default (corporate – government bond)	0.66	0.74	3.93	1.45
Municipal – government bond	0.43	0.49	3.25	1.16
Horizon (government – commercial paper)	–0.92	–0.79	5.05	–1.21
B. World Excluding United Kingdom				
Equity – commercial paper	1.90	2.35	9.50	1.91*
Equity – long-term government bond	1.05	1.37	8.08	1.31
Equity – all corporate securities	0.79	1.03	6.97	1.15
Priority (preferred stock – corporate bond)	0.59	0.81	6.72	0.94
Default (corporate – government bond)	–0.13	–0.07	3.57	–0.15
Municipal – government bond	0.52	0.57	3.23	1.36
Horizon (government – commercial paper)	0.84	0.98	5.11	1.48
C. World				
Equity – commercial paper	2.90	3.21	7.84	3.17***
Equity – long-term government bond	2.72	2.92	6.29	3.59***
Equity – all corporate securities	2.56	2.72	5.85	3.61***
Priority (preferred stock – corporate bond)	0.61	0.67	3.60	1.45
Default (corporate – government bond)	–0.18	–0.14	2.73	–0.41
Municipal – government bond	–0.03	–0.01	1.96	–0.06
Horizon (government – commercial paper)	0.19	0.29	4.54	0.50

Notes: All premium estimates are stated in annualized percentages. * and *** denote significance at the 10% and 1% levels, respectively.

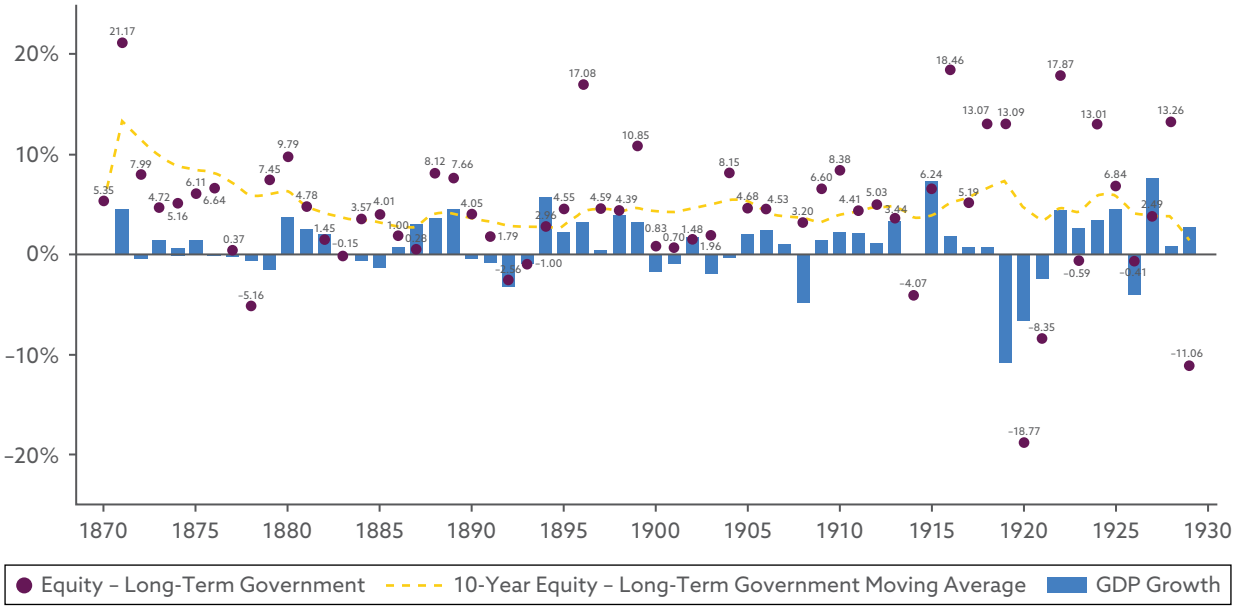
Consistent with theory, the priority premium of preferred stock returns over corporate bond returns is positive, at about 0.52%. The difference in corporate bond returns and long-term government bond returns measures the realized default premium, which is about 0.66%. Chambers, Dimson, Ilmanen, and Rintamäki (2024) surveyed the literature on long-run asset returns and reported that investment-grade corporate bonds have historically offered a credit premium of roughly 1% per year over government bonds across several markets and periods.

Dimson, Marsh, and Staunton (2024) devoted a special chapter to corporate bond returns across countries in the *UBS Global Investment Returns Yearbook 2024*. Our estimate of the default premium in the *IMM* data is broadly consistent with these findings. The only premium with an unexpected sign is the horizon premium.

Exhibit 12.6 plots the annual equity risk premium with respect to government bonds. Purple dots are the annual realized premium, the dashed yellow line is the 10-year backward-looking rolling equity risk premium, and the blue bars are annual UK GDP growth. In most years, the equity risk premium is positive, particularly in the years before World War I. Negative values are associated with recessions or near-zero GDP growth, consistent with equity market exposure to macroeconomic risk.

The rolling 10-year equity premium shows that stocks beat government bonds over every decade-long period in the sample. Exhibit 12.5 shows the relationship is a statistically significant one. The smallest 10-year spread was the final one, ending in 1929. It is noteworthy that 1930

Exhibit 12.6. Equity Risk Premium over Bonds for the Top 100 UK Firms, Backward-Looking 10-Year Moving Average, and Percentage Change in UK GDP, 1870–1929



Note: The risk premium is measured as the difference between the capitalization-weighted index of top 100 UK firms by size and the return to an index of long-term UK government bonds

was the last year *The Economist* published *The Investor's Monthly Manual*. The sample ended as the Great Depression began.

McQuarrie (2024) argues that over the very long run, stocks do not always beat bonds, documenting episodes in both the United States and the United Kingdom during which bonds outperformed equities, even over extended holding periods. The consistently positive rolling 10-year equity premium in the *IMM* data suggests that at least in the pre-1930 UK market, the equity risk premium was reliably positive at the decade horizon. This result stands in contrast to the postwar experience in some markets where bonds periodically dominated.

Conclusion

The Investor's Monthly Manual is a record of an important and liquid capital market during its historical peak. We use it to test whether the premiums for a hierarchy of the seniority of corporate claims are consistent with theory; that is, subordinate claims should have a higher risk and thus a higher expected return. We use long-term realized returns over 60 years to test the higher-risk hypothesis and the long-term mean return over the period as a proxy for expected returns. We also tested the statistical significance of these premiums, as well as that of the equity risk premium, with respect to proxies for the riskless rate; long-term government bonds, which have a similarly long duration of future cash flows to corporate cash flows; and a commercial paper rate, which is typically of 30–60 days' duration.

The empirical evidence provided by UK firms strongly supports theoretical predictions about subordinated versus senior claims. Junior claims are more volatile and more sensitive to macroeconomic shocks. The evidence from the ex-UK firms is not significant but generally consistent in sign relative to UK firms.

One potential concern about these results is that we calculated the premiums using data recorded during the heyday of the London capital market. The data stopped in 1930, after the crash year of 1929. This may bias our estimate of the equity risk premium upward. For an investor in 1929 looking back over nearly a lifetime of financial securities performance, however, the relative risk and return of corporate securities with a hierarchy of claims on cash flows and firm value accords well with what later financial theory would predict.

Key Takeaways

- Equity investors in the London market between 1870 and 1929 were consistently compensated for risk. The equity premium over long-term government bonds averaged 4.5% per year, similar to modern evidence for developed markets over the twentieth century.
- The realized returns to equities, preferred shares, corporate bonds, and government bonds decline monotonically with seniority, consistent with the predictions of contingent claims theory.
- The equity premium comoved with the real economy, confirming that equity risk reflected exposure to macroeconomic shocks and was not just noise.

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CHAPTER 13. AN INDEX OF COMMODITY FUTURES RETURNS SINCE 1871

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Introduction

Commodity futures have long played a pivotal role in the global economy, facilitating price discovery and risk management across sectors ranging from agriculture to energy and industrial production. Despite their economic significance, the classification of commodity futures as a distinct asset class remains a subject of debate. To qualify as an asset class, Sharpe (1992) emphasizes shared risk–return characteristics and common responses to economic forces as key criteria.

Although commodity futures share common attributes, such as providing price insurance and exposure to inflation-sensitive assets, their classification as a distinct asset class hinges on whether they exhibit consistent risk and return characteristics over time. This question is fundamentally empirical, requiring a long-term analysis of historical performance across a variety of economic regimes.

This chapter documents the returns to a broadly diversified index of commodity futures, covering more than 150 years of economic, financial, and institutional development. The analysis is based on a uniquely constructed dataset that draws from exchange yearbooks when available and relies extensively on newspaper archives to fill gaps in coverage. By including both active and obsolete contracts, the resulting index reflects the evolving structure of futures markets and captures the performance of a broad array of commodities, many of which are no longer traded today.[1]

This chapter is organized as follows. We begin by defining the return earned by an investor in commodity futures and discuss how it differs from the return on holding physical commodities. We then discuss the data and the construction of our commodity futures index. Next, we examine the time-series behavior of the commodity futures index and compare its performance to that of a diversified index of US equities. This comparison highlights the distinct return dynamics and volatility profiles of futures-based investments relative to other asset classes. We also

[1]For a detailed description of the database, see Qiao and Rouwenhorst (2026).

compare our collateralized commodity index with the cumulative inflation rate to understand real returns over time.

The main findings are that over the past 155 years:

- Commodity futures have earned a risk premium over the riskless rate of 5.5%.
- Commodity futures have outperformed US stocks in two of every five years.
- The return to commodity futures has exceeded an index of US inflation by more than 6% per year.

Finally, we highlight the distinction between futures and spot returns through a decomposition of futures excess returns into spot returns and the roll yield.

In the next section, we define the excess return and collateralized return to commodity futures. Readers who are familiar with these concepts can skip to the section on data and index construction without loss of continuity.

Definition of Collateralized Commodity Futures Returns

When evaluating the investment performance of commodities, it is important to draw a distinction between investing in commodity futures versus the underlying physical commodities. A futures contract is a standardized agreement to buy or sell some physical good or financial asset (the "underlying") at a prespecified time in the future. The futures price itself is not the cost of entering into a futures contract but, rather, an agreed-on reference from which gains and losses are tallied.

At the initiation of a futures contract, no cash changes hands between the buyer and the seller because the futures price is set such that the value of the contract is zero at origination. As the futures price changes, futures buyers and sellers may be required to post collateral to alleviate counterparty risk, but the collateral remains theirs, can be placed in interest-bearing securities (commonly Treasury bills), and is therefore not a "cost" to the investor.

In contrast to futures, a spot transaction to buy or sell physical commodities does require a transfer of cash to open the position. A spot transaction is therefore a fully funded investment, similar to buying or selling stocks without a margin loan.

The return dynamics differ too. An investor in physical markets benefits from an increase in the (spot) price of the commodity but incurs the cost of "carrying" the commodity. The cost of carry includes storage fees, insurance costs, and loss associated with spoilage. In an efficient market, the futures prices will embed market expectations about future spot price movements, so a long futures investor will benefit from *unexpected* spot price increases. *Expected* spot price changes, however, are not a source of returns for a futures investor. We will discuss the difference between futures returns and spot returns in more detail later.

Let F_t^T denote the futures price at time t of a contract that matures at time T. The futures excess return from time t to time $t + 1$, $\mathrm{ER}_{t,t+1}^{F,T}$, is calculated as follows:

$$\mathrm{ER}_{t,t+1}^{F,T} = \frac{F_{t+1}^T}{F_t^T} - 1. \tag{13.1}$$

$ER^{F,T}_{t,t+1}$ is an excess return because no cash changes hands when a futures position is initiated. To facilitate a comparison of a futures excess return to funded investments, such as stocks or physical commodities, we assume that the "funding" for the futures position is invested in a riskless investment. This is also how in practice "fully collateralized" commodity indices are constructed—as a holding of T-bills supporting a position in futures.

The total return of a fully collateralized futures position from time t to time $t + 1$, $TR^{F,T}_{t,t+1}$, is given by

$$TR^{F,T}_{t,t+1} = ER^{F,T}_{t,t+1} + r_t, \tag{13.2}$$

where r_t is the one-period riskless rate. Because the collateral is invested in the riskless asset, the risk of the collateralized futures position is identical to that of the excess return. Therefore, the excess return on the collateralized futures position has the interpretation of the commodity futures risk premium (over the riskless asset).

A common economic explanation for the presence of a risk premium in commodity futures is to compensate the long side of the contract for absorbing the excess demand for short hedging of price risk in the underlying physical markets. First hypothesized by Keynes (1930), what is commonly known as the theory of normal backwardation has been extensively explored in the academic literature.[2]

Data and Index Construction

In this section, we cover the sources of our data and explain how we constructed our index.

Data Sources

Despite the long history of commodity futures trading, few comprehensive databases of historical price records exist. One of the most popular commercial datasets, offered by the Commodity Research Bureau (now Barchart), goes back to 1959. Dow Jones published a commodity index in 1933, but it was primarily used to track spot prices (Bhardwaj, Janardanan, and Rouwenhorst 2021). Two recent efforts to collect historical data (Levine, Ooi, Richardson, and Sasseville 2018; Geczy and Samanov 2019) covered very few contracts prior to 1950.

The data used in this chapter are drawn from a hand-collected dataset of 230 contracts going back to 1871, when futures trading commenced in the United States. This comprehensive dataset combines prices from prominent newspapers with exchange handbooks. A unique and important aspect of the database is the extensive coverage of contracts that have ceased trading over time. Qiao and Rouwenhorst (2024) show that poor investor performance is negatively correlated with contract survival. Hence, it is important to include nonsurviving contracts when evaluating the investment performance of commodity futures.

We complement our futures data with other datasets used in subsequent analysis and comparison. For the riskless rate, we use the 3-Month Treasury Bill Secondary Market Rate from FRED (Federal Reserve Economic Data) from 1934 to 2025, the Ibbotson Associates 30-Day Treasury Bill Total Returns from 1926 to 1934, and values obtained from Siegel (1992) prior to 1926.

[2]See the reviews by Gray and Rutledge (1971) and Rouwenhorst and Tang (2012).

We use the all-cap composite portfolio from Ibbotson Equity Indices™ to represent the performance of the aggregate US stock market, kindly provided by Roger Ibbotson and described elsewhere in this volume. Because the Ibbotson Indices™ do not start until 1926, we use the market-capitalization weighted portfolio of all stocks from the Cowles Foundation from 1871 through 1925.

Finally, inflation data are obtained from the Federal Reserve Bank of St. Louis. From 1913 to 2025, we use the monthly series Consumer Price Index for All Urban Consumers: All Items in U.S. City Average, not seasonally adjusted (CPIAUCNS). From 1871 to 1912, inflation figures are calculated from Robert Shiller's CPI data used in his book *Irrational Exuberance* (Shiller 2000).

Index Construction

The construction of an index of commodity futures returns requires a number of choices regarding the tenor (time to maturity) of the contract and the roll schedule:

- Contract maturity: At the end of month t, the index tracks for each commodity the nearest-to-maturity contract that does not mature in month $t + 1$. This approach ensures that the index is invested in what is typically the "front" contract, which is typically the most liquid portion of the futures curve.
- Commodity weighting: Especially in the early days of futures trading, similar commodities are traded on multiple exchanges. For example, wheat was traded in Buffalo as well as Chicago, and Chicago offered multiple turkey contracts. For the purpose of index calculation, "similar" contracts on the same underlying commodities on the same exchange are treated (averaged) as one, but commodities that trade on different exchanges are always treated as separate commodities.
- Commodities receive equal index weights, and the index is rebalanced monthly.

In a given month, the index total return is defined as follows, where $TR^{F,T}_{i,t,t+1}$ is the total return of commodity i and N_t is the number of commodities in month t:

$$TR^{EW}_{t,t+1} = \sum_{i=1}^{N_t} \frac{TR^{F,T}_{i,t,t+1}}{N_t}. \tag{13.3}$$

Annual Index Returns

Exhibit 13.1 shows annual total returns for the collateralized equally weighted (EW) commodity futures index. A time series of annual total returns can be constructed from the data labels in the four panels. The advantage of having a bar plot along with specific values combines the ease of visual inspection of return sizes and dynamics with the precision of exact figures for each calendar year.

In its early history, toward the end of the nineteenth century, the index performed poorly because of a string of negative returns, despite experiencing one of the largest single-year returns in its 155-year history (54.2% in 1879). This period was marked by large increases in cultivated farmland and technological improvements (such as railways and tractors) in a largely deflationary environment that saw a steady decrease in consumer prices.

A remarkable string of positive annual total returns followed this period, from 1897 to 1919. The period between World War I and World War II was marked by large total returns of either sign, indicating heightened uncertainty in the resources markets. A more tranquil phase followed World War II, with many years exhibiting returns of relatively small magnitude, mostly positive, between 1950 and 1970.

The 1970s were again a turbulent decade, with several events putting inflationary pressure on commodity prices, such as the energy crisis of 1973 and the "Great Grain Robbery" in 1972, which saw the Soviet Union purchase massive amounts of grain from the United States at subsidized prices, subsequently causing global prices to soar. A period of mostly positive returns spans 1987 to 2010, although consecutive positive years are interrupted by a few negative ones, such as 2008. No clear pattern emerges from the most recent 15 years of history.

To provide a sense of the breadth of the index and the ebb and flow of commodity contracts over time, Exhibit 13.1 tracks the number of index constituents in each year at the bottom of each panel. During the first decade, the index consisted of fewer than 20 commodities,

Exhibit 13.1. Annual Total Returns of Equally Weighted Commodity Futures Index, 1871–2025

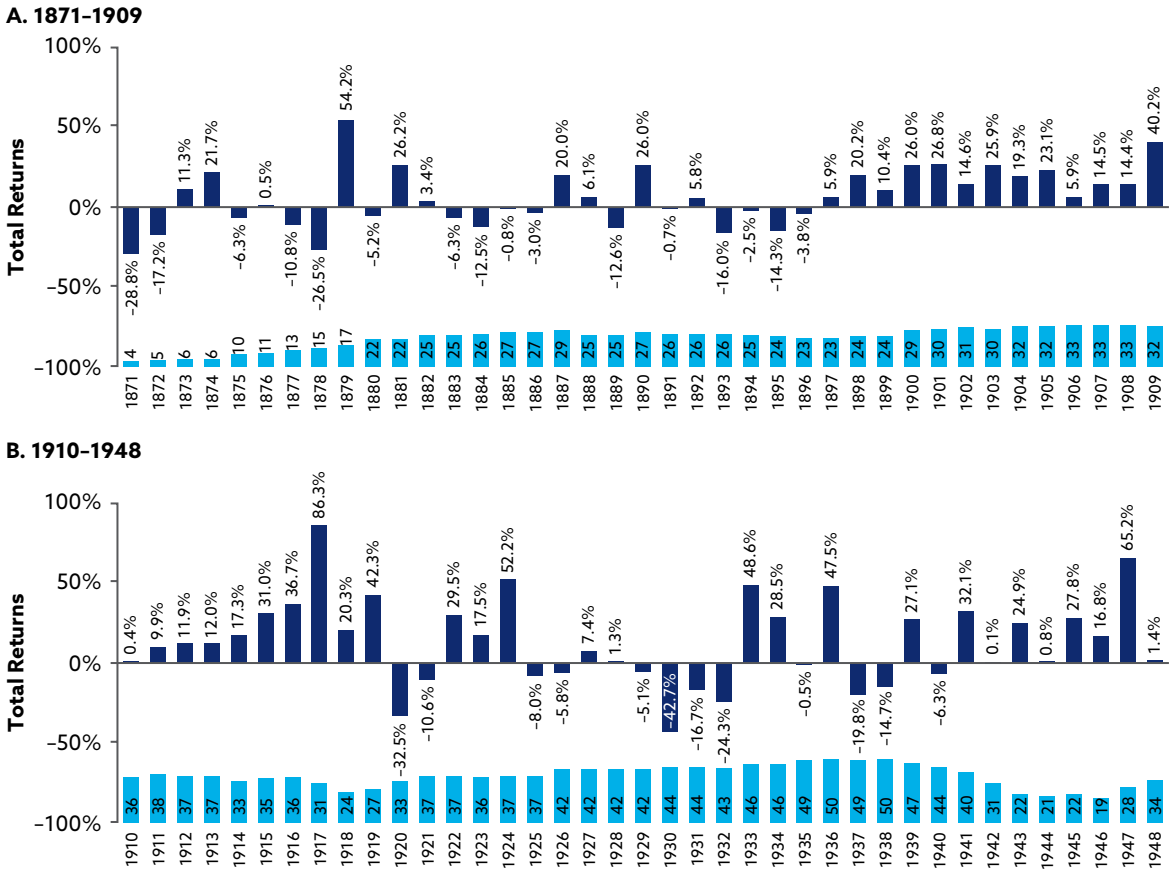
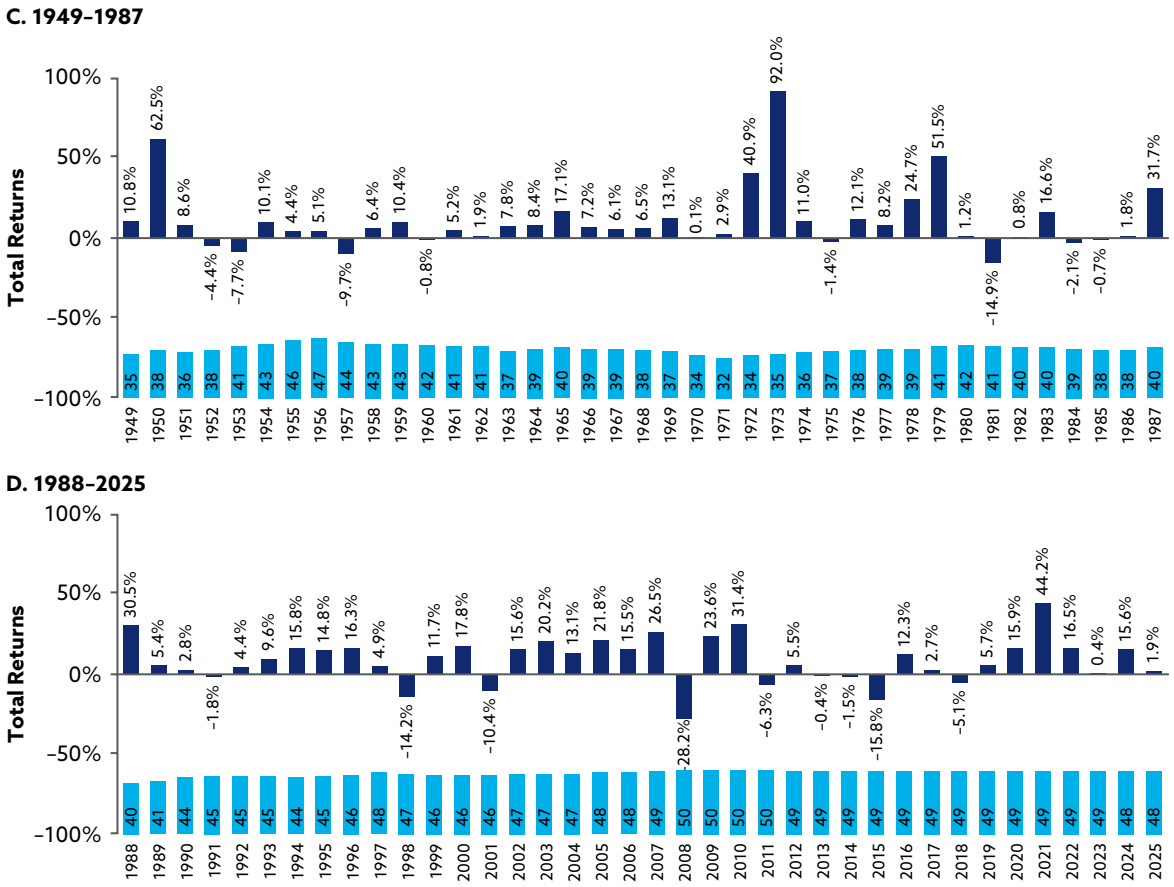


Exhibit 13.1. Annual Total Returns of Equally Weighted Commodity Futures Index, 1871–2025 (*continued*)



Source: SummerHaven Investment Management.

Notes: The exhibit provides annual total returns of the equally weighted commodity futures index. The number of index constituents in each year appears at the bottom of each panel.

reflecting the gradual expansion of commodity futures markets in the United States. By the turn of the twentieth century, the index covered about 30 distinct commodity futures, growing to 50 by the early twenty-first century. The two world wars were periods of index contraction because of trading suspensions and market closures.

Commodity Futures vs. Equities

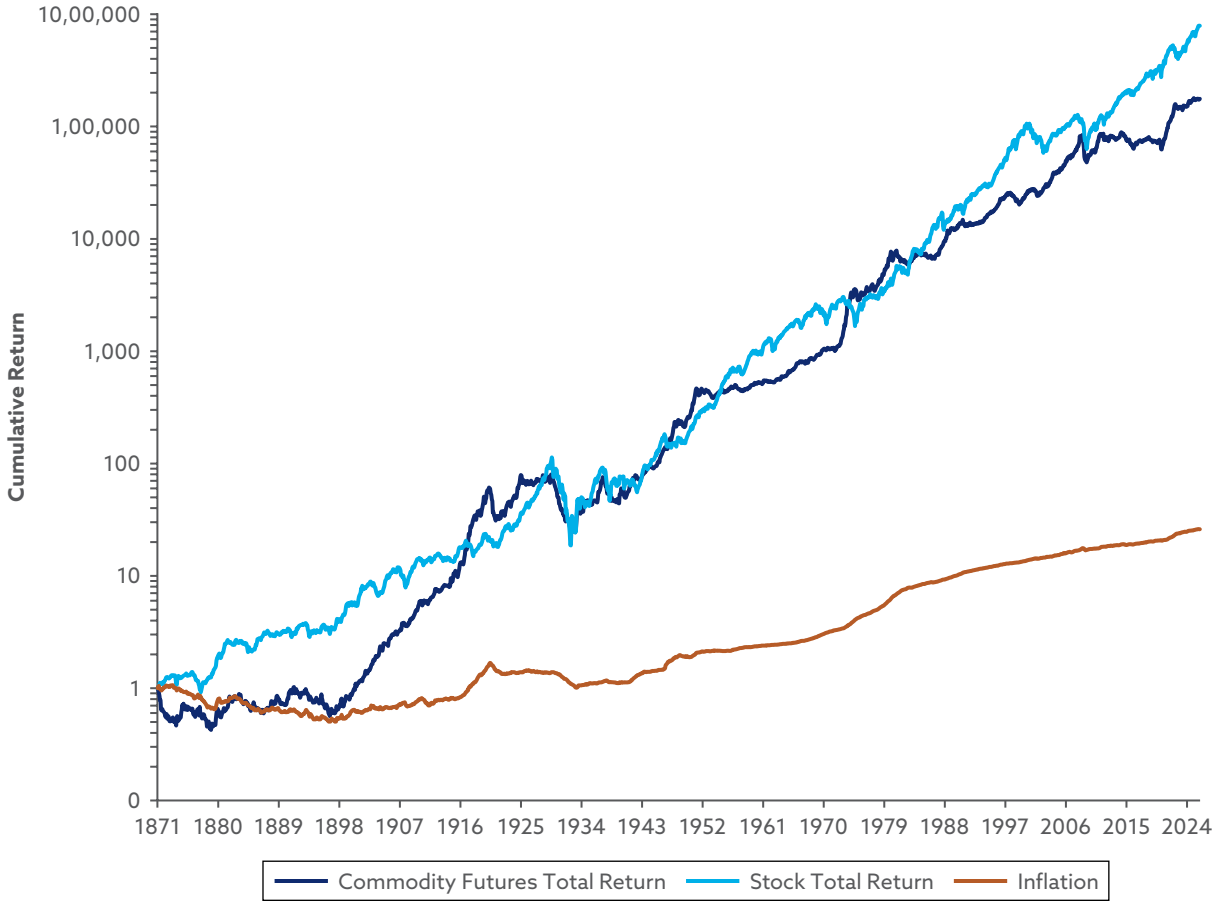
In this section, we compare the performance of commodities and equities since 1871.

Cumulative Performance

Exhibit 13.2 illustrates the cumulative total returns of commodities and stocks over 155 years versus cumulative inflation, plotted on a logarithmic scale to visualize changes in average returns over time. Three observations stand out:

1. A long position in commodity futures has historically earned a positive risk premium that is similar in magnitude to the equity risk premium, as evidenced by the similar average slope of the two indexes on a log scale.
2. Returns to commodity futures and equities have historically exceeded inflation by a wide margin.
3. The commodity risk premium and the equity risk premium have historically accrued in different periods, as evidenced by the divergence and subsequent convergence of the two performance lines.

Exhibit 13.2. Commodity and Stock Cumulative Total Returns and Inflation, January 1871–December 2025



Source: SummerHaven Investment Management, Federal Reserve Bank of St. Louis, Ibbotson Equity Indices™.

The first observation is evident from comparing the futures and equity lines in Exhibit 13.2. Anyone skeptical about the presence of a historical risk premium for commodities would have to explain why the two lines have tracked each other closely over a 155-year period. For others, the presence of a historical risk premium can provide direct evidence of an important requirement for qualification as an asset class.

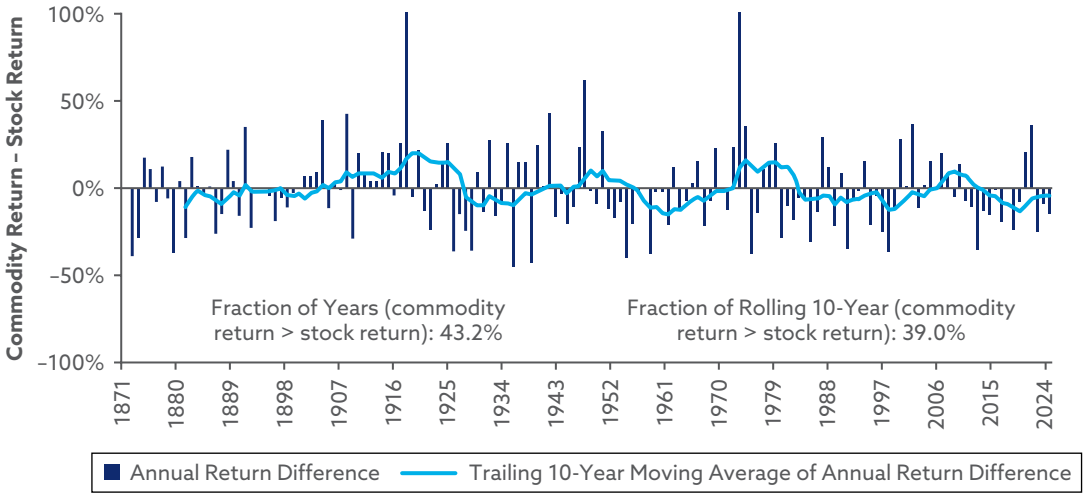
As Qiao and Rouwenhorst (2026) show, the index risk premium stems in large part from risk premiums embedded in the pricing of the *individual* index constituents. These authors showed that the majority of the 230 futures contracts that make up the index have earned a positive average excess return over their lifetimes. In this respect, commodity futures fit well with Sharpe's (1992) notion of an asset class. The second observation is self-evident from the discrepancy between the cumulative returns to commodity futures and equities, on one hand, and cumulative inflation, on the other.

Differential Performance and Diversification

The third observation is more clearly illustrated in **Exhibit 13.3**, which plots the annual difference between the return to stocks and the return to commodity futures over the past 155 years. A positive bar indicates a year where commodity futures outperformed equities, while a negative bar indicates underperformance of commodities relative to equities. The solid line tracks the 10-year trailing return difference of commodities over stocks. Two observations stand out:

- There is great variability in the annual return difference between commodities and stocks.
- Commodities have outperformed equities in two out of every five years historically. Similarly, in two out of every five historical 10-year periods, commodities outperformed equities.

Exhibit 13.3. Difference in Annual Returns Between Commodities and Stocks, January 1871—December 2025



Source: SummerHaven Investment Management, Ibbotson Equity Indices™.

The first observation suggests that commodity futures and equities have distinct fundamental risk drivers. If they had significant common drivers, we would expect to observe high comovement of returns and little variation in the return difference between the two indices. But we do not. In other words, commodities as a whole have a high "tracking error" relative to equities, marked by idiosyncratic movement in the respective asset classes. The second observation points to the potential diversification benefits of commodity futures. A portfolio that allocates to commodities and equities, rather than just equities, benefits from improved performance in the 40% of years that equities underperform commodities.

A Decomposition of Commodity Futures Returns

In this section, we discuss how the collateralized futures return differs from the spot return. The spot return, $R^S_{t,t+1}$, is defined as follows:

$$R^S_{t,t+1} = \frac{S_{t+1}}{S_t} - 1, \tag{13.4}$$

where S is the spot price of the commodity. The standard way to describe the link between the spot return (Equation 13.4) and the excess futures return (Equation 13.1) when rolling futures forward is through the approximate expression

$$\text{ER}^{F,T}_{t,t+1} = R^S_{t,t+1} + \text{Roll Yield}_{t,t+1}. \tag{13.5}$$

"Rolling futures forward" refers to closing out the front contract and opening a comparable position in the next-closest-to-maturity contract. The roll yield, also known as "carry," is the slope of the futures curve between the two contracts.[3] When the futures curve slopes downward, the roll yield will be positive; this condition is called *backwardation*. When the futures curve slopes upward (called *contango*), the roll yield will be negative.

The theory of storage (Kaldor 1939; Working 1949) can be used to decompose the roll yield into (1) the benefits of holding the spot commodity, called the convenience yield (y), and (2) the cost of carrying physical inventories, which is the sum of the forgone interest (r) and direct storage costs (u):

$$\text{Roll Yield}_{t,t+1} = y_{t,t+1} - (r_t + u_t). \tag{13.6}$$

Note that Equation 13.5 links the futures excess return (excluding collateral) with the spot return, which is a funded investment. To facilitate a more meaningful comparison, we follow Levine et al. (2018) and combine Equations 13.5 and 13.6 to express the difference between the futures and spot in excess return form:

$$\text{ER}^{F,T}_{t,t+1} - (R^S_{t,t+1} - r_t) = (y_{t,t+1} - u_t), \tag{13.7}$$

where $(y - u)$ is referred to as the "interest-adjusted carry."

The intuition for the difference in Equation 13.7 is that the convenience yield (net of storage) is a benefit embedded in the spot price of the physical commodity related to its use as an input in

[3]For an in-depth discussion on why the roll yield should not be interpreted as a cash flow to a futures investor, see, for example, Bessembinder (2018). Also see Gorton, Hayashi, and Rouwenhorst (2013); Erb and Harvey (2016); Koijen, Moskowitz, Pedersen, and Vrugt (2018); and Levine et al. (2018).

the productive process. It accrues to the futures investor as the futures price converges to the spot prices at the maturity of a futures contract.

As pointed out earlier, Keynes' theory of normal backwardation predicts that the first term on the left-hand side of Equation 13.7 is positive. By contrast, neither Keynes nor the theory of storage makes a direct prediction about the overall sign of the futures excess return. Whether the convenience yield has historically exceeded storage costs is an empirical matter, which we explore next.

The historical evolution of the components of Equations 13.5 and 13.7 for the equally weighted index is illustrated in **Exhibit 13.4**, which shows the following:

- The futures excess return has historically lagged the spot *total* return due to the cumulative effect of negative carry over the past 155 years (Panel A).
- The futures excess return has historically exceeded the spot price *excess* return (positive interest-adjusted carry; Panel B).

Exhibit 13.4. Decomposition of Futures Excess Returns, January 1871–December 2025

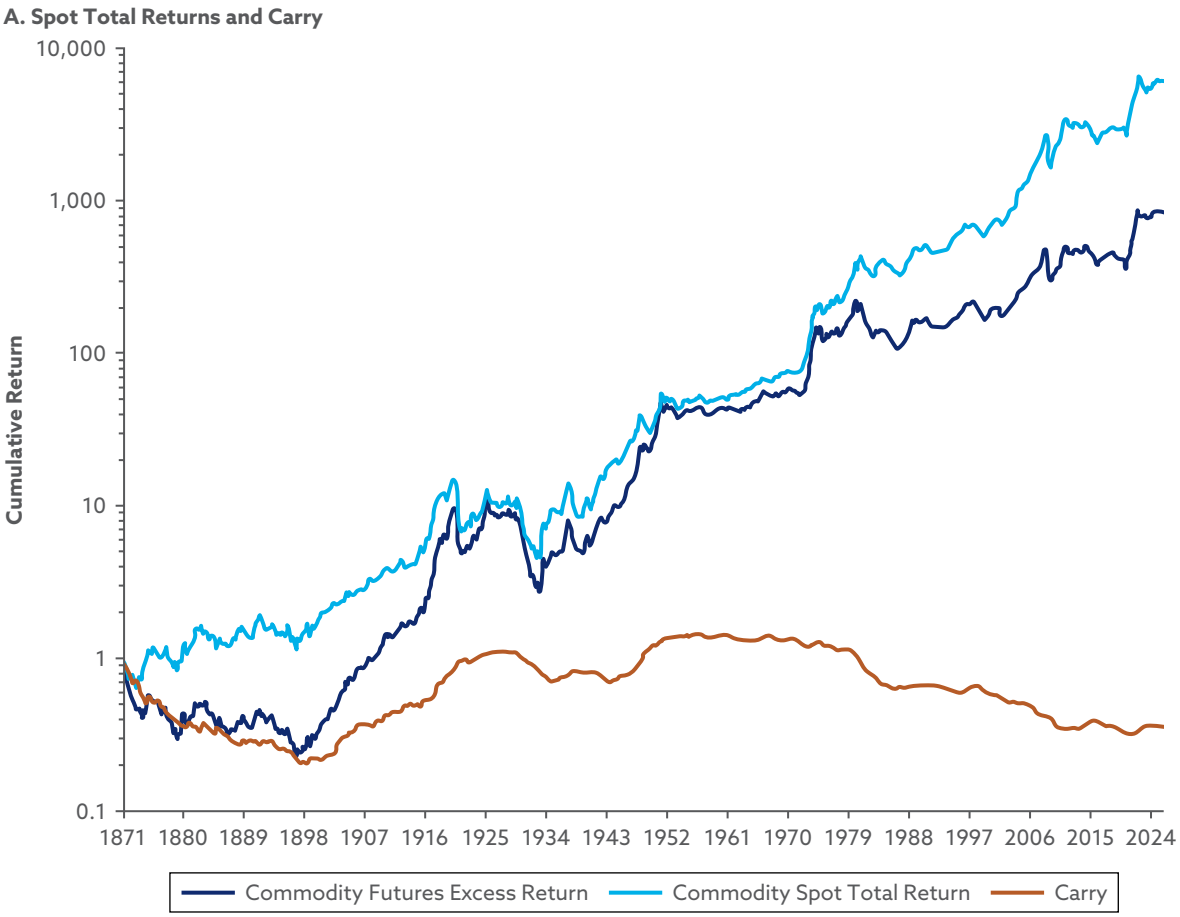
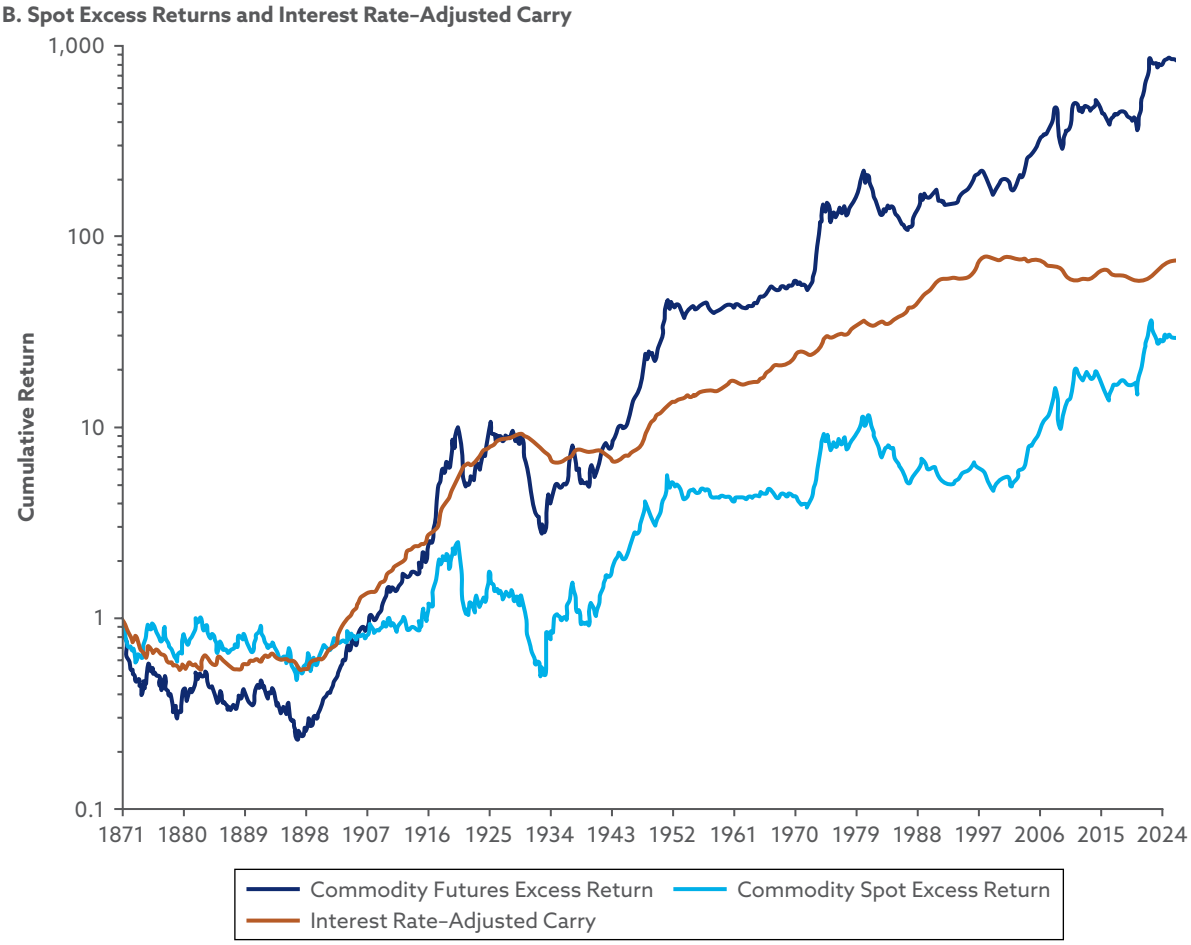


Exhibit 13.4. Decomposition of Futures Excess Returns, January 1871–December 2025 (*continued*)



Source: SummerHaven Investment Management.

The first observation empirically underscores the important fact that a negative roll yield does not preclude investors from earning a positive risk premium. The second observation implies that when collateral returns are included, futures returns have historically exceeded spot price returns. This is the case even before taking into account storage costs, which would be necessary for calculating the return to carrying physical inventories.

Summary of Asset Class Performance

We quantitatively summarize our results in **Exhibit 13.5**, which provides average returns, volatility, and Sharpe ratios of collateralized commodity futures, stocks, Treasury bills, and inflation over the 1871–2025 period. Panel A shows that the EW commodity futures index has earned a risk premium of 5.5%, with annualized volatility of 14.3% and a Sharpe ratio of 0.38.

Exhibit 13.5. Summary Statistics for Commodity Futures, Commodity Spot, and Stock Indices; the Riskless Rate; and Inflation, January 1871–December 2025

	Arithmetic Mean TR (%)	Geometric Mean TR (%)	Arithmetic Mean ER (%)	Geometric Mean ER (%)	Volatility (%)	Sharpe Ratio
A. Full Sample, 1871–2025						
Commodity futures index	8.9	8.2	5.5	4.5	14.3	0.38
Commodity spot index	6.7	5.8	3.2	2.2	14.3	0.22
Stock index	10.1	9.2	6.6	5.5	16.2	0.41
Riskless rate	3.5	3.5	—	—	0.7	—
Inflation	2.2	2.1	—	—	3.5	—
B. 1871–1922						
Commodity futures index	8.9	7.8	5.1	3.9	16.4	0.31
Commodity spot index	5.5	4.2	1.8	0.4	16.4	0.11
Stock index	7.0	6.5	3.2	2.6	11.3	0.29
Riskless rate	3.7	3.8	—	—	0.2	—
Inflation	0.7	0.6	—	—	5.5	—
C. 1923–1974						
Commodity futures index	9.3	8.7	6.9	6.1	14.4	0.48
Commodity spot index	7.1	6.2	4.7	3.7	14.4	0.33
Stock index	10.2	8.5	7.8	5.9	20.3	0.38
Riskless rate	2.4	2.4	—	—	0.6	—
Inflation	2.2	2.2	—	—	2.2	—
D. 1975–2025						
Commodity futures index	8.6	8.2	4.3	3.6	11.6	0.37
Commodity spot index	7.4	6.9	3.1	2.4	11.8	0.26
Stock index	13.2	12.6	8.9	7.9	15.5	0.57
Riskless rate	4.3	4.4	—	—	1.0	—
Inflation	3.6	3.7	—	—	1.3	—

Sources: SummerHaven Investment Management, Federal Reserve Bank of St. Louis, Ibbotson Equity Indices™.

Note: Total return (TR) and excess return (ER) are expressed as percentages per year.

For comparison, the stock index has a risk premium of 6.6% and a volatility of 16.2%, which results in a Sharpe ratio of 0.41. The commodity spot index has the same volatility as the commodity futures index but a markedly lower Sharpe ratio (0.22). The risk-adjusted returns are similar for the commodity futures index and the stock index, and these indices' risk-adjusted performance exceed that of the commodity spot index.

To examine Sharpe's (1992) requirement that an asset class "provides comparable risk and return characteristics over time," we split the 155 years of the sample into three periods of similar length (roughly 50 years each). The basic observations from the full sample statistics continue to hold for the subsamples: nearly identical volatility for commodity futures and spot returns, similar risk-adjusted returns for commodity futures and stocks, and a substantially lower risk-adjusted return for the commodity spot index.

Some sample-specific variation remains across the various time periods. In the first subperiod, 1871–1922, commodity spot returns show little appreciation, recording a near-zero geometric mean. In contrast, commodity futures in this period earn a risk premium of 5.1%, nearly 2 percentage points higher than stocks. From 1923 to 1974, commodity futures have a lower volatility than stocks but exhibit a higher Sharpe ratio (0.48 versus 0.38). The most recent subperiod saw the highest return and Sharpe ratio for equities.

Perhaps the most striking aspect of Exhibit 13.5 is the consistency of the 50-year commodity futures performance. Fifty-year averages of geometric total returns for commodity futures fall in a narrow range of 7.8%–8.7%, versus 6.5%–12.6% for stocks. Similarly, for commodity futures, the range of Sharpe ratios (0.31–0.48) is close to the full sample mean of 0.38, with less variability relative to the Sharpe ratio range for stocks (0.29–0.57) versus the full sample mean of 0.41.

Conclusion

Long-term returns provide critical input to inform investors about the properties of an asset class, especially when the underlying asset class constituents are volatile. This chapter presents a 155-year history of commodity futures markets. Using a unique hand-collected dataset, we presented annual returns and cumulative returns to an index of commodity futures and compared its performance with the aggregate stock market, inflation, and spot returns. Like stocks, commodity futures have a positive risk premium. Returns to commodity futures deviate from stocks in ways that provide periodic outperformance, likely resulting from different fundamental drivers of return. Although the index's performance is volatile over shorter investment horizons, the index shows consistent performance over long horizons—a critical requirement for any asset class.

Key Takeaways

- *Positive risk premium:* Commodity futures earned a risk premium of about 5.5% annually, comparable to the equity risk premium, with a Sharpe ratio of 0.38.
- *Diversification benefit:* Commodities outperformed US stocks in approximately 40% of years and 40% of rolling 10-year periods. This performance offers meaningful diversification benefits for investors with heavy equity exposure.
- *Outperformance versus spot and inflation:* The distinct performance of futures and spot indices highlights that futures returns are not driven solely by spot price changes.

- *Role of carry:* Futures excess returns exceeded spot excess returns because of a persistent positive interest rate–adjusted carry, reinforcing the notion that futures returns include a risk premium beyond mere spot price exposure.
- Commodity futures have historically delivered a stable long-term risk premium, diversification relative to equities, and performance not merely tied to spot price movements, supporting their role as a distinct asset class in strategic portfolios.

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CHAPTER 14. THE JAPANESE MARKET, 1952–2025

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Introduction: The Long-Run Perspective in Japan

A long view of capital market history in Japan, illustrated by the 74-year period (1952–2025) examined in this chapter, uncovers the basic relationships between risk and return among the various asset classes and between nominal and real (inflation-adjusted) returns in Japan. The goal of this study is to provide a period long enough to include almost all the major types of events that investors have experienced and may experience in the future. Such events include economic growth and decline, bull and bear markets, inflation and deflation, and other, less dramatic events that affect asset returns.

For Japan as for the rest of the world, one can make inferences about the future by studying the past. Although the actual events that occurred during 1952–2025 will not be repeated, the event types from that period can be expected to recur. From the early 1950s through the late 1980s, Japan experienced one of the most remarkable episodes of economic expansion in modern history. Rapid industrialization, technological upgrades, and export-led growth contributed to a prolonged equity bull market and substantial increases in national wealth. By the late 1980s, elevated asset valuations in both real estate and equities reflected strong growth expectations, although they also gave rise to imbalances that would later unwind. The subsequent period, particularly the 1990s and early 2000s, was marked by a prolonged adjustment in asset markets and subdued returns. Nevertheless, from around 2012 onward, Japanese equity markets exhibited a sustained recovery, supported by accommodative monetary policy, corporate governance reforms, enhanced capital efficiency, and a steady improvement in corporate earnings, thereby indicating a renewed phase of positive market dynamics.

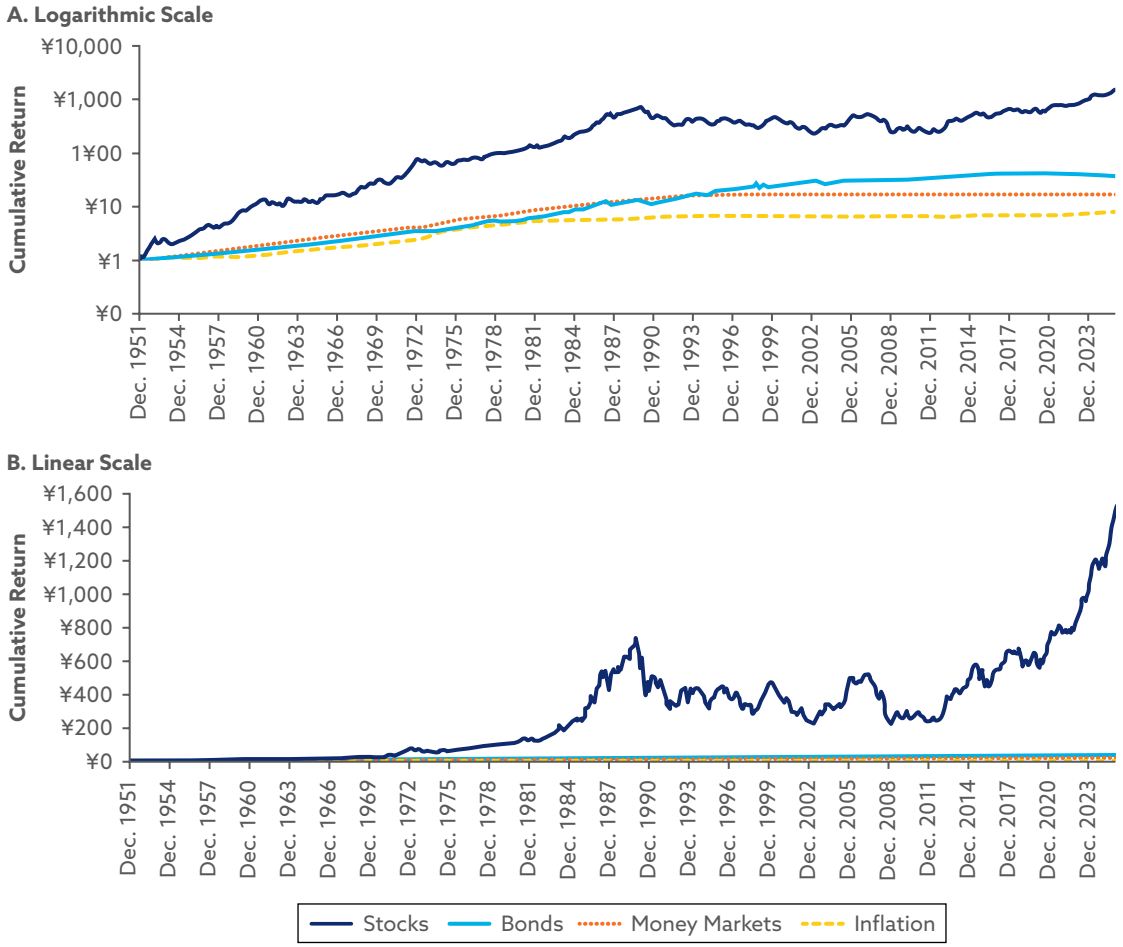
These experiences suggest that although the timing and specific triggers of market movements are difficult to predict, the underlying types of events tend to recur. As such, historical capital market data offer a valuable empirical foundation for forming expectations about future risk and return.

Historical Returns on Stocks, Bonds, Money Markets, and Inflation in Japan

Exhibit 14.1 depicts the growth of ¥1 invested in Japanese stocks, Japanese long-term government bonds, Japanese money markets, and a hypothetical asset returning the inflation rate over the period from the end of 1951 to the end of 2025.[1] All results assume reinvestment

[1] "Money markets" in Japan are the equivalent of short-term Treasury bills, sometimes called "cash" in an asset allocation context, in the United States.

Exhibit 14.1. Wealth Indices of an Investment of ¥1 in Japanese Stocks, Bonds, Money Markets, and Inflation, 1952–2025



Sources: Ibbotson Associates Japan™, Inc. (IAJ). Used with permission. All rights reserved. Underlying data sources are as follows: (1) Japanese stocks: Tokyo Stock Exchange First Section (TSE1) total return; (2) Japanese bonds: IAJ Japan Long-Term Government total return; (3) Japanese money markets: IAJ Japan Money Market total return; (4) Japanese inflation: IAJ Japan Inflation. Further details are provided in the Data Sources section.

of dividends and bond coupons and ignore taxes. Transaction costs are not included. Each cumulative index value is initialized at ¥1 at year-end 1951. The graph vividly illustrates that Japanese stocks were the big winners over the 74-year period. An investment of ¥1 in Japanese stocks at the end of 1951 would have grown to ¥1,520 by year-end 2025, while ¥1 invested at the end of 1951 in Japanese long-term government bonds would have turned into ¥37 by the end of 2025. Note that all returns and other data in this chapter are in Japanese yen except in the section "Japanese Stocks vs. US Stocks in US Dollars," which discusses Japanese asset returns converted to US dollars.

Some notable details on the indices are as follows.

- *Japanese stocks:* An index of TSE1 total returns initialized on 31 December 1951 at ¥1.00 closed 2025 at ¥1,519.6, which represents a compound annual growth rate of 10.4%. The inflation-adjusted TSE1 total return index closed 2025 at a level of ¥193.3.
- *Japanese bonds:* The Ibbotson Associates Japan Long-Term Government Total Return index, constructed with an approximate 10-year maturity and initialized on 31 December 1951 at ¥1.00, closed 2025 at ¥37.1, representing a compound annual growth rate of 5.0%. Based on the capital appreciation component alone, the index closed at ¥1.70, resulting in a 0.7% compound annual capital gain over the period 1952–2025. This result indicates that the majority of the positive historical returns on long-term government bonds resulted from income returns.
- *Japanese money markets:* An investment of ¥1.00 in the Ibbotson Associates Japan Money Market Total Return index at the end of 1951 was worth ¥17.4 by year-end 2025, representing a compound annual growth rate of 3.9%. This asset tended to track inflation; therefore, the average annual inflation-adjusted return on Japanese money markets, representing the real riskless rate of return, was only 1.1% compounded annually over the 74-year period.
- *Japanese inflation:* The compound annual Japanese inflation rate over 1952–2025 was 2.8%. The Japanese inflation index, initiated at ¥1.00 at year-end 1951, grew to ¥7.90 by year-end 2025.

Japanese Long- and Short-Term Interest Rates

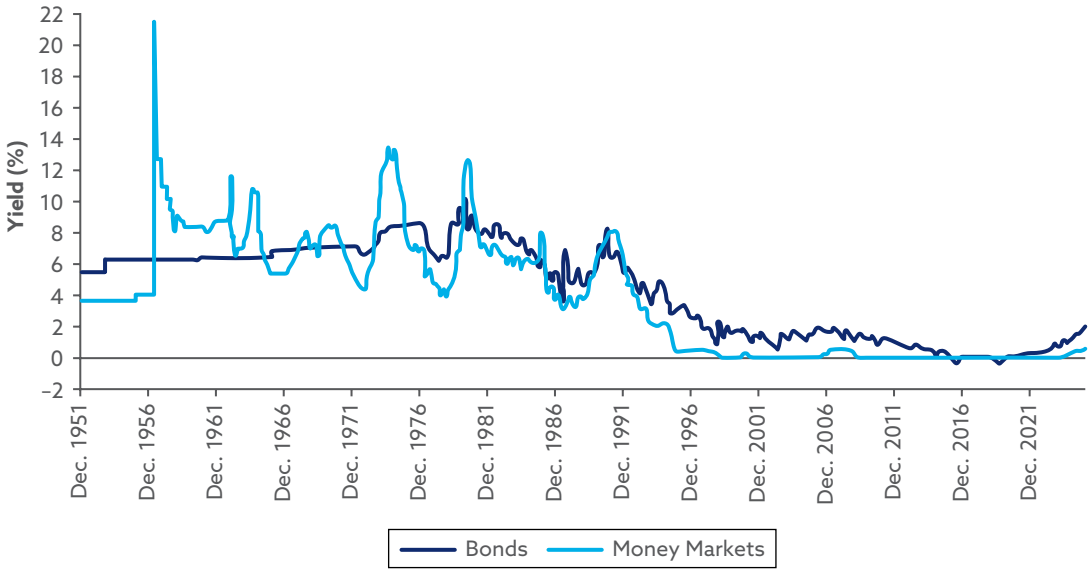
Exhibit 14.2 depicts the evolution of Japanese long- and short-term interest rates over the period studied. They have followed a pronounced secular decline over the entire 74-year period from the end of 1951 to the end of 2025.

Setting aside an extraordinary short-term rate peak around 1956, the trajectory shows an initial peak in both rates in the 1970s and early 1980s, coinciding with global inflationary periods. Following the collapse of the Japanese stock market bubble in the early 1990s, both yields fell sharply, initiating a prolonged ultra-low interest rate environment. Short-term rates, which are more sensitive to monetary policy shifts and business cycles than long-term rates are, have been particularly volatile but have largely hovered near zero since the late 1990s. This finding reflects Japan's persistent deflationary conditions and the Bank of Japan's long-standing accommodative stance. This historical trend in the term structure of interest rates mirrors the profound shifts in Japan's economic landscape from high growth to decades of low growth and deflation.

Summary Statistics of Total Returns

Exhibit 14.3 presents summary statistics (geometric mean, arithmetic mean, and standard deviation) of the annual total returns on each asset class over the entire 1952–2025 period. The data presented in this exhibit are described in the Data Sources section.

Exhibit 14.2. Yields-to-Maturity of Japanese Long-Term Bonds and Money Markets, 1952–2025



Sources: Ibbotson Associates Japan, Inc. (IAJ). Used with permission. All rights reserved. Underlying data sources are as follows: (1) bonds: IAJ Japan Long-Term Government Yld; (2) money markets: IAJ Japan Money Market Yld.

Exhibit 14.3. Summary Statistics of Annual Returns on Principal Japanese Asset Classes, in Japanese Yen, 1952–2025

	Geometric Average (%)	Arithmetic Average (%)	Standard Deviation (%)
Stocks	10.4	12.1	19.9
Bonds	5.0	5.1	4.7
Money Markets	3.9	3.9	1.1
Inflation	2.8	2.9	2.4

Source: See source notes to Exhibit 14.1.

Exhibit 14.3 summarizes the risk–return trade-off inherent in investing; that is, the potential return of an asset generally increases with the asset's risk. The compound annual return shown in the "Geometric Average" column is the rate of return that—if it had been earned each year—equates the investment's ending value with its beginning value; it assumes the reinvestment of all income. The numbers in the "Arithmetic Average" column represent the simple, or arithmetic, average of the individual annual returns over the past 74 years. The standard deviation, shown in the last column, is used to measure the risk of an investment.

Risk vs. Return of Principal Japanese Asset Classes

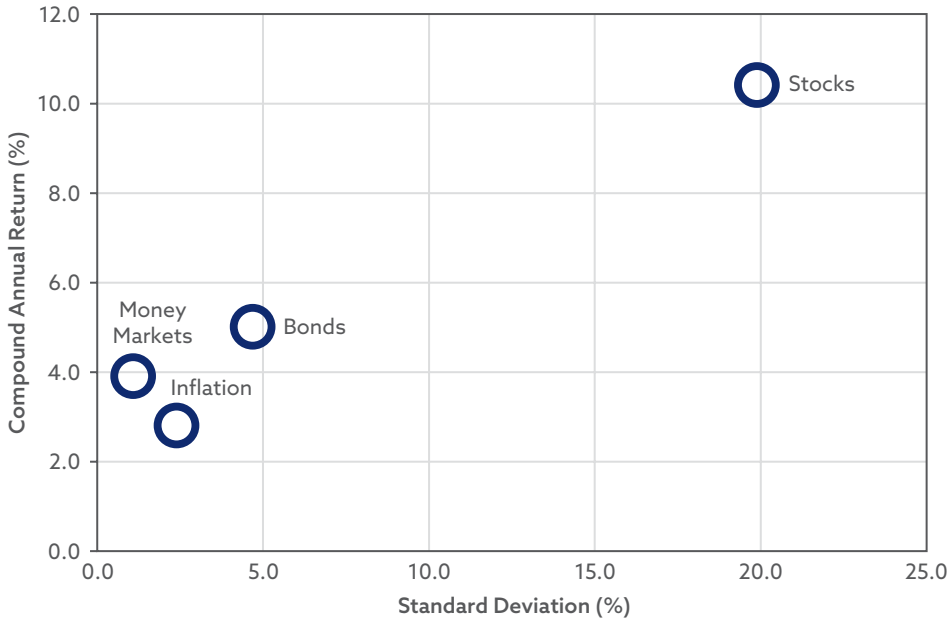
Exhibit 14.4 illustrates the relationship between the risk and return of three Japanese basic asset classes, along with inflation, over the past 74 years. Risk (standard deviation) is plotted on the *x*-axis, and compound annual return is plotted on the *y*-axis. As expected in a well-functioning market, the asset classes exhibiting higher risk had higher returns over the period studied.

Japanese stocks had the highest risk of the asset classes shown. Their high volatility was rewarded with high returns. At the low-risk end of the spectrum are Japanese bonds and money markets. These investments fluctuated much less than stocks did but provided lower returns as well.

Volatility of Stock and Bond Returns

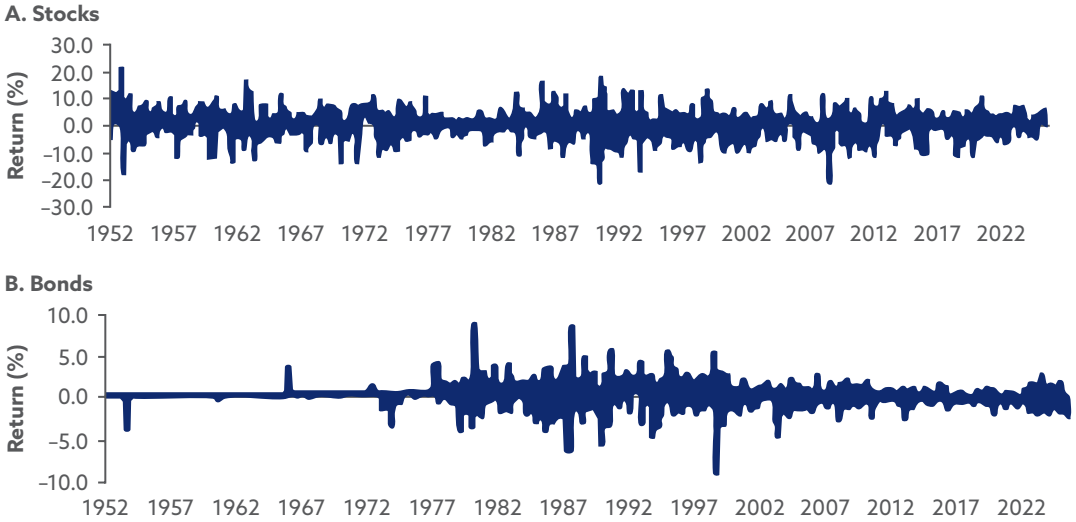
The volatility of Japanese stocks and bonds is shown in **Exhibit 14.5**. The volatility of the stock market has been nearly constant, with a minor decrease in the last decade. Before 1977, however, Japanese bonds were not traded on the market, so there was almost no visible price fluctuation. After 1977, bank deals for bonds began and prices began to fluctuate, in some cases dramatically. After 2000, Japanese bond volatility decreased due to the low interest rate policy.

Exhibit 14.4. Risk and Return of Annual Total Returns on Principal Japanese Asset Classes, in Japanese Yen, 1952–2025



Source: See source notes to Exhibit 14.1.

Exhibit 14.5. Volatility of Japanese Stock and Bond Returns (Monthly Returns in Japanese Yen), 1952–2025



Source: See source notes to Exhibit 14.1.

One relationship has remained constant: Japanese stocks have been more volatile than bonds on a month-to-month basis. Over the long term, however, stock investors have been rewarded for assuming this greater volatility.

Cross-Correlations of Monthly Returns

As illustrated in Panel A of **Exhibit 14.6**, the period from 1977 to 2025 featured a high correlation between money market returns and inflation but a low correlation between money market returns and long-term bond returns. In contrast, the more recent 20-year period, from 2006 to 2025, exhibited a different set of relationships, as shown in Panel B of Exhibit 14.6. Over this time frame, stock returns were negatively correlated with both long-term bond returns and money market returns. Furthermore, long-term bond returns have also shown a negative correlation with inflation during this period.

Correlation Fluctuations

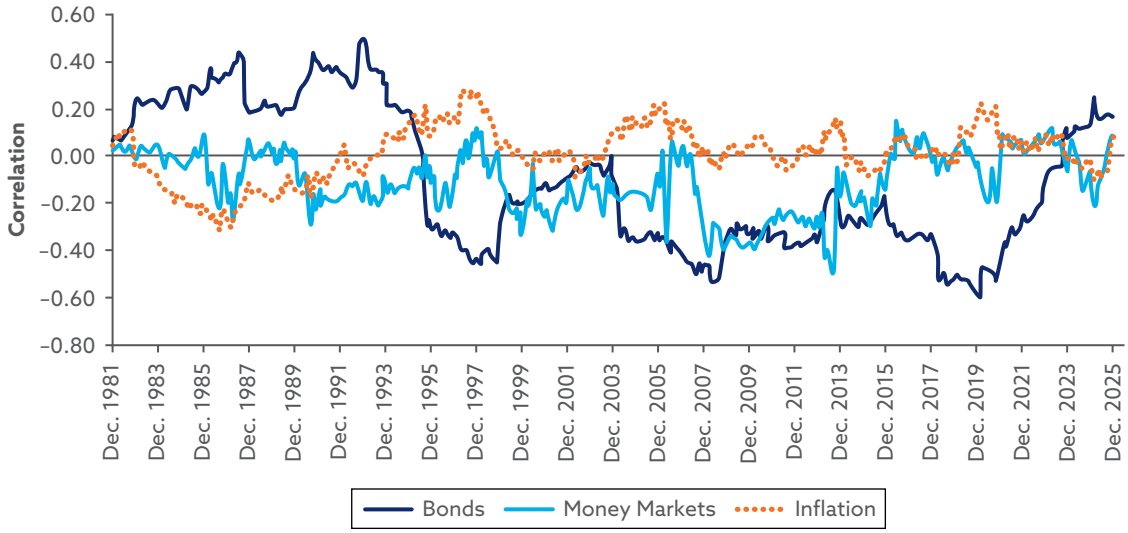
Exhibit 14.7 shows the rolling 60-month correlation between Japanese stocks and other assets. The correlations fluctuate in response to changes in the macroeconomic environment and business conditions. From the mid-1990s through the 2020s, when the economy was sluggish and monetary easing policies continued, stocks had a negative correlation with long-term bonds. As signs of economic recovery emerged, however, the correlation recently became positive.

Exhibit 14.6. Cross-Correlations of Monthly Returns on Principal Japanese Asset Classes, in Japanese Yen, 1977–2025 and 2006–2025

	Stocks	Bonds	Money Markets	Inflation
A. 1977–2025				
Stocks	1.00	–0.01	0.02	0.02
Bonds	–0.01	1.00	0.16	0.00
Money Markets	0.02	0.16	1.00	0.23
Inflation	0.02	0.00	0.23	1.00
B. 2006–2025				
Stocks	1.00	–0.24	–0.14	0.06
Bonds	–0.24	1.00	0.02	–0.06
Money Markets	–0.14	0.02	1.00	0.05
Inflation	0.06	–0.06	0.05	1.00

Source: See source notes to Exhibit 14.1.

Exhibit 14.7. Rolling 60-Month Correlations Between Japanese Stocks and Other Japanese Assets, in Japanese Yen, 1982–2025



Source: See source notes to Exhibit 14.1.

Firm Size and Return

I formed decile portfolios of the Japanese stock market sorted by capitalization size. Summary statistics of annual returns of the 10 deciles over 1978–2025 are presented in **Exhibit 14.8**. The risk and return of the 10 deciles over the same period are plotted in **Exhibit 14.9**. Note that the average return tends to increase as one moves from the largest decile to the smallest. On average, small companies have higher returns than large ones. The total risk, or standard deviation of annual returns, also increases with decreasing firm size.

Investors are compensated for taking on this additional risk by the higher returns provided by small companies. Note, however, that this risk–return relationship applies only over the long term. The increased risk faced by investors in small stocks is quite real. The long-term expected return for any asset class is quite different from short-term expected returns, and investors in small-cap stocks should expect losses and periods of underperformance.

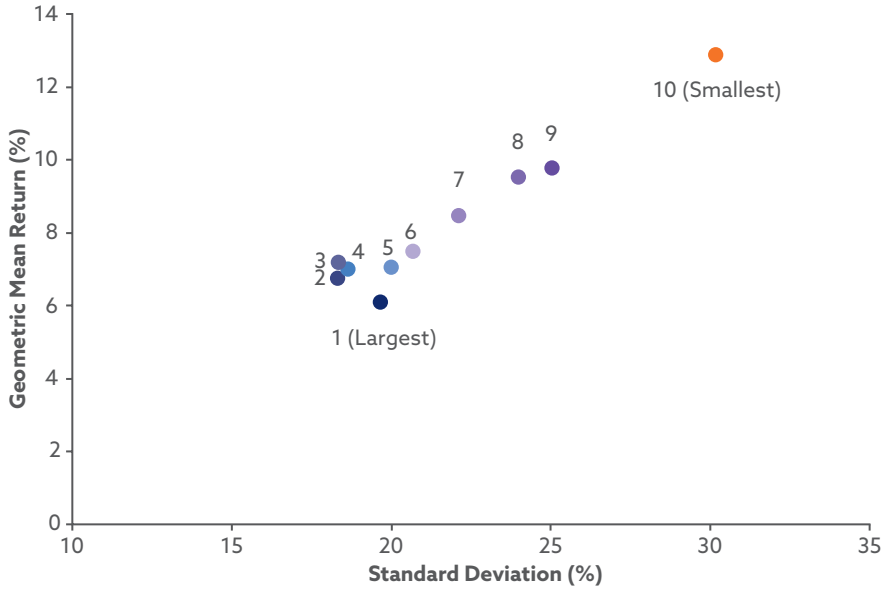
Exhibit 14.10 depicts the growth of ¥1 invested in each of these capitalization strata and the entire TSE1.

Exhibit 14.8. Summary Statistics of Returns on Japanese Size-Decile Portfolios and the Overall Japanese Stock Market, in Japanese Yen, 1978–2025

Decile	Geometric Mean (%)	Arithmetic Mean (%)	Standard Deviation (%)
1 (Largest)	6.1	7.9	19.6
2	6.8	8.3	18.3
3	7.2	8.7	18.3
4	7.0	8.6	18.6
5	7.1	8.9	20.0
6	7.5	9.4	20.7
7	8.5	10.7	22.1
8	9.6	12.0	24.0
9	9.8	12.5	25.0
10 (Smallest)	12.9	16.6	30.2
Mid Cap	7.1	8.7	8.7
Low Cap	8.3	10.4	10.4
Micro Cap	11.0	14.0	14.0
TSE1	6.3	8.0	18.7

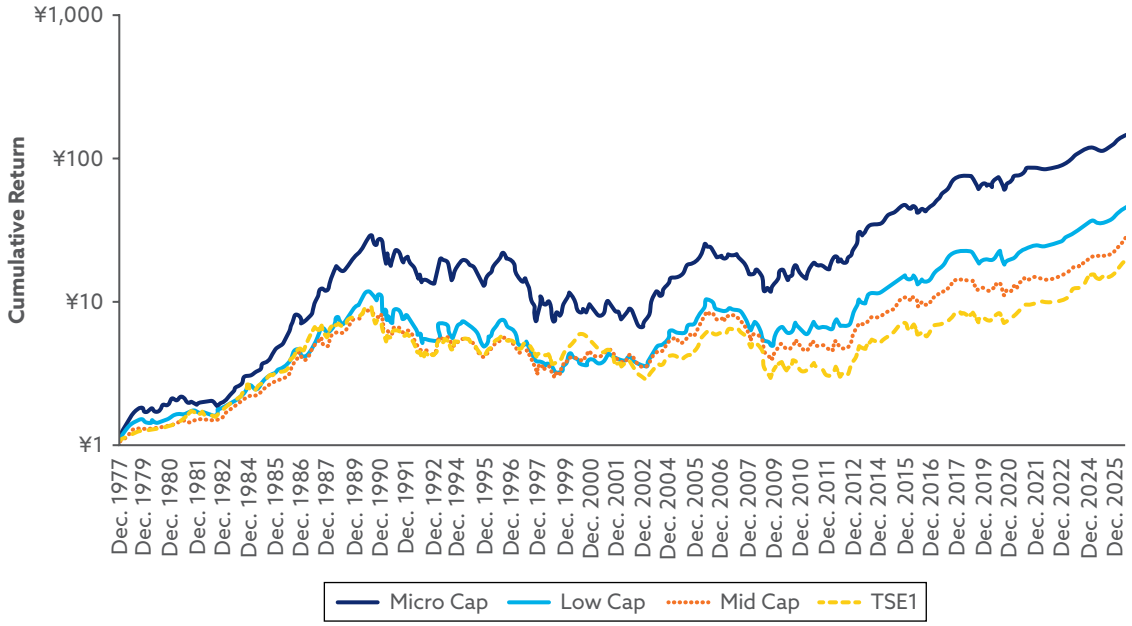
Sources: Ibbotson Associates Japan, Inc. (IAJ). Used with permission. All rights reserved. Decile 1–10: IAJ's Japanese Size-Decile Portfolios; Mid Cap: Deciles 3–5; Low Cap: Deciles 6–8; Micro Cap: Deciles 9–10; TSE1: TSE1 total return. Further details are provided in the Data Sources section.

Exhibit 14.9. Risk and Return of Japanese Size-Decile Portfolios, in Japanese Yen, 1978–2025



Source: See source notes for Exhibit 14.8.

Exhibit 14.10. Size-Decile Portfolios of the TSE1: Cumulative Return Indices in Japanese Yen, 1978–2025



Source: See source notes for Exhibit 14.8.

Decade-by-Decade Analysis of Japanese Asset Returns

Exhibit 14.11 presents a detailed, decade-by-decade analysis of the performance of the principal Japanese asset classes, plus inflation, from the 1950s to the 2020s. The postwar high-growth period (1950s–1960s) was distinguished by a government-directed financial system and a low interest rate policy that catalyzed explosive stock market growth and infrastructure investment.

In the 1970s, the Japanese economy shifted from a heavy-industry-centered model to a more energy-efficient, high-value-added, and technology-intensive industrial structure in response to oil crises and other global shocks. During this period, high inflation was followed by a process of disinflation, which led the Bank of Japan (BOJ) to place greater emphasis on price stability and to adopt a more disciplined approach to monetary policy.

In the 1980s, following the yen's appreciation after the Plaza Accord, the BOJ implemented monetary easing. This policy is widely regarded as one of the factors contributing to the subsequent asset price bubble. At the same time, because consumer prices remained relatively stable, rising asset prices were not a central focus of monetary policy.

Exhibit 14.11. Summary Statistics of Returns on Principal Japanese Asset Classes and Average Interest Rate by Decade, in Japanese Yen, in Percent, 1952–2025

	Stocks		Bonds		Money Markets		Inflation		Avg. Interest Rate	
	Compound Annual Return	Std. Dev.	Compound Annual Return	Std. Dev.	Compound Annual Return	Std. Dev.	Compound Annual Return	Std. Dev.	Long Term	Short Term
1952–1959	29.9	27.4	5.3	1.5	6.2	1.2	2.1	3.4	6.2	6.0
1960–1969	14.5	19.5	6.5	1.1	7.8	0.4	5.5	2.9	6.6	7.6
1970–1979	12.8	17.8	6.5	3.4	7.5	0.8	8.9	3.5	7.6	7.3
1980–1989	21.6	17.7	8.8	8.0	6.3	0.7	2.3	2.0	6.7	6.1
1990–1999	–4.2	22.3	7.3	7.8	2.7	0.8	1.1	1.5	3.9	2.7
2000–2009	–5.1	17.3	2.6	3.8	0.1	0.0	–0.2	1.0	1.4	0.1
2010–2019	8.9	18.3	2.4	2.3	0.0	0.0	0.6	1.1	0.5	0.0
2020–2025	14.8	15.0	–1.6	3.0	0.1	0.1	2.1	1.1	0.5	0.1
1952–2025	10.4	19.9	5.0	4.7	3.9	1.1	2.8	2.4	4.3	3.9

Source: See source notes for Exhibit 14.1.

The bursting of this bubble in the 1990s and 2000s was associated with a prolonged period of economic stagnation and deflation, known as the Lost Decades. During this era, the BOJ introduced unconventional monetary policies, such as the zero interest rate policy and quantitative easing, the efficacy of which sparked academic debate, with scholars questioning whether the economy was in a liquidity trap or facing deep-seated structural problems.[2]

The 2010s were defined by "Abenomics," the set of economic policies associated with Japanese Prime Minister Shinzo Abe, who served from 2006 to 2007 and again from 2012 to 2020. Abenomics featured large-scale quantitative and qualitative monetary easing (QQE) in an attempt to escape deflation, leading to a resurgence in the stock market and moderate inflation. However, structural headwinds from demographic changes persisted. The 2020s marked a fundamental turning point, with the BOJ finally beginning to exit its ultra-loose monetary policy. This normalization was made possible as persistent inflation, driven by external factors, provided the necessary conditions for unwinding unconventional policies.

A brief synopsis of each period follows.

- 1952–1959: Japan's postwar reconstruction and rapid industrialization drove extraordinary equity market performance, supported by high productivity growth and export expansion. Long-term government bonds offered modest but stable returns, while money market rates reflected gradual financial liberalization. Inflation was low, indicating a relatively stable macroeconomic environment.
- 1960–1969: The high-growth era saw equities continue to perform strongly, albeit at a more moderate pace than in the 1950s. Bond and money market returns improved, reflecting both economic expansion and financial deepening. Inflation began to pick up, partly in response to increased domestic demand and wage growth.
- 1970–1979: The oil shocks of 1973 and 1979 caused severe inflationary pressure, yet equities and fixed income still posted positive nominal returns. Money market yields stayed relatively high, reflecting tighter monetary conditions and inflation. Inflation reached its highest sustained levels of the postwar period.
- 1980–1989: The 1980s saw the asset price bubble form in the latter half of the decade, fueled by financial deregulation and aggressive monetary easing. Equities surged, long-term bonds benefited from declining inflation, and money market rates moderated. Inflation remained subdued.
- 1990–1999: Following the bursting of the bubble, equities entered a prolonged bear market. Bonds performed relatively well as yields fell in response to economic stagnation, while money market returns dropped sharply. Inflation was minimal, edging toward deflation.
- 2000–2009: A second "lost decade" took shape in the 2000s, with equities declining further amid banking crises and slow growth. Bond returns moderated, money market yields approached zero, and inflation was effectively absent.
- 2010–2019: Abenomics boosted equity sentiment in the latter half of the decade, but the overall pace of growth was moderate. Bond returns were low, reflecting the prolonged

[2] A liquidity trap occurs when economic stimulus through the lowering of interest rates becomes ineffective on the margin as interest rates approach zero.

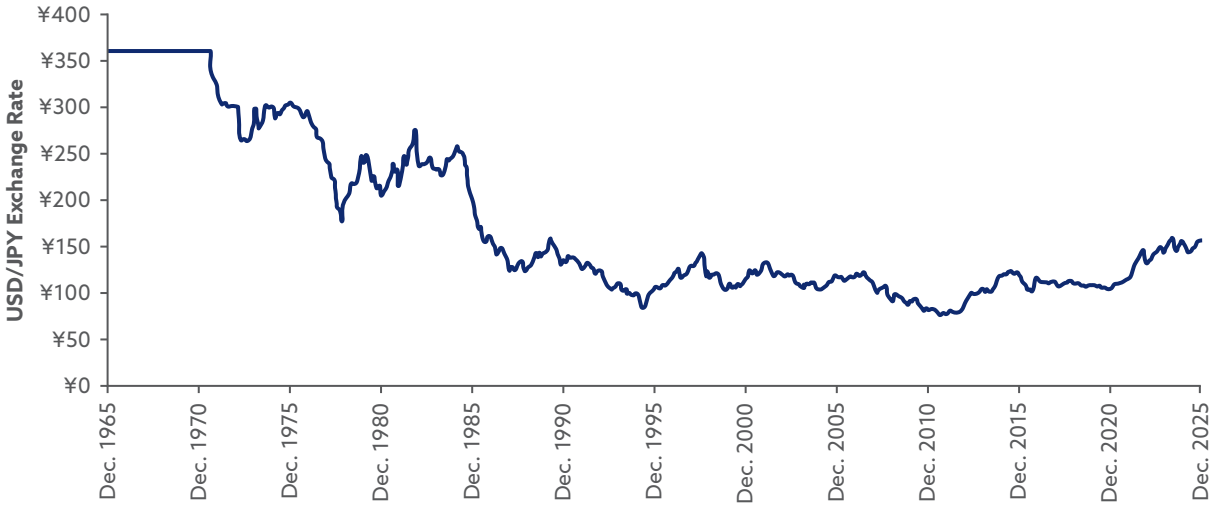
low/zero interest rate policy, while money market rates stayed near zero. Inflation remained below the BOJ's 2% target.

- 2020–2025: Despite the COVID-19 shock, equities rebounded strongly, aided by fiscal stimulus and global liquidity. Bond returns turned negative amid rising global yields, while money market rates stayed at zero. Inflation picked up modestly but remained well below international peaks.

The History of US Dollar/Japanese Yen Exchange Rates

Exhibit 14.12 depicts the US dollar/Japanese yen (USD/JPY) exchange rate over the period from the end of 1965 to the end of 2025. This exchange rate was fixed at ¥360 per dollar prior to 1970.[3] The evolution of the dollar–yen exchange rate over the past 60 years reflects broader shifts in the global monetary order and the structural maturation of the Japanese economy. This period can be divided into three phases.

Exhibit 14.12. The History of the USD/JPY Exchange Rate, December 1965–December 2025



Sources: The exchange rates are "Tokyo interbank USD/JPY Spot Rate at 17:00 in JST, End of Month, Tokyo Market," obtained from Bank of Japan from 1973 onward, while earlier observations were constructed using historical Federal Reserve H.10 and central-bank exchange-rate data standardized through Morningstar's US dollar–based conversion framework.

Notes: In this context, USD/JPY exchange rates are quoted as the number of Japanese yen per US dollar. Thus, a decrease in the rate denotes an appreciation of the Japanese yen and a depreciation of the dollar; conversely, an increase in the rate denotes a depreciation of the Japanese yen and an appreciation of the dollar.

[3] In this chapter, the dollar–yen exchange rate (the number of yen per dollar) will be referred to as "dollar–yen" or USD/JPY, following the conventions of the currency market. For example, an exchange rate of $1 = ¥150 is expressed as USD/JPY = 150.

Phase 1: The End of Fixed Rates and the Move to Market Prices (Early 1970s)

In the early 1970s, the Bretton Woods system—functioning as a gold-dollar standard that had fixed the Japanese yen at 360 per US dollar since 1949—reached its limit and collapsed. The collapse was caused by the large "twin deficits" (budget and trade deficits) that the United States ran to fund the Vietnam War while simultaneously expanding domestic social programs. This heavy deficit spending caused high inflation and made investors doubt whether the United States had enough gold to back the dollar, a problem known as the "Triffin dilemma" in reference to Belgian-American economist Robert Triffin.

In August 1971, President Richard Nixon unilaterally suspended the dollar's convertibility into gold—an event called the "Nixon shock"—which triggered an immediate and sharp decline in the dollar–yen exchange rate. Although the December 1971 Smithsonian Agreement tried to save the fixed-rate system by resetting the rate at ¥308 per dollar, the rate continued to drift lower despite the agreement. Market pressure to sell the dollar remained too strong, and by February 1973, Japan and other major nations completely gave up on fixed rates. The dollar value of the yen finally began to be determined by supply and demand in the open market.

Phase 2: The Long Era of a Strong Japanese Yen (1970s–2011)

For nearly 40 years following the move to floating rates, the Japanese yen was defined by a long-term strengthening trend against the US dollar. The primary driver was the massive trade surplus created by Japan's powerful manufacturing sector, particularly in cars and electronics, which led to a constant market demand for the currency. This trade imbalance led to the Plaza Accord in 1985, where the G5 group of advanced economies agreed to implement coordinated interventions aimed at correcting the overvalued US dollar. Within just one year of this agreement, the dollar–yen exchange rate tumbled from 240 to 150, representing a rapid surge in the Japanese yen's value.

Reflecting not just trade but other factors, the Japanese yen became a global "safe haven" because of Japan's low inflation and its status as the world's largest creditor. During global crises, such as the 2008 financial crash, and Japanese crises, such as the 2011 Fukushima earthquake, the yen would spike as investors closed out "yen carry trades" (borrowing in yen at low interest rates to invest elsewhere at high rates) and bought back yen to reduce risk. This trend peaked in 2011, when the dollar–yen rate reached its record low of 75 (a record high for the Japanese yen). This circumstance forced many Japanese companies to move their factories overseas to remain competitive.

Phase 3: The Era of a Strong US Dollar and a Weak Japanese Yen (2012–Present)

The landscape shifted dramatically in late 2012 with the start of Abenomics. To end decades of falling prices (deflation), the BOJ launched an unprecedented monetary easing program known as quantitative and qualitative monetary easing. This policy flooded the market with liquidity, intentionally driving down the yen to boost exports and stock prices. The situation intensified after 2020, when the US Federal Reserve began raising interest rates aggressively to fight inflation while the BOJ kept its rates at zero or negative. This interest rate differential made the

Japanese yen the world's cheapest funding currency, encouraging a massive wave of yen carry trades in which investors sold the yen to buy the US dollar.

By 2024, the dollar–yen exchange rate hit a 34-year high of 160, marking a historic decline in the yen's value against the dollar. Today, structural changes—such as Japan's growing "digital deficit" and the fact that many Japanese companies now keep their profits abroad—continue to limit the natural demand for the Japanese yen, keeping the currency at historic lows.

Japanese Stocks vs. US Stocks in US Dollars

This section compares the performance of Japanese stocks with that of US stocks from a US dollar perspective, incorporating the impact of dollar–yen exchange rate fluctuations. **Exhibit 14.13** illustrates the cumulative performance of a $1 investment in both markets starting at the end of December 1951. **Exhibit 14.14** shows the geometric mean return and annualized standard deviation for each specific period. Because the dollar–yen exchange rate and Japanese stocks exhibited varied behaviors over this time frame, the analysis is segmented into three distinct phases to examine performance under different market regimes.

The exchange rates used to convert Japanese stocks from yen to dollars are "Tokyo interbank USD/JPY Spot Rate at 17:00 in JST, End of Month, Tokyo Market," obtained from the BOJ from

Exhibit 14.13. Wealth Indices of Investments in Japanese Stocks and US Stocks, in US Dollars, 1952–2025

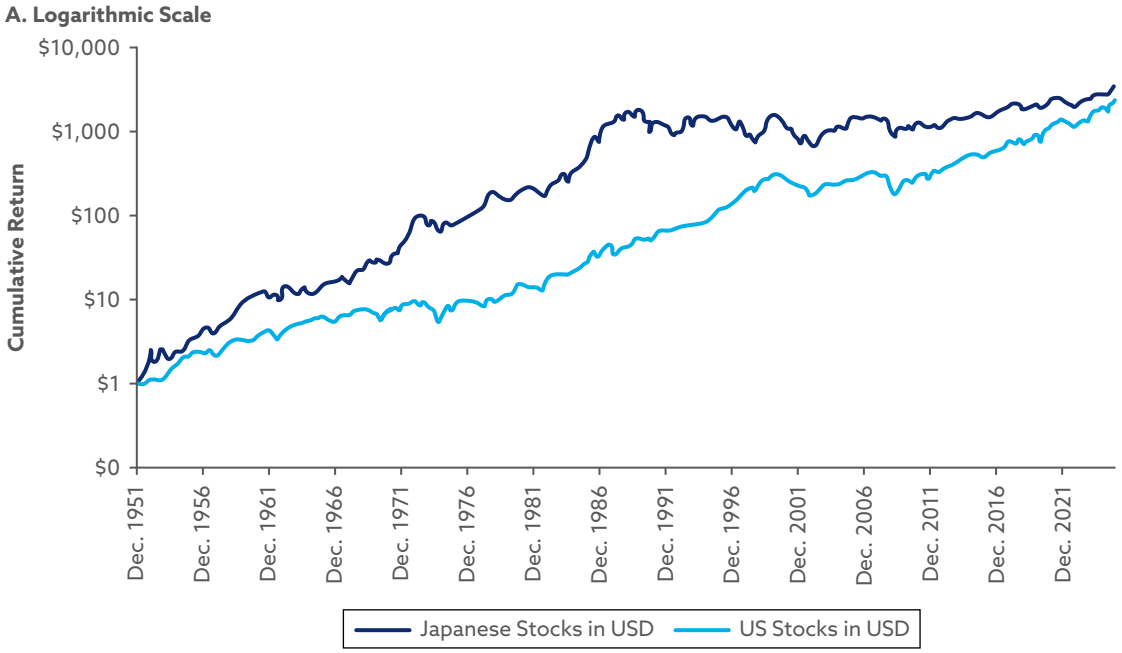
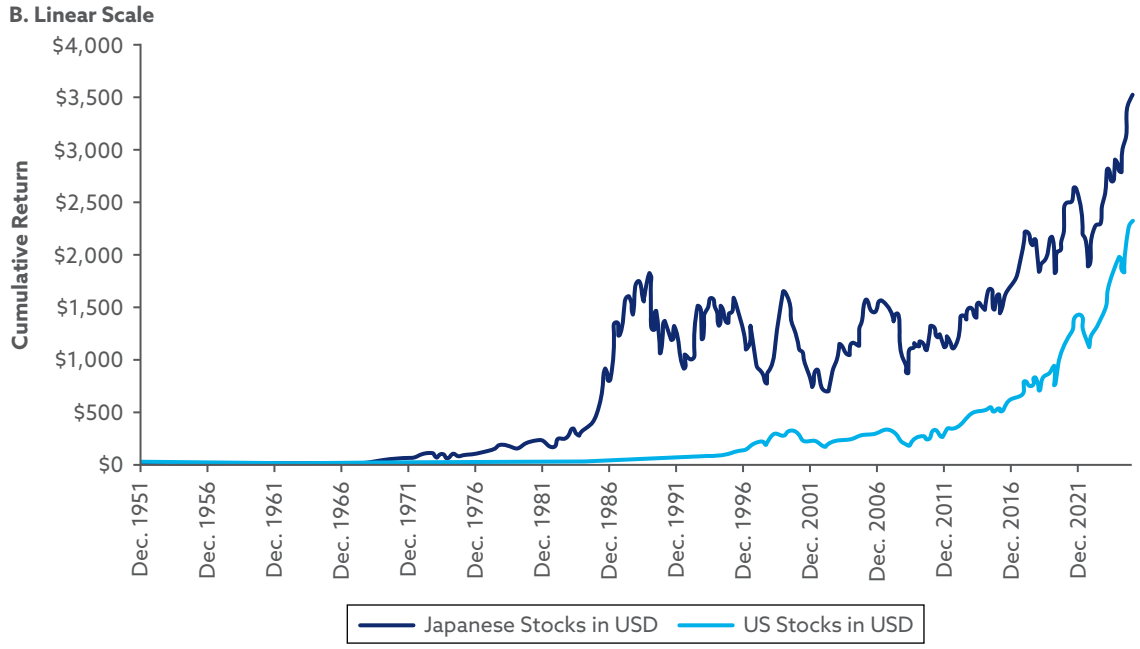


Exhibit 14.13. Wealth Indices of Investments in Japanese Stocks and US Stocks, in US Dollars, 1952–2025 (*continued*)



Sources: Japanese stocks: TSE1 total return; US stocks: Large Cap Total Return provided by CRSP.

Exhibit 14.14. Summary Statistics of Japanese Stocks and US Stocks in US Dollars (%), 1952–2025

	Japanese Stocks in US Dollars			US Stocks in US Dollars			
	Compound Annual Return (1)	Std. Dev. (2)	(1)/(2)	Compound Annual Return (3)	Std. Dev. (4)	(3)/(4)	Correlation of Monthly Returns
1952–2025	11.7	22.0	0.53	11.0	16.1	0.68	0.32
1952–1989	21.9	23.6	0.92	11.1	15.8	0.70	0.18
1990–2011	–2.3	22.3	–0.10	8.1	16.5	0.49	0.39
2012–2025	8.7	14.7	0.59	15.6	16.2	0.96	0.72

Sources: Japanese stocks: TSE1 total return; US stocks: large-cap total return provided by CRSP.

1973 onward. Earlier observations were constructed using historical Federal Reserve H.10 and central-bank exchange-rate data standardized through Morningstar's US dollar–based conversion framework.

Overview: 1952–2025

Over the 74-year span from 1952 to 2025, Japanese stocks delivered a compound annualized (geometric mean) return of 11.7%, with a standard deviation of 22.0%, in US dollar terms. During the same period, US stocks generated a geometric mean return of 11.0%, with a standard deviation of 16.1%. Although the compound annual return of Japanese stocks slightly exceeded that of US stocks, the significantly higher volatility in the Japanese market resulted in a lower risk-adjusted return compared with US equities.

Phase 1 (1952–1989): High Growth and Yen Appreciation—The "Double Tailwind"

During this era, Japan experienced unprecedented economic growth, ranging from the postwar miracle to the "Shōwa bubble."[4] This growth, combined with the yen's strengthening against the dollar, created a "double tailwind" for US dollar–based investors. As a result, Japanese stocks substantially outperformed US stocks during this period.

Phase 2 (1990–2011): Market Slump and Yen Appreciation

Following the collapse of the bubble economy, Japanese equities struggled in response to a prolonged economic downturn triggered by the nonperforming loan crisis. However, the continued appreciation of the yen provided a crucial buffer for US dollar investors.

Despite the currency support, the absolute decline in stock prices led to a negative compound annual return for Japan, with US equities showing superior relative performance.

Phase 3 (2012–2025): Market Rally and Yen Depreciation

Driven by the ultra-loose monetary policy of Abenomics, the yen shifted toward a significant depreciation. This shift boosted the earnings of Japanese exporters, propelling the domestic stock market to record highs by the end of 2025. Conversely, the weak yen acted as a major headwind for dollar-based returns.

Although Japanese stocks rallied in local terms, the substantial depreciation of the yen (foreign exchange headwinds) meant that the US dollar–denominated returns of Japanese stocks lagged far behind the returns of their US counterparts.

[4] The Shōwa era (1926–1989) is a period in Japanese history characterized by the reign of Emperor Hirohito (Emperor Shōwa). The "Shōwa bubble" refers to Japan's asset price bubble of the late 1980s (roughly 1986–1991), driven by loose monetary conditions and resulting in subsequent financial and economic stagnation.

Key Takeaways

- *Equities beat bonds.* Over the 74-year period from 1952 to 2025, Japanese stocks were the big winners. A ¥1 investment in 1951 grew to ¥1,520 by year-end 2025, representing a compound annual geometric mean return of 10.4%.
- *Risk was rewarded with a higher return.* The Japanese market demonstrated a clear risk–return trade-off where returns increased with an asset's risk. Although stocks exhibited the highest volatility, they provided greater rewards than both bonds (5.0% compound return) and money markets (3.9% compound return).
- *For bonds, income returns dominated capital gains.* The large majority of historical returns on long-term government bonds were driven by income returns (coupons) rather than capital appreciation. Japanese bonds saw a mere 0.7% capital gain, compounded annually, over the entire period.
- *Interest rates declined.* Japanese long- and short-term rates have followed a pronounced secular decline since the early 1980s. Following the collapse of the market bubble in the 1990s, Japan entered a prolonged ultra-low interest rate environment, reflecting persistent deflationary conditions.
- *Correlations fluctuated significantly over time.* Stock returns were negatively correlated with bonds during Japan's era of ultra-accommodative monetary policy (from the mid-1990s until March 2024), but the correlation has recently turned positive as the economy recovered and monetary policy began to normalize.
- *Small caps beat large caps.* Investors were compensated for the higher standard deviation of small companies with higher realized returns, although they had to endure periods of significant underperformance, sometimes lasting many years.
- *Historical returns are representative of what can happen.* Although specific historical events, such as the 1987 crash or the 1990s bear market, are unique, the event types tend to recur. Examining these past returns remains highly informative for making inferences about future market behavior.

Data Sources

Primary Data Source

Ibbotson Associates Japan, Inc. Stocks, Bonds, Money Market, and Inflation Japan (SBMI-J) Series (1952–2025).

Specific Asset Class Indices

Japanese stocks: Tokyo Stock Exchange First Section (TSE1) Total Return Index.

Subperiod 1952–1989: Japan Securities Research Institute, "Stock Investment Return" (TSE1).

Subperiod 1989–2025: JPX Research Institute, Inc., TOPIX Total Return Index.

Japanese bonds: IA Japan LT Government Total Return Index (approx. 10-year maturity).

Data derived from: Ministry of Finance (Financial Bureau); Bond Underwriters Association; Japan Securities Dealers Association.

Japanese money markets: IA Japan Money Market Total Return Index.

Data derived from: Bank of Japan, "Collateralized/Uncollateralized Overnight Call Rate."

Japanese inflation: IA Japan Inflation Index.

Data derived from: Ministry of Internal Affairs and Communications (Statistics Bureau), Consumer Price Index (Nationwide, General).

Japanese size-decile portfolios: IA Japan Size-Decile Portfolio Series (TSE1/TOPIX Universe).

USD/JPY exchange rate: Tokyo interbank USD/JPY Spot Rate at 17:00 in JST, End of Month, Tokyo Market; historical Federal Reserve H.10 and central-bank exchange-rate data standardized through Morningstar's US dollar–based conversion framework.

Data derived from: Bank of Japan; Morningstar, Inc.

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CHAPTER 15. THE CHINESE MARKET, 2005–2025

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To fully understand the risk and return characteristics of financial assets, investors and researchers must examine long-term historical return series because asset returns—particularly those of equity investments—exhibit extreme short-term volatility. Only through the analysis of long-term historical data can we uncover the fundamental underlying logic of risk and return and, in turn, use these insights to inform sound long-term investment decisions.

This chapter, based on the *SBBI® China Investment Yearbook*, documents the historical returns of major Chinese asset classes from year-end 2004 to year-end 2025 (Chen and YouZhiYouXing forthcoming 2026). Its purpose extends far beyond mere archival record keeping; it aims to explain, analyze, and distill actionable insights for investors. As Niccolò Machiavelli wrote, "Whoever wishes to foresee the future must consult the past." This sentiment is echoed by Theodore Roosevelt, who observed, "The more you know about the past, the better prepared you are for the future."

The original Ibbotson and Sinquefield dataset was first compiled in the United States in 1976. This work represented the first rigorous, systematic statistical analysis of long-term historical risks and returns across major US asset classes. Upon its publication, the dataset garnered widespread attention from academics and finance practitioners worldwide because of its transformative implications for understanding financial market mechanics, asset class behavior, and the development of long-term investment strategies. Under its previous names, CFA Institute Research Foundation published updates in the form of research monographs by the two authors in 1977, 1979, 1982, and 1989.[1] Ibbotson Associates and successor firms continued to publish annual updates until recently.

This chapter applies the Ibbotson and Sinquefield approach to China, the fastest-growing large economy in the world during the period this study covers (2005–2025). Although that is a short period compared with the capital market histories of many other countries, it is one during which China experienced massive economic growth and achieved an increasing degree of maturity in its capital markets.

Compiling the SBBI® China dataset on which this chapter is based has been a longstanding personal and professional aspiration. I first encountered the original Ibbotson and Sinquefield data while writing my doctoral dissertation in the 1990s and later had the privilege of collaborating with those authors, as well as other leading financial practitioners, for more than 20 years, beginning in 1997. Through this framework, I gained invaluable insights into the fundamental underlying logic of financial asset pricing, and I had the opportunity to promote its application to serve a diverse range of institutional and individual investors globally.

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[1]At the time of the first three updates, the organization's name was Financial Analysts Research Foundation. The name in 1989 was Research Foundation of the Institute for Chartered Financial Analysts, and Dow Jones-Irwin co-published this update. See Ibbotson and Sinquefield (1977, 1979, 1982, 1989).

Since 2020, I have increasingly recognized the critical importance of compiling and analyzing a rigorous historical returns dataset along these lines for the Chinese market—primarily to determine whether the financial market laws and logic observed in mature overseas markets hold true in China's unique market environment.

The return histories presented in this study help reveal the fundamental relationships among various asset classes and between risk and return, including both nominal returns and real (inflation-adjusted) returns. By studying the long-term historical record, one encounters most of the major types of market events that investors have experienced in the past and are likely to encounter in the future. These include geopolitical tensions, economic expansion and recession, bull and bear markets, inflation and deflation, and other less dramatic events that affect asset returns.

The primary goal of this chapter is to help investors understand contemporary Chinese financial markets through the lens of financial history. I aim to do the following:

- Document historical market returns to demonstrate the long-term equilibrium relationship between risk and return in China's capital markets.
- Reveal the structural relationships between the returns of various asset classes, including the drivers of inflation, real interest rates, risk premiums, and other return components.
- Encourage a deeper, data-driven understanding of China's economic and financial markets through empirical data and visualizations.
- Assist readers in answering fundamental, practical questions about the functioning of China's financial markets.

Major Asset Classes and Asset Class Indices in China

The asset classes included in this chapter not only highlight the structural differences across segments of China's financial market but also adhere strictly to the Ibbotson and Sinquefield classification framework, in order to ensure comparability with global historical data. I segment the Chinese equity market into large-cap and small-cap stocks. The fixed-income market is differentiated along two core dimensions: Riskless government bonds are categorized by time horizon, or maturity (represented here by long-term and short-term government bonds), and long-term corporate credit bonds are compared with long-term government bonds to isolate and quantify the default risk premium.

Exhibit 15.1 describes the six major asset classes analyzed in this study and identifies their representative market indices.

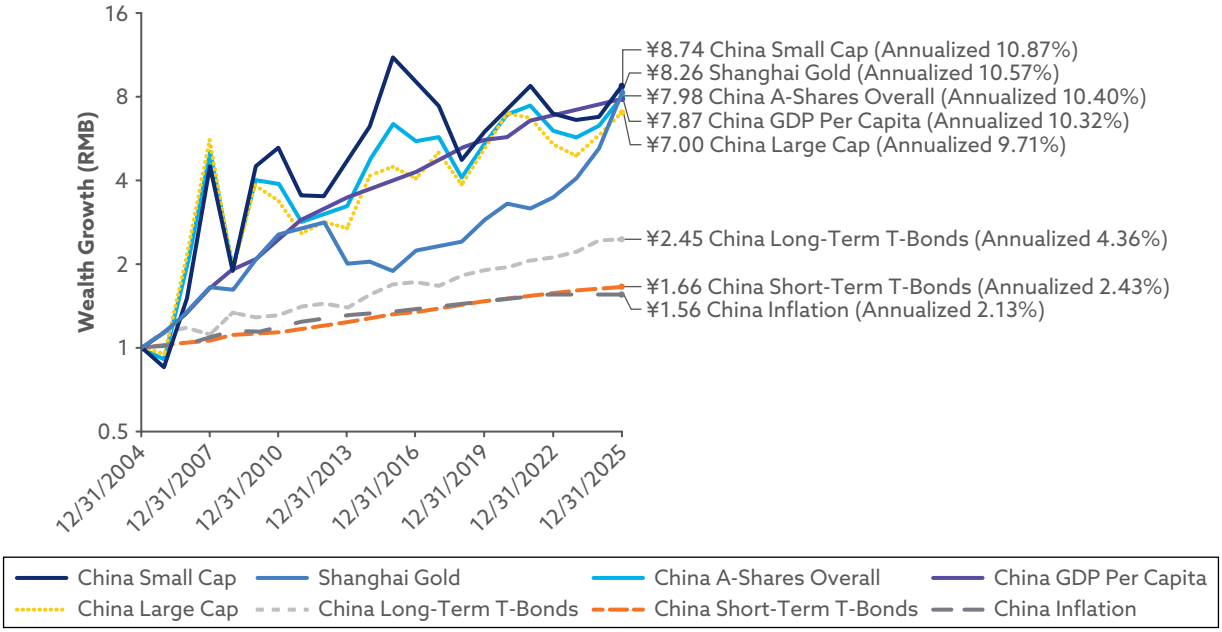
Exhibits 15.2 and **15.3** show cumulative wealth indices of these asset classes, with the latter showing details on the fixed-income asset classes. All returns are total returns (including reinvestment of dividend or interest income). All data in this chapter are in Chinese renminbi (RMB) except where noted.

Exhibit 15.4 presents summary statistics for these asset classes and depicts the distribution of their annual returns over the sample period. Over 2005–2025, higher-risk assets produced higher returns, with Chinese small-cap stocks producing the highest returns and experiencing the highest volatility. Lower-risk assets, such as investment-grade bonds, have return distributions tightly clustered around the series mean. The return distribution for short-term

Exhibit 15.1. Chinese Asset Classes

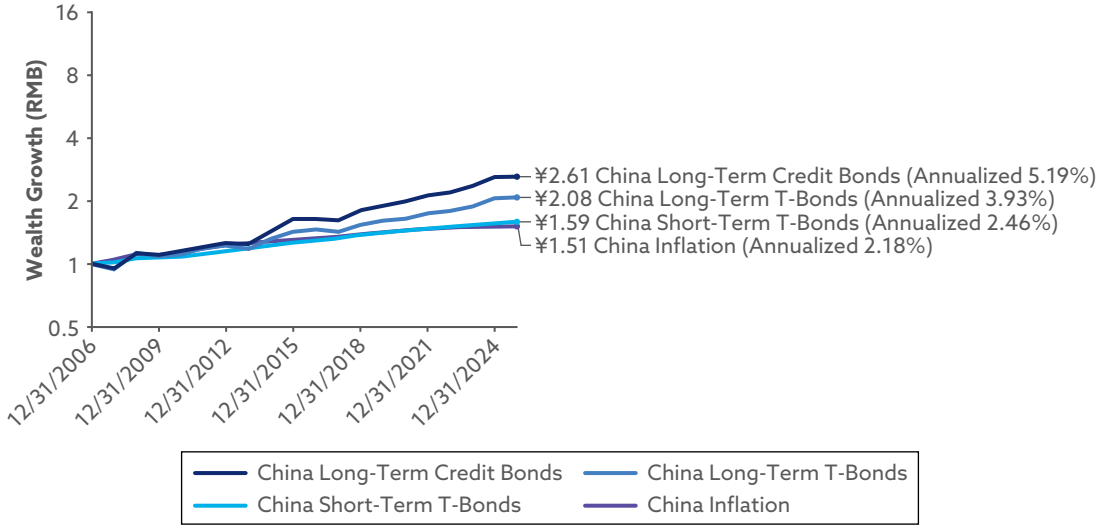
Chinese Asset Class	Representative Index (代表指数)	Index Ticker (指数代码)	Source (数据来源)	Note (备注)
Inflation	Chinese CPI		China National Statistics Bureau 国家统计局官网	
Chinese short-term government bonds	China Bond 0–1 Year Government Bond Index 中债 0–1 年国债指数	CBA14101.CS	China Central Depository & Clearing Co., Ltd. (www.ccdc.com.cn/en/) 中央国债登记结算有限责任公司官网	Returns in 2005 and 2006 are estimated using 6-month government bond yields for each month. 2005、2006 两年以 6 月期国债收益预估得到
Chinese long-term government bonds	China Bond 7–10 Year Government Bond Index 中债 7–10 年国债指数	CBA06501.CS	Same as above	Returns in 2005 and 2006 are estimated using 7-year government bond yields for each month. 2005、2006 两年以 7 年期国债收益预估得到
Chinese long-term corporate bonds	China Bond Investment Grade 7–10 Year Bond Index 中债-高信用等级新财富(7–10年)指数	CBA04751.CS	Same as above	Without data from 2005 and 2006 缺少 2005、2006 年的数据
Chinese stocks (all market)	CSI All Share Index 中证全指	000985.SH	Wind Terminal	
Chinese large-cap stocks	CSI 300 Index 沪深 300	000300.SH	Wind Terminal	2005 dividend of index is estimated using the underlying dividend data for each stock. 2005 年的分红数据根据成分股分红数据估算得到
Chinese small-cap stocks	CSI 1000 Index 中证 1000	000852.SH	Wind Terminal	

Exhibit 15.2. The China Market: Cumulative Indices of Total Returns on Stocks, Bonds, Bills, and Gold, and Inflation Index, 2005–2025



Sources: See sources listed in Exhibit 15.1.

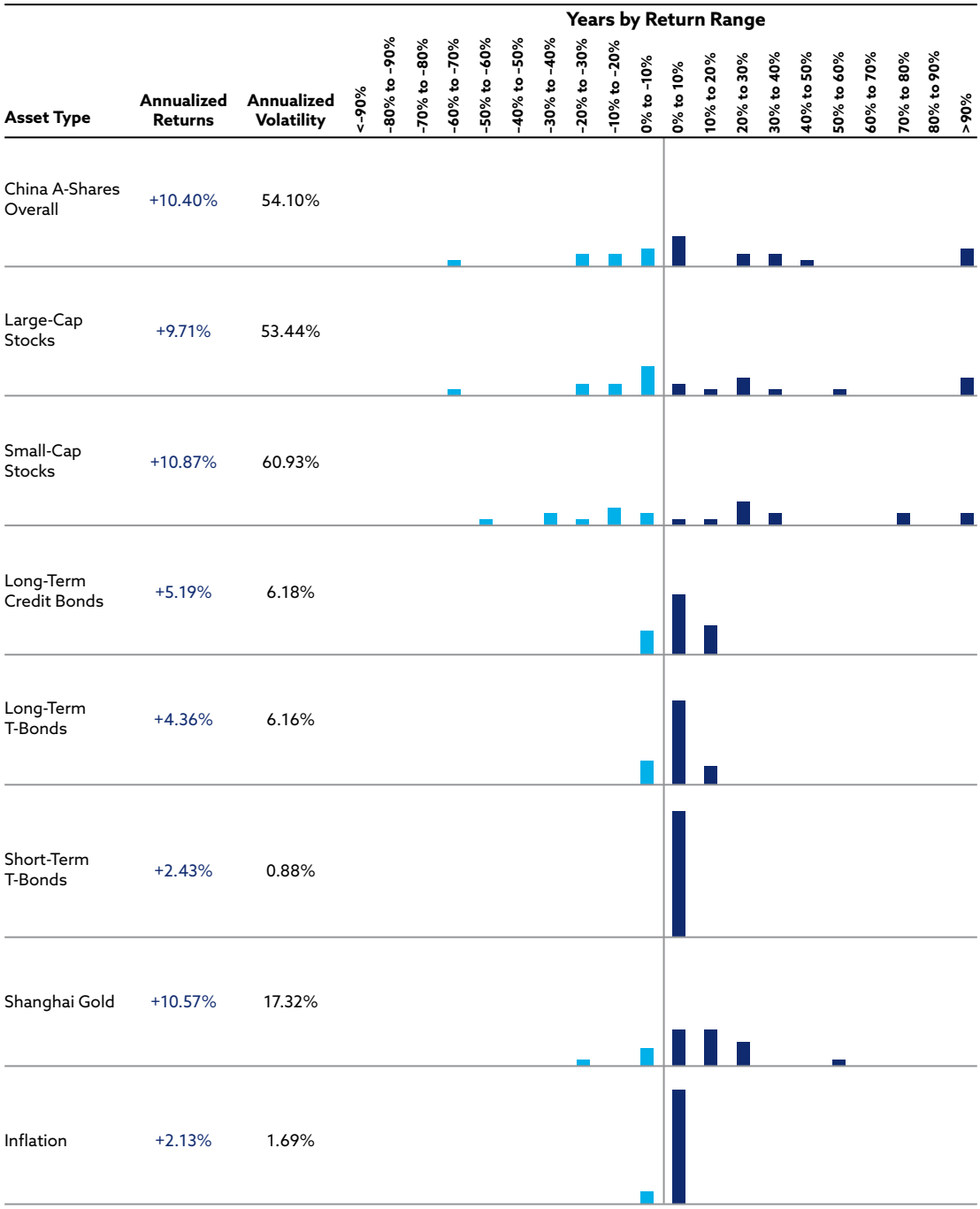
Exhibit 15.3. Chinese Long-Term Corporate Credit, Long-Term Government, and Short-Term Government Bonds, 2007–2025



Sources: See sources listed in Exhibit 15.1.

Exhibit 15.4. Summary Statistics and Distributions of Returns on Principal Chinese Asset Classes, 2005–2025 (2007–2025 for Long-Term Credit Bonds)

Asset Type	Annualized Returns	Annualized Volatility	Years by Return Range
China A-Shares Overall	+10.40%	54.10%	
Large-Cap Stocks	+9.71%	53.44%	
Small-Cap Stocks	+10.87%	60.93%	
Long-Term Credit Bonds	+5.19%	6.18%	
Long-Term T-Bonds	+4.36%	6.16%	
Short-Term T-Bonds	+2.43%	0.88%	
Shanghai Gold	+10.57%	17.32%	
Inflation	+2.13%	1.69%	



Sources: See sources listed in Exhibit 15.1.

government bonds lies entirely to the right of the zero-return line. In other words, these bonds never delivered a negative annual return over the sample period.

Exhibit 15.5 presents year-by-year returns in renminbi on each of the asset classes, plus gold (also quoted in renminbi) and Chinese inflation rates.

Exhibit 15.5. Year-by-Year Total Returns on Principal Chinese Asset Classes, 2005–2025

Year	Chinese Small-Cap Stocks (%)	Chinese Stocks (all cap) (%)	Chinese Large-Cap Stocks (%)	Chinese Long-Term Corporate Bonds (%)	Chinese Long-Term Government Bonds (%)	Chinese Short-Term Government Bonds (%)	Gold (%)	Inflation (%)
2005	–14.99	–9.43	–5.25		14.23	2.46	13.10	1.80
2006	76.73	115.38	125.23		3.10	1.80	19.31	1.51
2007	203.10	172.40	163.28	–4.46	–5.26	1.99	22.40	4.80
2008	–59.19	–63.77	–65.61	17.91	19.64	4.39	–2.25	5.90
2009	140.44	108.10	98.58	–1.64	–3.31	1.15	28.25	–0.71
2010	17.64	–2.99	–11.58	4.06	1.64	0.95	23.44	3.29
2011	–32.78	–27.32	–24.05	4.07	7.06	3.35	5.96	5.39
2012	–0.77	6.24	9.80	5.08	2.67	2.65	4.60	2.60
2013	32.50	7.10	–5.33	–1.24	–3.54	2.53	–29.31	2.60
2014	35.26	48.41	55.85	14.85	11.43	3.93	1.75	2.00
2015	76.59	33.78	7.22	13.96	9.03	3.00	–7.37	1.40
2016	–19.69	–13.31	–9.26	0.70	1.86	2.08	18.42	2.00
2017	–16.89	3.68	24.25	–1.77	–2.94	2.76	3.45	1.59
2018	–36.28	–28.79	–23.64	11.62	8.67	3.57	4.25	2.10
2019	26.98	33.41	39.19	5.98	4.40	2.75	19.75	2.90
2020	20.45	26.87	29.89	4.40	2.52	2.00	14.44	2.49
2021	21.61	7.70	–3.52	6.76	5.76	2.46	–4.14	0.90
2022	–20.77	–18.93	–19.84	3.24	3.00	1.94	9.80	2.01
2023	–5.28	–5.34	–9.14	7.74	4.80	2.09	16.83	0.20
2024	2.79	9.98	18.24	10.22	9.38	2.00	28.19	0.20
2025	29.02	27.03	20.98	0.30	0.89	1.23	58.57	0.00

Source: See Exhibit 15.1.

Components of Total Return: Interest, Dividends, and Capital Gains

For all asset classes analyzed in this study, annual total return is decomposed into three components: capital gain return, income return (dividends for equities, coupon interest for fixed income), and return from the reinvestment of income. **Exhibit 15.6** shows the decomposition. For equities, capital appreciation accounts for the majority (70%–90%) of total annualized returns but exhibits extreme year-to-year volatility. In contrast, dividend income and the return from dividend reinvestment are far less volatile but constitute a smaller portion of total annual returns. In other words, capital gain returns are less stable and inherently riskier in the short term, whereas equity dividend income offers greater stability and certainty for investors.

For fixed-income investments, the vast majority of total returns are derived from coupon income and the reinvestment of that income, with capital gains accounting for a small fraction of total returns—and typically turning negative during periods of rising interest rates. This behavior is consistent with the core structural characteristics of fixed-income assets observed in mature global markets.

Exhibit 15.6. Capital Gain and Income Returns on Principal Chinese Asset Classes, 2005–2025

Asset Class	Compound Annual Return	Capital Gain	Income Return
Chinese stocks (all cap)	10.40%	8.84%	1.43%
Chinese large-cap stocks	9.71%	7.57%	1.99%
Chinese small-cap stocks	10.87%	10.14%	0.77%
Chinese long-term corporate bonds	5.19%	0.51%	4.65%
Chinese long-term government bonds	4.36%	0.89%	3.43%
Chinese short-term government bonds	2.43%	–0.35%	2.79%

Source: Chen and YouZhiYouXing (forthcoming 2026).

The Chinese Capital Market from 2005 to 2025

The 2005–2025 period represents one of the most transformative eras in the history of China's capital markets. What began as a relatively small, retail-dominated, policy-driven market evolved into the world's second-largest equity market and bond market by capitalization, with substantial improvements in institutional structure, openness, regulatory governance, and investor sophistication. This backdrop is essential to interpreting the return patterns, volatility, and risk premiums documented in this chapter.

The period opened with a foundational institutional breakthrough: the launch of the split-share structure reform in 2005, which resolved a longstanding structural flaw whereby two-thirds of listed shares—mostly state-owned and legal-person shares—were nontradable. By requiring nontradable shareholders to pay consideration to tradable shareholders, the reform unified shareholder incentives, improved price discovery, and laid the groundwork for a genuine market-oriented valuation system. This reform coincided with strong economic growth, rapid industrialization, and rising corporate profitability, fueling a historic bull market that peaked in 2007 before collapsing amid the global financial crisis in 2008. These extreme swings help explain the exceptionally high volatility observed in Chinese equity returns over the full sample.

In the decade that followed, China's capital markets underwent layered institutional development. Key milestones include the launch of the China Growth and Enterprise Market in 2009 to support innovative small and medium-sized enterprises, the introduction of margin trading and short selling in 2010, and the rollout of cross-border connectivity mechanisms, starting with Shanghai-Hong Kong Stock Connect in 2014 and followed by Shenzhen-Hong Kong Stock Connect in 2016. These channels gradually opened A-shares to global capital, culminating in the inclusion of Chinese domestic equities in major international indices, such as those compiled by MSCI, FTSE Russell, and S&P Dow Jones Indices, marking a decisive shift toward institutionalization and global integration.

The market also experienced repeated cycles of boom, bust, and regulatory tightening. The highly leveraged rally of 2014–2015 and subsequent sharp correction underscored persistent risks from retail-dominated trading, speculative sentiment, and procyclical liquidity conditions. These episodes reinforced why Chinese equities exhibit much higher annual volatility than mature markets, even as long-term returns remained competitive.

From 2019 to 2025, the market entered a new era of high-quality development driven by the registration-based initial public offering reform. Beginning with the launch of the SSE STAR Market (Shanghai Stock Exchange Science and Technology Innovation Board) in 2019, the reform shifted from a government approval system to a disclosure-based, market-driven registration system, which was fully implemented across all exchanges by 2023. Parallel reforms strengthened delisting mechanisms, improved investor protection, and enhanced oversight of accounting and disclosure quality. Meanwhile, the investor base matured: Institutional holdings rose; passive investment products, such as exchange-traded funds, expanded rapidly; and market behavior gradually became more driven by fundamentals, earnings quality, and long-term cash flows rather than short-term policy sentiment or speculative flows.

By 2025, China's equity market featured 5,000 listed firms, with a total market capitalization of USD15 trillion. It had become far more liquid, regulated, and globally connected than at the start

of our sample. Nevertheless, it retained distinctive characteristics: strong sensitivity to macro policy, liquidity cycles, and regulatory shifts; a mix of state-owned enterprises and dynamic private firms; and ongoing structural transition toward higher-value-added growth. These unique features shaped the return, volatility, correlation, and risk premium patterns observed across asset classes during 2005–2025 and provide essential context for the empirical analysis in this chapter.

Parallel to the equity market, China's bond market also experienced extraordinary expansion and institutional maturation over 2005–2025, growing from a relatively narrow funding channel into the world's second-largest bond market, with total outstanding volume exceeding USD25 trillion by 2025. The period saw steady development in market structure, with the emergence of a comprehensive ecosystem encompassing Treasury bonds, policy bank bonds, local government bonds, financial bonds, and corporate credit bonds, supported by robust interbank and exchange trading platforms. Regulatory frameworks were gradually unified, issuance mechanisms became more market-driven, and investor bases expanded to include commercial banks, insurance companies, asset managers, and global institutional investors.

The opening of the Chinese markets to non-Chinese investors accelerated notably after 2015, with the launch of Bond Connect in 2017 and the inclusion of Chinese government bonds in major global bond indices starting in 2020, drawing substantial international participation and enhancing price discovery and liquidity. Throughout the period, fixed-income assets exhibited far more stable return patterns and lower volatility than equities, providing investors with a reliable, low-risk alternative and forming an essential pillar for asset allocation and risk management in China's capital markets.

Supply-Side Equity Return Decomposition

Following the Ibbotson and Chen (2003) supply-side return decomposition framework documented in Chapter 9, this section takes the total returns of the China total A-share market index over 2005–2025 and decomposes them into their supply-side components: inflation, real earnings growth, price-to-earnings ratio (P/E) changes, dividend yield, and dividend payout ratio. In this way, the Ibbotson–Chen Dividend Model is implemented.

The results show that over 2005–2025, the geometric mean (compound annual) total return of China's A-share market was 10.40%, of which real earnings per share (EPS) growth was the dominant factor, at 7.11% per year. The P/E showed a slight long-term contraction of –0.50% per year, the average dividend yield was 1.43% per year, and the dividend payout ratio showed a slight downward movement of –0.30% per year. **Exhibit 15.7** shows the decomposition results, and **Exhibit 15.8** provides a graphic depiction.

Exhibit 15.9 illustrates the fact that the growth rates of earnings, dividends, and stock market prices in China have consistently moved together over time.

The annualized growth rate of real EPS of A-shares was 7.11%, representing the majority of equity returns. The P/E contracted slightly over the long term (–0.50% per year), indicating that the long-term returns of A-shares have solid fundamental support, are not driven by valuation changes, conform to supply-side pricing logic, and are consistent with the conclusions of Ibbotson and Chen (2003).

Exhibit 15.7. Historical Supply-Side Return Decomposition, 2005–2025

Building Blocks		Capital Gain and Income	
Component	**Compound Annual Return**	**Component**	**Compound Annual Return**
Equity risk premium	5.67%	Income	1.43%
Riskless rate	2.18%	Real capital gain	6.57%
Inflation	2.13%	Inflation	2.13%
Reinvestment	0.13%	Reinvestment	0.13%
Earnings		**Dividends**	
Component	**Compound Annual Return**	**Component**	**Compound Annual Return**
Income	1.43%	Income	1.43%
Growth in P/E	–0.50%	Growth in P/E	–0.50%
Growth in real EPS	7.11%	Growth in real dividends	6.79%
Inflation	2.13%	– Growth in payout ratio	–0.30%
Reinvestment	0.13%	Inflation	2.13%
		Reinvestment	0.13%

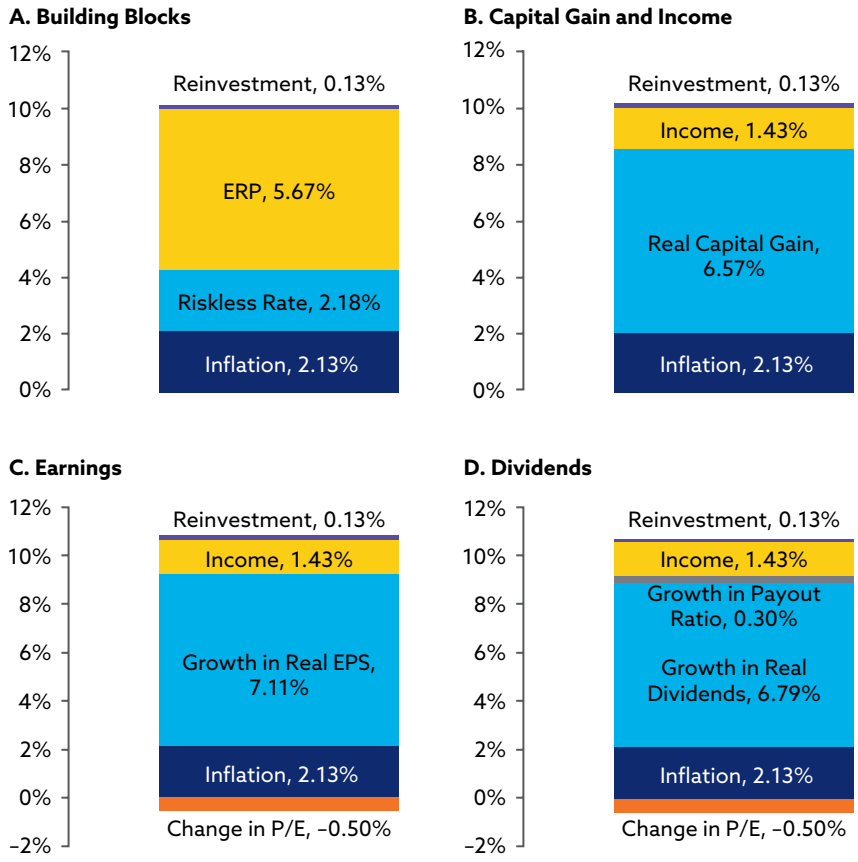
Source: Chen and YouZhiYouXing (forthcoming 2026).

The geometric mean of the long-term equity risk premium of A-shares over government bonds is 5.67%, indicating that holding A-share equity assets over the long term can produce a reasonable return for the amount of risk taken and supporting a substantial allocation to equities for institutional investors and individual investors. Under the new listing policies, the dividend distribution mechanism has been gradually improved. The average dividend yield and payout ratio have risen in recent years and are expected to continue to rise.

Risk Premiums

Risk and return are closely related over long investment horizons. This fundamental relationship exists because investors demand higher expected returns for asset classes with greater underlying risk exposures. The differences in expected or realized returns across asset classes, which compensate investors for bearing incremental risk, are called risk premiums. By examining the historical return differentials between asset classes bearing different amounts of risk, we can calculate the realized or historical risk premiums in China's capital markets over the 21-year sample period.

Exhibit 15.8. Graphic Historical Supply-Side Return Decomposition, 2005–2025



Source: Chen and YouZhiYouXing (forthcoming 2026).

Exhibit 15.10 compares the realized risk premiums in China over 2005–2025 with the much longer-term realized risk premiums in the US market over 1926–2025, calculated using the same methods.

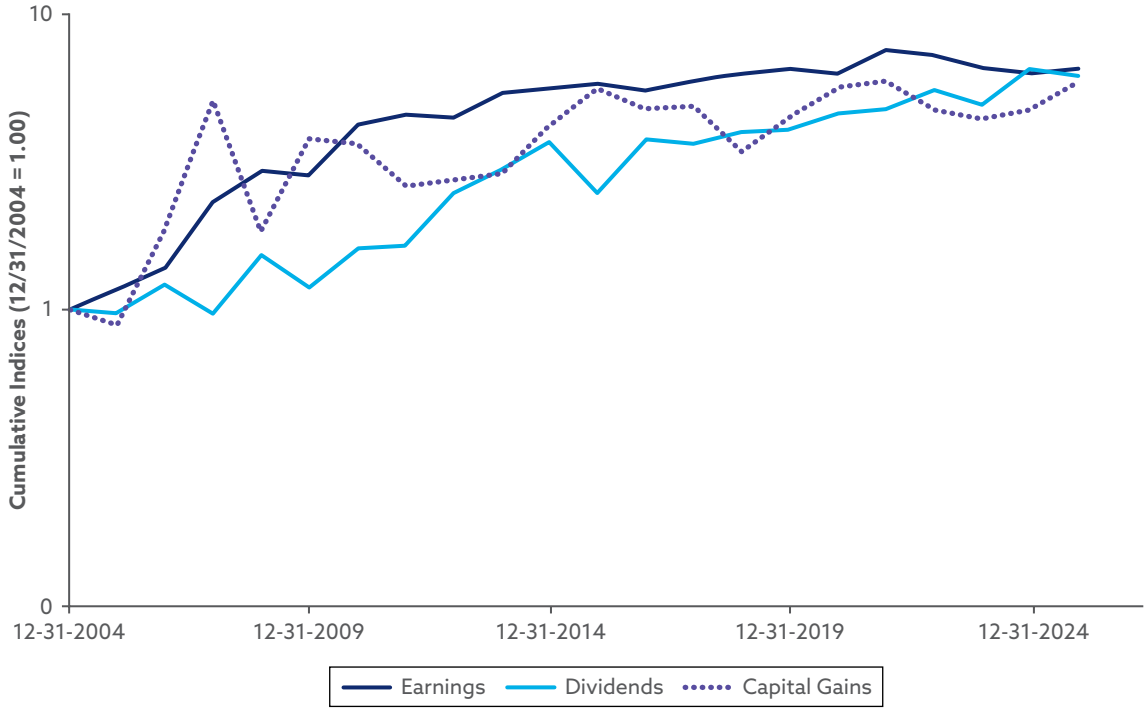
Exhibit 15.11 decomposes the total returns over 2005–2025 on the various Chinese asset classes in this study into risk premiums, the real riskless rate, and the inflation rate using the "building block" analysis described in Chapter 4.

Exhibit 15.12 performs the same analysis for the comparable US asset classes, using data over 1926–2025.

Regarding the Chinese market, I find the following:

- Investing in short-term government bonds incurred no credit risk and no significant horizon (maturity) risk. This instrument delivered a compound annual riskless rate of 2.43%, roughly on par with the inflation rate over the sample period.

Exhibit 15.9. Growth of Earnings, Dividends, and Capital Gains in China, 2005–2025



Source: Chen and YouZhiYouXing (forthcoming 2026).

Note: Growth of RMB1 invested in hypothetical assets returning the growth rate of stock prices ("capital gains"), earnings, and dividends.

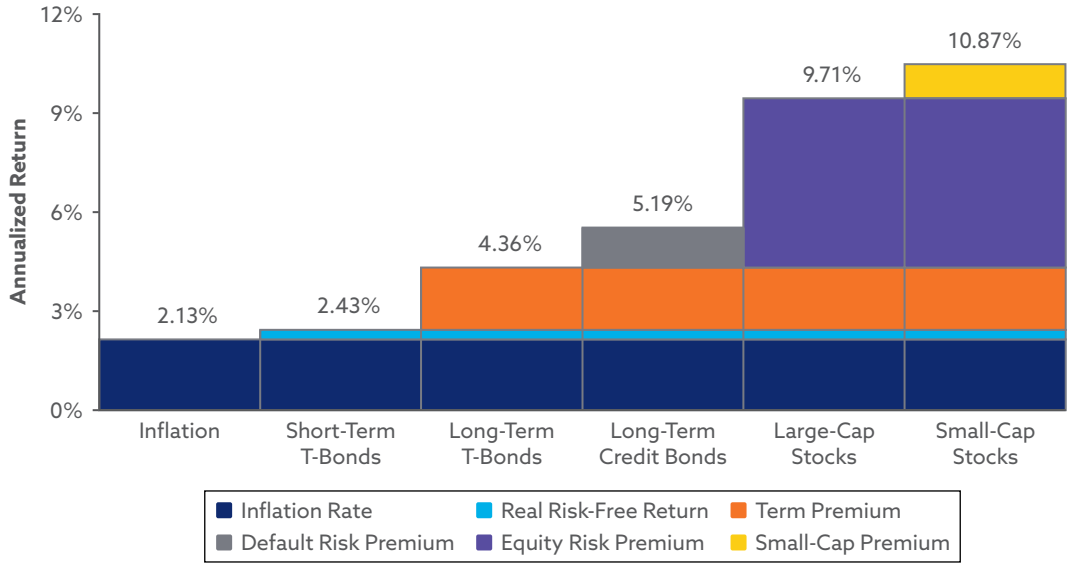
- Compared with short-term government bonds, long-term government bonds have a longer maturity and expose investors to more uncertain risk factors and thus generated an annualized term premium of 1.88%.
- Compared with long-term government bonds, long-term credit (corporate) bonds require investors to bear corporate default risk, with the possibility of partial (or even total) loss of

Exhibit 15.10. Historical Risk Premiums in China and the United States

	Inflation	Real Riskless Rate	Bond Horizon (Term) Premium	Credit Risk Premium	Equity Risk Premium (Large Cap)	Small-Cap Premium
China, 2005–2025	2.13%	0.29%	1.88%	1.21%	5.13%	1.06%
US, 1926–2025	2.94%	0.31%	1.57%	0.76%	5.35%	0.36%

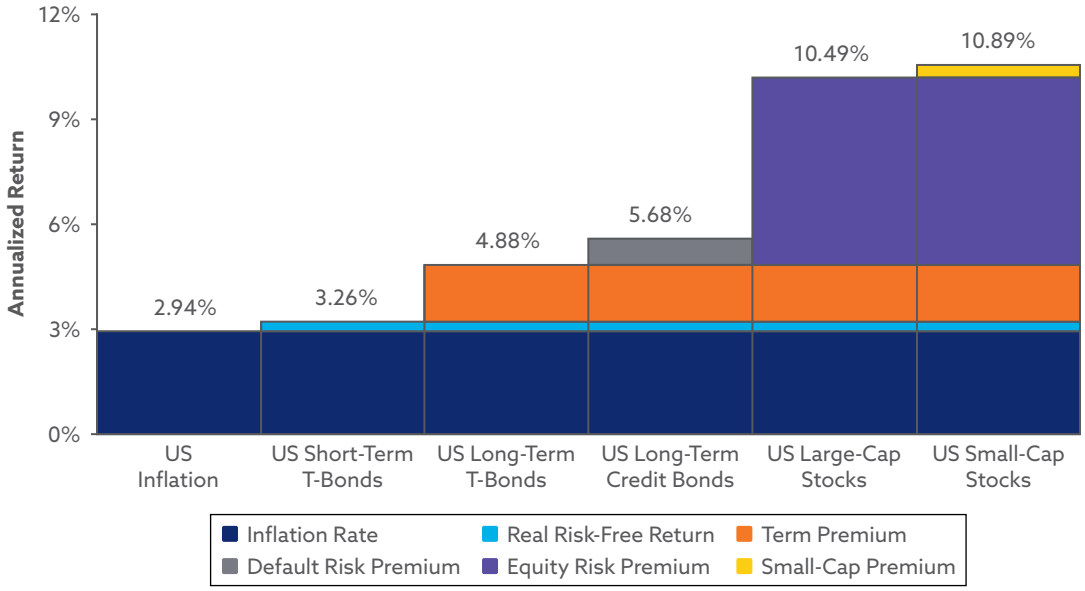
Source: Chen and YouZhiYouXing (forthcoming 2026).

Exhibit 15.11. Building Blocks of Chinese Capital Market Returns, 2005–2025 (2007–2025 for Long-Term Credit Bonds)



Source: Chen and YouZhiYouXing (forthcoming 2026).

Exhibit 15.12. Building Blocks of US Capital Market Returns, 1926–2025



Source: Chen and YouZhiYouXing (forthcoming 2026).

principal in the event of issuer default. These bonds therefore delivered an annualized credit risk premium of 1.21%.

- Bonds represent a contractual debt obligation, whereas stocks represent an ownership stake in a business, making these two types of investment have different risk and return characteristics. Compared with long-term government bonds, investing in A-share large-cap stocks requires investors to bear significantly higher systematic and idiosyncratic risk. As a result, stocks earned an annualized equity risk premium of 5.13% over the period studied.
- Compared with large-cap stocks, small-cap stocks carry higher operational risk, lower secondary market liquidity, and higher transaction costs. Investors in small-cap stocks were compensated for bearing these incremental risks with an annualized small-cap size premium of 1.06%.

I also compare risk premiums earned in China and the United States and find that despite the relatively short history of China's capital market and the material differences in national conditions, regulatory policies, and economic development between the two countries, the realized risk premiums for Chinese and US asset markets have been strikingly similar. This observation confirms that the underlying logic of financial markets is consistent across borders: Risk and return are inextricably linked, and over the long term, higher risk requires higher return compensation. This fundamental law has been empirically verified in both the Chinese and US markets, fully demonstrating the powerful force of the market's "invisible hand" in the allocation of capital and resources.

Conclusion

Over the long term, equities delivered the strongest absolute and risk-adjusted performance of all the major asset classes in China. Over the 21-year sample period (2005–2025), Chinese broad-market (all cap) equities achieved a compound annual total return of 10.40%, compared with 4.36% for Chinese long-term government bonds and 2.43% for Chinese short-term government bonds (cash equivalents). These findings mean that equity investments generated an average annual excess return (equity risk premium) of approximately 5% for investors over the 21-year period.

Small-cap stocks outperformed large-cap stocks over the period studied, with a compound annual total return of 10.87%, versus 9.71% for large-cap stocks, consistent with the size premium observed in global markets. Long-term investment-grade corporate bonds returned 5.19% per year, outperforming government bonds of the same duration (4.36%); this performance reflects the credit risk premium for bearing corporate default risk. Although I do not present multi-asset-class performance in this chapter, such analysis reveals that diversified strategic allocation across equities and other asset classes significantly improved portfolio risk-adjusted return profiles for Chinese investors over the sample period.

This study represents the first comprehensive analysis of asset class risk and return characteristics in China using the rigorous, globally recognized methodology pioneered by Ibbotson and Sinquefield (1976). It is important to note that the major findings from this 21-year historical return analysis align closely with the findings from longer-term studies of the US market and other global markets: Equities consistently outperform bonds, cash equivalents, and inflation over the long term, and these premium returns come with correspondingly higher levels of risk. This research contributes to our understanding of the market dynamics and long-term performance characteristics of China's stock and bond markets and provides a foundational empirical dataset for future academic and industry research.

Key Takeaways

- The core findings, based on 21 years of data on the principal Chinese asset classes, align closely with those of more mature international markets. The results verify that despite China being a developing market with unique national conditions, the underlying logic of financial markets and investor behavior remains largely consistent with global norms.
- Overall, Chinese A-shares (including both large- and small-cap stocks) produced a compound annual return of 10.4% over 2005–2025, with very high volatility (a standard deviation of annual returns of 54.1%). Small caps beat large caps at a compound rate of 1.1% per year.
- Chinese fixed-income asset classes, as expected, provided much lower returns—for example, long-term government bonds with a compound return of 4.4% over the same period. Inflation proceeded at a modest 2.1% annual rate. Across all the Chinese asset classes studied, higher-risk assets produced higher returns in a monotonic fashion.
- This dataset provides an empirical foundation for further academic and industry research on China's capital markets, asset pricing, and strategic asset allocation. Most importantly, the dataset equips investors with essential, quantitative knowledge for a better understanding of China's market and the risk–return characteristics of its major asset classes, enabling more rational, disciplined long-term investment decisions.

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CHAPTER 16. GLOBAL MARKETS IN PREVIOUS CENTURIES

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Between 1601, when shares of the Vereenigde Oost-Indische Compagnie (VOC, or Dutch East India Company) started trading in Amsterdam, and July 1914, when almost every stock market in the world closed because of World War I, financial markets became essential to running the modern economy. In 1601, only one stock traded regularly on the Amsterdam stock exchange, but by 1914, thousands of stocks and bonds traded on dozens of exchanges throughout the world.

Global stock market capitalization was less than 1% of global GDP in 1800, but by 1900, it was 36%. By 1914, stocks and bonds worth billions of dollars were traded on a daily basis. Financial markets transformed the world during the nineteenth century and enabled railroads, telecommunications, energy, and other industries to create the modern economy.

Four Financial Revolutions

Four separate financial revolutions transformed the global economy. The first began in 1171, when Venice imposed forced loans on its citizens to fund its war with Byzantium. These loans were eventually converted into *prestiti* bonds, which were bought and sold in Venice until the 1500s. The first known trade fair occurred in France in 1127, the first currency transfer occurred in 1156, shares in the *Société des Moulins de Bazacle* were traded in the 1250s (Le Bris, Goetzmann, and Pouget 2018), and the first gold coins since antiquity were issued in Italy in 1252 (Kindleberger 1984, p. 23). Between 1150 and 1600, exchanges sprung up throughout Europe, although they existed primarily to trade commodities and currencies, not stocks and bonds.

The second revolution occurred in the late 1500s, when England created trading companies that were given monopolies in different parts of the world. Thousands of companies would follow in the centuries to come (Scott 1912). The first corporation was the Muscovy Company, which was chartered in 1555 and had a monopoly on trade between Russia and England. It still exists today as a charity working in Russia. The four East India companies were founded in England (1601), the Netherlands (1602), France (1604), and Denmark (1616). Each of these countries created corporations that had monopoly trading rights in southern and eastern Asia and were able to raise large amounts of capital to fund their operations.

Editor's note: Much of the text in this chapter comes from a recent CFA Institute Research Foundation monograph (Taylor 2026b).

Shares in Dutch East India Company stock began trading in Amsterdam in 1602, and shares in the Dutch West India Company began trading in 1623.[1] Shares traded in coffee shops in London in the 1690s, and by 1720, trading in over a dozen companies occurred regularly in Amsterdam, London, and Paris. Because of the wars of the 1700s, the amount of outstanding government debt grew more rapidly during the eighteenth century than the capitalization of stock markets grew.

The third revolution occurred after the Napoleonic Wars ended in 1815. The number of corporations and stock markets expanded, leading to stock and bond trading in every major market in the world. Gradually, countries across Europe began trading shares on domestic markets, including France (1801), the Netherlands (1814), Austria (1817), Belgium (1832), Germany (1834), Switzerland (1851), Italy (1856), Russia (1865), and Sweden (1870). Shares traded domestically in India (1850), Hong Kong (1865), China (1869), Singapore (1872), and Japan (1878). Countries that had shares listed in London, such as Canada (1822), Australia (1825), and South Africa (1835), began trading shares domestically as well.

The fourth revolution occurred in the 1980s. The economic problems of the 1970s led Ronald Reagan, Margaret Thatcher, and other world leaders to emphasize global free trade and privatization in the economy, bringing about an explosion in the size of stock markets. Between 1981 and 1999, global stock market capitalization as a percentage of GDP rose from 22% to 109%. Stock markets continue to play an important role in the global economy. Today, stock markets exist in more than 100 countries, and their market capitalization exceeds global GDP.

The Growth of Financial Markets

Financial markets developed rapidly during the 1600s and 1700s. In the 1600s, nations began to issue debt securities that were held by domestic citizens. The issuance of shares by the English East India Company in 1601, the VOC in 1602, the French East India Company in 1604, and the Danish East India Company in 1616 initiated a new period of investment in financial markets.

The Amsterdam Stock Exchange was founded in 1602, when VOC stock started trading. Although a number of corporations were established in England in the 1500s and 1600s, the number of shares that were issued by each company was limited, and there was very little trading in their shares (Michie 2006, pp. 25–31; van Dillen, Poitras, and Majithia 2006). The only company for which regular data on share values in the 1600s exist is the Dutch East India Company.

Before 1689, share trading primarily occurred in Amsterdam, but when William of Orange replaced James II as the King of England in 1689, initiating the "Glorious Revolution," he brought with him knowledge of Dutch finance. Consequently, in the 1690s, English share trading increased dramatically. Shares in more than a dozen companies were traded in the coffee houses in London in the 1690s, and share trading grew by leaps and bounds for the next 30 years. In 1689, there were 15 major joint-stock companies in London, with a total capitalization of almost £1 million. By 1695, there were more than 150 companies, with more than £4 million in capital. The Bank of England alone raised £1.2 million in capital in 1694. The Bank of Scotland was established in 1695.

It was not until the 1690s that data on the prices of stocks and bonds became regularly available. As already mentioned, trading occurred in coffee shops, and the *Course of the*

[1] "West India," in this case, refers to islands in the Caribbean (the West Indies), plus a broader area that includes large parts of the New World.

Exchange published the price of foreign currencies, coins, commodities, stocks, and annuities twice a week beginning in 1698 using trades from Jonathan's Coffee House.

The Nine Years' War was fought between 1689 and 1697, and the War of the Spanish Succession took place between 1701 and 1714. These two wars dramatically increased the debt of both Britain and France. British government debt grew from less than £1 million in 1688 to more than £50 million by 1720, equal to about 60% of British GDP. The British and French governments wanted a way to unload their debt.[2] Both countries used debt–equity swaps and encouraged their citizens to trade their government debt for shares in the *Compagnie des Indes* in Paris and the South Sea Company in London. Prices of the two securities skyrocketed, creating the Mississippi Bubble of 1719 and the South Sea Bubble of 1720.

Share prices for the *Compagnie des Indes* in Paris rose from 300 livres in 1718 to 10,000 livres in 1719, and South Sea shares rose from £100 to £1,000 in 1720. But these share prices eventually collapsed. The first stock market bubbles drew in thousands of people, including Sir Isaac Newton, who was Master of the Royal Mint at the time and nevertheless lost a fortune (Neal 1990).

After the bubbles of 1719–1720 and the losses that investors incurred, interest in stocks remained low for the rest of the century. Interest in government bonds grew, however, as British government debt increased to more than £400 million by the end of the eighteenth century, with Britain funding its wars with debt paying 3%–4%. The value of outstanding shares declined while the amount of outstanding government bonds grew.

England introduced the 3% bond in 1729 and consolidated its debts in 1752, creating the "consol," which was a perpetuity—a bond without a maturity date. The consol continued to trade for the next 260 years and was the most traded bond in the world until World War I. France issued similar bonds in 1746, and in the late 1800s, most European governments issued perpetuities to cover their debts. There was little difference between the returns of stocks and bonds during the 1700s. Both were traded for their yield, not their capital gains.

The Century of Peace and Economic Growth

The period between 1689 and 1815 was one of increasing government debt, leaving little capital for investment in individual companies. For a long time after the collapse of the stock market bubbles in 1720, investors were wary of individual stocks. A century later, however—between 1815 and 1914, a period of peace—government debt declined and investment in corporations grew dramatically. In 1789, there were only a handful of companies whose shares traded publicly, but by 1914, thousands of companies were listed on dozens of stock exchanges around the world.

The French Revolution led to the dissolution and bankruptcy of French and Dutch corporations and to default on the government debts of every country that participated in the Napoleonic Wars except for the United Kingdom. In the United States, Alexander Hamilton reorganized the debts of the central and state governments in 1792. Dutch and French debt was reorganized, with bondholders receiving new bonds worth one-third of their face value. Interest payments on Swedish, Russian, and Spanish debt were suspended during the wars, although these payments later resumed. Britain suspended its link to gold in 1797, only to restore it in 1821.

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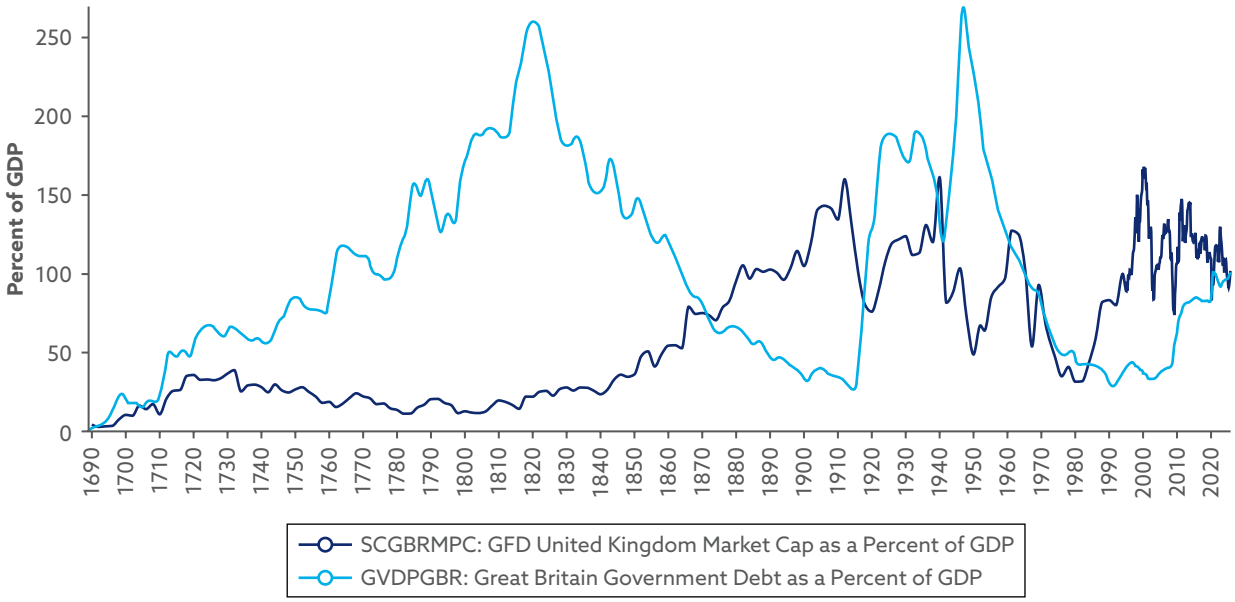
[2] See Balen (2004) and Carswell (1960) on the South Sea Bubble, as well as Buchan (2018).

Before 1789, national monopolies represented the majority of stock market capitalization. After the Napoleonic Wars ended, capital flowed out of bonds and into dozens of new industries. Canal mania struck England in the 1790s, when Parliament approved 44 canals to be built in the Midlands between 1791 and 1794. The price of many canal stocks doubled and quadrupled in the early 1790s before the bubble burst in November 1792 and the price of most canal stocks returned to their par value, £100 (de Salis 1904).

In 1815, the Treaty of Vienna brought peace to Europe, and between 1825 and 1845, railroads provided immense growth to European economies. Railroads quickly became the largest industry traded on stock exchanges in Europe. The collapse of railroad shares after 1845, however, led to the most severe global bear market of the 1800s.

With peace prevailing and governments no longer issuing bonds to fund wars, capital was reallocated from government bonds to corporate bonds and equities. Between 1815 and 1914, stock market capitalization grew relative to both government debt and GDP. Although British government debt shrank from 182% of GDP in 1815 to 29% in 1914, British stock market capitalization grew from 17% to 122% of GDP. By 1914, every developed country in Europe had exchanges that traded stocks and bonds. Commitment to the gold standard provided fixed exchange rates between countries, enabling financial assets to be freely traded across borders. The rise and fall of government debt in Britain in the 1700s and 1800s and the increase in stock market capitalization in the 1800s are illustrated in **Exhibit 16.1**.

Exhibit 16.1. UK Equity Capitalization and Government Debt as a Percentage of UK GDP, 1689–2025



Source: Finaeon, Inc.

Growth of the Stock Market in the Early 1800s

Before 1790, there was rarely activity in more than a dozen stocks in London. Beginning in 1805, however, the number of stocks trading on the London Stock Exchange exploded, reaching 100 in 1814, 200 in 1824, and 300 in 1832. During the 1840s, railroads were built in every major European country, using both domestic and foreign capital. The transatlantic cable connected Europe and North America in 1866, the transcontinental railroad in the United States connected the Atlantic and the Pacific in 1869, and the Suez Canal opened in 1869, making it easier, cheaper, and quicker to send goods and information around the world.

Railroads and telecommunications transformed the world between 1850 and 1900. New industries were born, and their benefits quickly spread around the world. Canals and turnpikes, railroads, utilities, iron and steel, chemicals, the telegraph and telephone, cinema, bicycles, sewing machines, automobiles, and dozens of other industries came into existence, completely transforming the global economy.

Whereas Europe's railroads connected existing cities to improve transportation, the United States spent the next few decades building the country by using the railroads to link the Atlantic and Pacific coasts and establish new cities along the railroad routes. By 1850, newspapers in England, France, Germany, Austria, the Netherlands, Belgium, the United States, and other countries were listing stock market prices from their own and other countries on a daily basis. The greatest beneficiaries of these cash flows were the railroads, which by mid-century had become the largest sector in the stock market.[3]

The continental Revolutions of 1848 led to sharp declines in stock and bond prices throughout Europe and brought about the worst bear market of the nineteenth century. The combination of the collapse of the Railroad Bubble in 1845 and the Revolutions of 1848 sent stock markets to the lowest levels they would reach for the rest of the century. Gold was discovered in California in 1849 and in Australia in 1851, leading to a reflation of the global economy and recovery from the Revolutions of 1848.

Financial Markets Before World War I

The United States stock market grew steadily after the Civil War. Paris sought to challenge London's domination of global capital markets but fell short. The institution of the gold standard after 1870 led to a steady deflation over the next 20 years. Prussia unified the German lands and used the French indemnity from 1870 to adopt the gold standard between 1871 and 1873. In the United States, the "Crime of 1873" demonetized silver and de facto moved the United States onto the gold standard in 1878. The Latin Monetary Union in southern Europe and the Scandinavian Monetary Union in the north helped provide a common currency to their member countries.

The Panic of 1873 affected the United States, England, France, Germany, and Austria. The crash of the Berlin Stock Exchange in November 1872 and the Vienna Stock Exchange in May 1873 led to the Long Depression, which lasted until 1879. The period from 1873 to 1896 was a period of mild deflation and falling bond yields, whereas the period from 1896 to 1914 was one of mild inflation and rising bond yields.

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[3] See Odlyzko (2010). For Germany, see Michaelis (1854, 1859, and 1863).

Stocks and bonds in the 1880s and 1890s provided some of the highest returns to investors until the 1980s and 1990s. By 1881, the market capitalization of the London Stock Exchange was greater than the United Kingdom's GDP, the first time this had happened anywhere in the world. Although bear markets occurred in every country in the world between 1873 and 1914, they were not coordinated, with bull markets in one country offsetting bear markets in others. So, there was no global bear market during the last half of the nineteenth century.

One of the best ways to understand financial markets before World War I is to read the newspapers that printed quotes of securities. Quotes were taken from either local exchanges or stockbrokers seeking publicity. Newspapers provided prices not only from local exchanges but also from the four primary exchanges as well. Interest in the stock market became so widespread that *The Times*, *Financial Times*, *Figaro*, *Allgemeine Zeitung*, and newspapers in other countries regularly printed the prices of stocks and bonds from the world's major markets. The majority of the quotations were for government bonds, but stocks became more prominent over time. Dow, Jones & Co. began calculating its averages in 1885, and *The Banker's Magazine* in the United Kingdom started to calculate stock market indices in 1887.

In the United States, the primary exchange was in New York City, with Boston, Philadelphia, and Chicago providing secondary exchanges. The primary exchange in Germany was in Berlin, with Frankfurt, Munich, and others trading shares as well. The primary exchange in France was in Paris, with exchanges in Lyon, Lille, Marseille, and Bordeaux. The situation was similar in Asia: India had exchanges in Bombay and Calcutta; Japan had exchanges in Tokyo and Osaka; and China had Shanghai and Hong Kong. In addition, Australia had exchanges in Sydney and Melbourne. Each of these exchanges might trade more than 100 securities. The nineteenth century was truly an era of free capital markets.

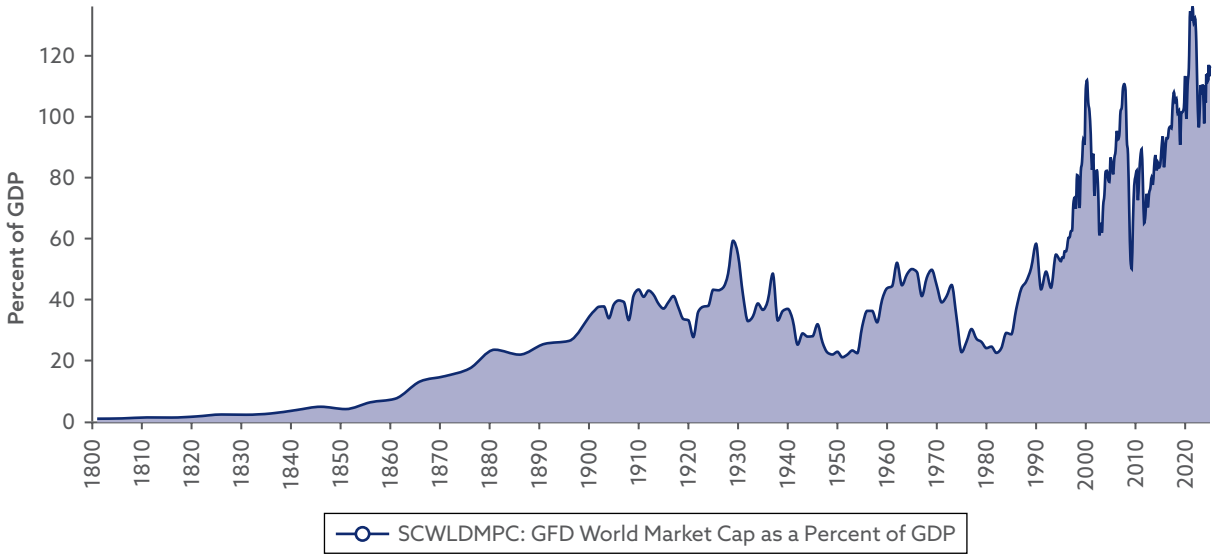
Share markets grew dramatically after 1815. It is probably no coincidence that the economic historian Angus Maddison points to 1820 as the time when the world escaped the low rates of growth that had prevailed between 1 AD and 1820 and saw the beginning of two centuries of unprecedented economic growth (Maddison 2007, p. 380).

World War I Changed the World

World War I changed financial markets forever. Before July 1914, Europe had integrated exchanges on which thousands of stocks and bonds were traded in every country in Europe. Investors in London and other cities readily bought American railroad bonds, Russian securities, South African gold shares, and government bonds from dozens of countries. With the declaration of war by Austria-Hungary on Serbia on 28 July 1914, fears of mass selling of securities and the repatriation of funds forced the closure of exchanges across the world.

For the next 70 years, governments regulated financial markets extensively, controlling the opening and closing of exchanges, the listing of stocks and bonds, the rights of international investors to invest in domestic markets, the flow of funds across borders, the link to gold, links to another currency, or the floating of currencies. Before July 1914, governments tried to minimize the regulation of financial markets. After July 1914, everything was subject to regulation. As illustrated in **Exhibit 16.2**, global market capitalization grew steadily until 1914 and then stagnated as a share of GDP for the next 70 years.

Exhibit 16.2. World Stock Market Capitalization as a Share of GDP, 1800–2025



Source: Finaeon, Inc.

After World War I, the United Kingdom no longer had the financial ability to lead global financial markets the way it had done before 1914, and the United States was reluctant to take on the responsibility of directing international political, economic, and financial markets. World War I forced nations to float their currencies and restrict international cash flows. The dislocations that followed World War I led to a severe global recession. The victors in World War I recovered, and their stock markets soared during the 1920s, while the losers collapsed into political chaos, recession, and hyperinflation.

The recovery from World War I led to the Roaring Twenties. Stock markets peaked in 1929. Economies in Europe and the United States collapsed into the Great Depression between 1929 and 1932 because governments were unable to provide the leadership needed to rescue the global economy. With little trust in foreign trade and international agreements, nations fell back on domestic production. Germany began preparing for World War II, which engulfed Europe between 1939 and 1945.

The world enjoyed a remarkable recovery and expansion in the 1950s and 1960s, referred to as the *Wirtschaftswunder* (economic miracle) in Germany and *les trentes glorieux* (30 glorious years) in France. By the 1970s, however, stagflation had set in, with low growth and high inflation replacing the high growth and low inflation that occurred in the 1950s and 1960s. The oil price increased tenfold. Economists and the public lost their faith in the government's ability to successfully regulate the economy.

Milton Friedman and others recommended that governments choose markets over regulation. Ronald Reagan and Margaret Thatcher promoted markets, and in the 1980s, the world moved from Keynesian attempts to regulate the business cycle to a world of floating exchange rates,

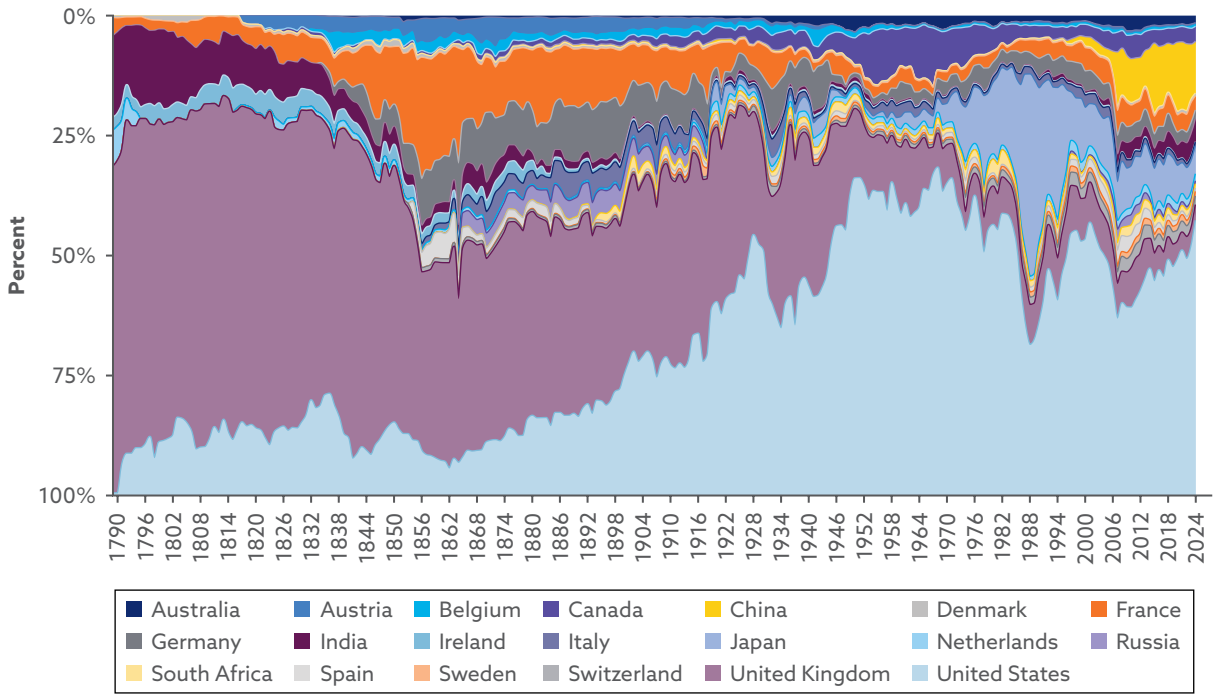
privatization, globalization, and freer markets. Communist governments collapsed, and by the 1990s, almost every country was using stock exchanges to allocate capital, pursuing freer markets and economic growth.

Distribution of Stock Markets

Financial markets can be divided into three groups before World War I. London was the largest, representing more than half of global market capitalization. Paris, Berlin, and New York provided important secondary markets for both domestic and foreign securities. The remaining countries provided access to capital for local investors, but foreign securities primarily traded on one of the four primary exchanges.

Exhibit 16.3 illustrates the global distribution of market capitalization between 1789 and 2024. The United Kingdom represented more than 50% of global market capitalization throughout the nineteenth century. London was the center of global capital markets. Hundreds of corporations throughout the British Empire and South America raised more capital in London than they did on their domestic markets. Government and corporate bonds from almost every country in the world traded in London.

Exhibit 16.3. Distribution of Global Market Capitalization by National Market, 1789 to Mid-2024



Source: Finaeon, Inc.

In 1789, the London Stock Exchange (on which securities from the United Kingdom, India, and Ireland were listed) represented almost 90% of global market capitalization. In 1850, the United Kingdom, including Ireland, represented 57% of global market cap, the United States 15%, India 10%, and the rest of the world about 18%. Diversification continued during the nineteenth century, and by 1914, the United Kingdom represented about 38% of global market cap, the United States 28%, Germany and France each about 8%, and the remaining 20% scattered around the rest of the world.

The United States' share of global market cap increased steadily from 7% in 1860 to 66% in 1950. In 2025, the United States represented more than 60% of the investible global market cap. Japan exceeded the United States' market cap briefly in the late 1980s, peaking in 1989, but today, Japan's market cap is one-tenth that of the United States. Developed markets outside the United States represent about 27% of global market cap, and emerging markets represent 11%. Exhibit 16.3 shows changes in the distribution of global market cap between 1789 and 2024.

Long-Term Return Data

What were the returns to stocks, bonds, and bills before World War I? I have collected data from almost every country for which data on stocks, bonds, and bills exist prior to World War I to track changes in the prices of these assets over time.[4]

Global returns to stocks, bonds, and bills were calculated in British pounds between 1700 and 1789 and in US dollars between 1789 and 2025. These returns are summarized in **Exhibit 16.4** using data from Finaeon's Global Index of Developed Stock Markets. Calculations use British bonds and bills from 1700 to 1789 and US bonds and bills from 1789 to 2025.[5] Over time, the average annual real return to stocks has increased and the average real annual return to bonds and bills has declined. Consequently, the retrospective or realized equity risk premium (ERP) has increased.

The returns in Exhibit 16.4 show how different the twentieth century was from the nineteenth century. During the nineteenth century, there was very little government interference in capital markets and returns to bonds were not significantly different from returns to stocks.

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[4] I used a multiplicity of data sources collected by Finaeon and used with permission. First, I found the broadest price and return index that is currently calculated for each country. Second, because many of these indices began recently, I identified indices that were calculated in real time before the current indices existed, chain-linking the indices together. Because many of the historical indices are price-only indices, I collected dividend and share outstanding information for each country. Third, data were collected on individual stock prices, corporate actions, dividend payments, shares outstanding, and dividend yields so indices could be calculated where none currently existed.

Data were collected from newspapers published in each country. In the United States, for example, these included *The New York Times*, *The Commercial and Financial Chronicle*, and the *Bank and Quotation Record*. For the United Kingdom, newspapers included *Course of the Exchange, The Investor's Monthly Manual*, and *The Times*. Information on corporate actions and shares outstanding also came from, among other sources, the manuals published by Moody's and Standard & Poor's in the United States and *The Stock Exchange Official Yearbook* in the United Kingdom. Similar resources were found for each country analyzed.

In addition to price and total return indices for each country, I calculated sector indices, stock and bond market capitalization, and economic indicators. Finally, I calculated world and regional indices. For more information on the sources for each country, see Taylor (2026a, 2026b).

[5] The Developed World Index includes the United States, Canada, the United Kingdom, the Netherlands, Belgium, France, Spain, Sweden, Italy, Germany, Austria-Hungary, Ireland, Denmark, Australia, New Zealand, and Japan.

Exhibit 16.4. Real Annual Returns on Global Stocks, Bonds, and Bills; the Equity Risk Premium; and Inflation Rates, 1700–2025 (Returns in British Pounds to 1789, US Dollars Between 1789 and 2025)

Period	Real Annual Total Return (%)			Risk Premiums (%)		Inflation Rate (%)
	Stocks	Bonds	Bills	Bond ERP	Bill ERP	
1700–1789	4.92	4.33	3.74	0.56	1.18	0.01
1789–1914	5.31	3.47	3.04	1.94	2.27	0.62
1914–2025	6.37	0.72	0.32	5.61	6.08	3.17

Source: Finaeon, Inc.

Financial markets were allowed to evolve on their own, and there was a prejudice against government intervention.

The Federal Reserve was established in the United States in 1913, and World War I began in 1914. Between 1914 and 1981, governments intervened heavily in capital markets. Governments allowed inflation to increase, and financial repression drove down the real return on fixed income, even to negative levels. Fixed-income investor returns were clearly impacted by government intervention in the economy after 1914.

Over time, significant changes in political, economic, and financial environments have driven the economy. Between 1815 and 1914, Europe transformed from a continent riven by war to an integrated financial market where capital moved freely between countries and new industries and corporations were born on a regular basis. By 1914, the global economy was integrated, and capital and goods flowed freely between countries. No one could imagine that a war would disrupt the progress made during the previous 100 years, but it did. The century of peace between 1815 and 1914 evolved into the twentieth century of war.

I provide three exhibits that present the evolution of real returns to stocks, bonds, and bills between 1789 and 2025. **Exhibit 16.5** shows the returns from various starting dates (between 1789 and 1815) to 1914 in five countries. **Exhibit 16.6** covers 1848–1914, and **Exhibit 16.7** covers 1914–2025. All data have been converted to US dollars after inflation to facilitate comparisons between countries.

Although the start dates differ for each country's data, at least 100 years of data are provided for each. Returns are similar for stocks and bonds, although they are lower for the United Kingdom than for the other countries, especially for bonds because the consol was the safest and most traded security in the world. Stocks outperformed bonds, which outperformed bills. Inflation was almost nonexistent in the 1800s.

By starting in 1848, the coverage expands to a dozen countries. Returns between 1848 and 1914 were fairly consistent for all the countries. Markets in London and Paris offered

Exhibit 16.5. Annual Returns on Stocks, Bonds, and Bills in Real US Dollars; Risk Premiums; and Inflation Rates, Up to 1914 (All Data in Percent)

Country	Real Returns			Risk Premiums		Inflation	Start Date
	Stocks	Bonds	Bills	Bond ERP	Bill ERP		
France	5.30	5.08	3.25	0.21	1.99	0.48	1800
India	5.75	3.80	3.68	1.53	1.64	0.48	1789
Netherlands	6.61	4.39	2.84	2.13	3.67	–0.37	1815
United Kingdom	4.57	2.91	3.04	1.61	1.48	0.19	1789
United States	6.09	4.26	3.67	1.76	2.34	0.58	1791

Source: Finaeon, Inc.

Exhibit 16.6. Annual Returns on Stocks, Bonds, and Bills in Real US Dollars; Risk Premiums; and Inflation Rates, 1848–1914 (All Data in Percent)

Country	Real Returns			Risk Premiums		Inflation
	Stocks	Bonds	Bills	Bond ERP	Bill ERP	
Australia	8.45	3.56	1.51	4.87	6.84	0.00
Austria	4.46	4.75	2.93	–0.26	1.49	0.94
Belgium	4.80	2.98	2.03	1.76	2.72	1.59
Canada	4.77	3.23	2.60	1.49	2.12	0.13
Denmark	4.51	3.23	3.32	1.24	1.16	0.42
France	4.31	3.59	2.08	0.70	2.18	0.32
Germany	4.34	2.87	2.12	1.42	2.17	1.56
India	5.22	2.04	3.35	3.13	1.83	1.25
Ireland	4.89	1.59	2.06	3.25	2.78	0.04
Netherlands	6.31	3.12	2.05	3.09	4.17	–0.01
United Kingdom	4.30	1.57	2.06	2.68	2.20	0.04
United States	7.25	3.18	2.60	3.94	4.53	1.11

Source: Finaeon, Inc.

Exhibit 16.7. Annual Returns on Stocks, Bonds, and Bills in Real US Dollars; Risk Premiums; and Inflation Rates, 1914–2025 (All Data in Percent)

Country	Real Returns			Risk Premiums		Inflation
	Stocks	Bonds	Bills	Bond ERP	Bill ERP	
Australia	6.45	1.60	0.28	4.78	6.16	4.05
Austria	1.04	–1.45	–7.19	2.53	8.86	11.69
Belgium	2.93	0.81	–0.35	2.09	3.28	5.44
Canada	5.36	1.97	0.57	3.33	4.78	3.02
Denmark	5.90	3.23	2.35	2.59	3.47	4.05
Finland	5.84	–0.19	–1.20	6.03	7.12	5.39
France	3.06	–1.81	–6.88	4.96	6.17	7.46
Germany	3.61	–5.58	–21.63	9.73	32.2	28.45
India	3.85	–0.18	–0.56	4.42	4.82	5.34
Ireland	5.31	1.89	0.89	3.36	4.38	4.41
Italy	1.70	–2.01	–2.22	3.78	4.00	9.16
Japan	3.78	–1.54	–3.27	5.41	7.28	6.79
Netherlands	5.57	1.61	0.34	3.89	5.21	3.29
New Zealand	5.47	1.21	1.38	4.20	4.04	4.08
South Africa	5.63	0.46	–0.66	5.15	6.33	5.48
Spain	3.10	0.31	–0.55	2.78	3.66	5.76
Sweden	5.88	1.34	0.82	4.48	5.02	3.78
Switzerland	5.47	2.23	1.08	3.16	4.34	2.17
United Kingdom	5.37	0.77	0.28	4.56	5.07	4.25
United States	7.46	1.43	0.25	5.94	7.19	3.17

Source: Finaeon, Inc.

investors the opportunity to invest in multiple countries and multiple securities. Capital could be moved from securities in one country to another if returns were low in any one country. Returns on stocks in most countries were in the 4%–5% range because capital was free to flow between countries. Returns to fixed income were in the 2%–3% range, with returns in the United Kingdom being the lowest. Inflation was low in all of these countries during the century before World War I.

Providing data between 1914 and 2025 allows the coverage to be expanded to 20 countries. In contrast to Exhibit 16.6, covering 1848 to 1914, there is much greater variation in the returns between countries. Capital was unable to flow freely between countries between 1914 and the 1980s, causing a wide variation in returns because domestic economic policies had a large impact on returns. Fixed income provided negative returns in countries with high inflation (Austria, Germany, Italy, and Japan). Returns to fixed income were lower in every country in our sample between 1914 and 2025 compared with returns before World War I. Fixed-income investors paid the price of inflation and financial repression.

There was a large difference in returns to stocks. Countries that suffered less from the destruction of World War I and World War II (Australia, Canada, New Zealand, and the United States) had higher returns than countries that were more directly involved (Austria, France, Italy, and Japan). Of the 20 countries, the United States had the highest returns and Australia was second. Nine countries had annual returns in the 5% range, and five countries were in the 3% range. Austria and Italy provided the lowest returns, mainly because of their involvement in World War I and World War II. Consequently, the ERP has been higher since World War I than before. Economic policy clearly impacts returns to stocks, bonds, and bills.

Conclusion: 1914 Changed Everything

Before 1914, there was steady growth in financial markets. Every major country had markets that allowed stocks and bonds to freely trade on a daily basis. Capital flowed between different countries to find the best investments possible. Newspapers provided quotes from all the world's major markets for those who invested in multiple countries, and both stocks and bonds provided similar returns based on yield and risk. Stock market capitalization as a share of global GDP grew from 1% in 1800 to more than 40% in 1910. One can only wonder how much the world would have continued to grow if World War I had not begun. But the war intervened.

In 1984, global market capitalization as a share of GDP was lower than it was in 1914. Between 1914 and the early 1980s, inflation rates increased and, along with financial repression, dramatically reduced returns to fixed income. Countries that escaped the destruction of the world wars provided high returns to stocks, but countries that suffered from the destruction of the wars saw returns collapse. It was not until the 1980s that the world began returning to the globalization and free capital markets that existed before World War I.

Our understanding of the equity risk premium has come a long way since it was first studied in the 1960s, mainly because the accumulation of return data on stocks, bonds, and bills over the last four centuries has enabled us to understand how the realized ERP has changed over time. Economics and politics impact the returns to stocks, bonds, and bills. Policies that favor freer markets and lower inflation clearly benefit investors.

Key Takeaways

- In 1601, only one stock traded regularly on the Amsterdam stock exchange, but by 1914, thousands of stocks and bonds traded on dozens of stock exchanges throughout the world.
- Four financial revolutions transformed the global economy. The first began in 1171, when Venice imposed forced loans on its citizens to fund its war with Byzantium, creating a market for government bonds.
- The second revolution occurred in the late 1500s, when England created trading companies. The four East India companies were founded in England (1601), the Netherlands (1602), France (1604), and Denmark (1616). The period between 1689 and 1815 was one of increasing government debt, leaving little capital for investment in individual companies.
- The third revolution occurred after 1815, when the expansion in stock markets led to stock and bond trading in every major country.
- With peace prevailing, capital was reallocated from government bonds to corporate bonds and equities. British government debt shrank from 182% of GDP in 1815 to 29% in 1914; British stock market capitalization grew from 17% to 122% of GDP.
- Before July 1914, governments tried to minimize the regulation of financial markets. After July 1914, everything was subject to regulation. In 1984, global market capitalization as a share of GDP was lower than it was in 1914.
- The fourth revolution occurred in the 1980s, when global free trade and privatization in the economy brought about an explosion in the size of stock markets, which continues today.

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CHAPTER 17. REVIEW AND CRITIQUE OF GLOBAL INDICES

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In this chapter, we survey the growing body of evidence on the magnitude and consistency of historical returns across the major asset classes of stocks and bonds. We update and extend earlier work reported by us in Chambers, Dimson, Ilmanen, and Rintamäki (2024). Our focus is stocks, bonds, and inflation over the very long term. We refer the reader to our 2024 work for a critical appraisal of the returns from investing in real assets, notably commodities and real estate. Most financial research uses data extending back to the early years of the last century. In this chapter, we try to look even farther into the past.

There are two main benefits from taking a long-horizon perspective on asset returns (Chambers and Dimson 2016). The first is simply that it gives us more data. Using as much historical data as possible helps investors form better return expectations. Statistically, a longer sample period gives more reliable average return estimates thanks to the law of large numbers and the resultant smaller standard errors. Second, we can test the robustness of in-sample results with the out-of-sample evidence that distant historical data provide. This ability is especially useful given that accumulating out-of-sample evidence as we move forward is painfully slow in a situation where the in-sample period has been thoroughly data mined.

At the same time, two caveats are important to bear in mind when using long-run data. First, the longer the run of financial data, the more likely it is that regime shifts occur that complicate the interpretation of long-run average return estimates. Second, the quality of financial data deteriorates the farther we reach into the past. For example, when stocks and bonds are delisted, it can be impossible for scholars to discover whether the firm was acquired for value or whether it went bankrupt and investors lost all their money.

Pástor and Stambaugh (2001); Lettau, Ludvigson, and Wachter (2008); and others have sought to identify and predict regime shifts. Such shifts—particularly in the case of more gradual structural changes—are obscured by the evolution of the investment landscape (e.g., expanding

Editor's Note: Much of the text in this chapter is adapted from Chambers, Dimson, Ilmanen, and Rintamäki (2024).

asset universes, falling trading costs) and by the changing nature of the investor community (e.g., the shift from individual to institutional investors, enhanced investor protection).

Paying adequate attention to the quality of long-run historical data is often difficult. In this review, we highlight four common challenges in seeking to uphold data quality: easy-data bias, macro-consistency, replicability, and total return estimation. We also make suggestions for best practices when compiling, interpreting, and using such datasets. These long-run datasets enable us to address questions using broader and more extensive evidence than was possible until recently.

The rest of this study deals with three important research questions. First, we address one of the central issues in empirical asset pricing: whether stocks consistently beat bonds in the long run. Much of this evidence is based on studies of data series starting in 1900 or, notably, 1926 in the case of US stocks and bonds—the start date of the CRSP dataset and the Ibbotson and Sinquefield (1976 et seq.) dataset that is updated in this book.

The choice of start date matters. The evidence regarding average returns drawn from post-1900/1926 studies delivered the conventional wisdom that the long-run equity risk premium over bonds was substantially positive in the United States and in every other country with a long history. In returning to this question, however, we examine the pre-1900/1926 history of stock and bond returns, primarily in the United States and the United Kingdom. The evidence suggests that during that earlier time, the gap between the average returns on stocks and on bonds was low in the United Kingdom and seemingly negligible in the United States.

Second, we examine just how abnormally low bond yields were in the two opening decades of the twenty-first century. When viewing the yields of government bonds (or other bonds with little credit risk) in a much longer-run perspective, we conclude that the recent yield experience was indeed unprecedented.

The third question concerns corporate bonds and the credit risk premium. The reliable evidence regarding the extent of the excess returns or premiums attributable to credit risk is based on a relatively short history stretching back to the 1970s. We therefore ask whether long-horizon corporate bond data histories can provide insights on credit excess returns. In brief, the evidence is at best mixed because of estimation problems and a paucity of data.

We begin with a discussion of the challenges in handling long-run financial data. Next, we deal with each of our important research questions that can be addressed with historical data. We conclude with some potentially promising directions for future research.

Challenges of Long-Run Financial Data

Although we are proponents of the use of long-run datasets, it is important to exercise care when using such data. The danger of not understanding the limitations of long-horizon data increases the longer the history. For example, structural changes may occur in characteristics of the data, such as the number of stocks in the universe and the degree of sector diversification. Therefore, it is important for historical datasets to include as full a description as possible of the key characteristics of the underlying records and how they were processed.

Next, we briefly outline four common challenges when handling long-run historical data. They are various biases, macro-consistency, replicability, and total return estimation. We focus on stock indices, but similar issues arise in other asset classes.

Easy-Data, Survival, and Success Biases

Researchers can be misled into assuming that long-term historical financial series are as high quality as contemporary indices. Dimson, Marsh, and Staunton (2002) noted that severe data weakness can result from reliance on easy-to-collect data. Seemingly innocuous decisions, such as selecting a base date that follows a period of market trauma, can distort estimates of expected return. The authors highlighted the fact that in 2002, the standard publications on long-term stock market returns in the United Kingdom started at the end of 1918, in the Netherlands in 1947, in Germany in 1952, and in Japan in 1971. Each data start point occurred after a major decline, before a major advance, or both.

Dimson, Marsh, and Staunton (2002) also pointed to index compilers' inclusion of markets that had grown and omission of those that had been laggards. For the 16 standard sources they examined, one for each country, the equity returns over the varying periods covered in prior studies exceeded the returns over the full period starting in 1900 by an average of 3 percentage points per year. Easy-data bias alone gave rise to estimated long-run equity premiums that were almost double the unbiased estimate.

We need to be particularly vigilant about possible biases that could make a dataset unrepresentative of the true long-term market experience we are seeking to document—that is, shortcomings that add not only noise but also bias. Easy data may expose the researcher to a variety of selection biases in terms of both the securities included and the countries studied. One cause of this bias is that the financial returns of stocks or countries are correlated with decisions about asset inclusion or exclusion.

Survivorship bias may be illustrated through comparisons of equity market country returns. Brown, Goetzmann, and Ross (1995); Jorion and Goetzmann (1999); and Dimson, Marsh, and Staunton (2021) all stressed that the US equity market has been one of the best-performing stock markets over the long term, outpacing the rest of the world by 2%–3% per year. Not coincidentally, the United States has until recently been the primary focus of most academic research. Meanwhile, markets that lacked full capital market histories during the past century and lagged in performance comparisons—including Russia, China, Argentina, and Zimbabwe—have often been excluded from historical studies of global equity market performance. As a result, researchers may have reported an unrealistically favorable picture of long-run equity returns.

Of course, the fact that the United States and the United Kingdom are recognized as markets with relatively accessible historical data going back to the 1800s and 1900s also reflects success bias. Easy-data bias points in the same direction as success bias, which often means that historical samples begin after some difficult periods when asset valuations may have been low. Some studies omit observations that were outliers or were not investable. Sometimes, periods were chosen with the benefit of hindsight. The German hyperinflation of 1923 is one example; most studies of German capital markets leave out that period or begin with data collected after it ended. Such issues are hard enough to address with recent data; they may be unresolvable with nineteenth century data.

Macro-Consistency

Early indices were rarely weighted by the market value of each constituent. They were typically unweighted—computed on an equally weighted basis—or, alternatively, as with the Dow Jones

Industrial Average, weighted by the price of each constituent stock. Many other indices followed investment approaches that could not be replicated by investors, including the *Financial Times* 30 index, or FT 30 (a UK index launched in 1935), and the Value Line Index (a US index launched in 1961). Both of these indices are geometric and thus incapable of being replicated by investors or index fund managers.[1] A geometric index understates the performance of the asset class that it purports to follow.

Indices can be constructed in many ways. Most useful are indices that measure the investment performance of a portfolio that contains every security in the investment universe, with each one held in proportion to its outstanding value. Such market-capitalization-weighted indices are macro-consistent (Sharpe 2010), meaning that everyone could hold the index with no stocks left over. They reflect the fact that the average investor must hold the market portfolio (Cochrane 2011).

Therefore, when we use a historical index, we need to know how the index is defined. Does it represent a broad all-stock universe or a narrower subset? What has been included, which stocks have been omitted, and why? When there is a choice between broader and more focused coverage, we favor using an all-share index, which provides the broadest coverage in every country. Indices should wherever possible be capitalization weighted, not equally weighted, and index composition should reflect the experience of real-world investors. It is difficult to create stock market indices for early periods that satisfy these criteria.

Replicability

Stock market indices should be designed in such a way that, without any foresight about future performance, investors can replicate index composition with real money. We have already discussed index design and the importance of having a value-weighted arithmetic index rather than, say, an equal-weighted index. We now turn to the challenge of stocks that disappear from databases; such securities often have low returns toward the end of their lives. What should a financial historian do to estimate stock market performance when stocks are deleted?

The crudest (and wrong) approach is to exclude stocks that, with the benefit of hindsight, no longer exist. Doing so is equivalent to assuming the investor is clairvoyant—that she exits from a holding before a disaster occurs. When delistings occur, researchers may assign overly optimistic estimates of pre-delisting returns. Grossman (2002) showed a wide range of UK equity return estimates for the period 1870–1913, depending on the delisting return assumptions used. Shumway (1997) showed that because of delisting bias, estimates of the long-run US equity return and especially the small-cap premium were significantly overstated. Foreman-Peck and Hannah (2012) and Campbell, Grossman, and Turner (2021) reported that a standard equity index used in the United Kingdom had serious omissions that made the index inadequate (Gregory 2024, p. 5).

Even transitory or occasional omissions matter. Pioneers will frequently see their early work as financial archaeologists criticized and their foundational research subsequently improved on by later scholars. McQuarrie (2024, p. 14) compared his new index for US common stocks in

[1]A geometric index (not to be confused with the geometric mean of a time series of returns) is constructed by calculating the ratio of each stock's closing price to its previous closing price, multiplying all the ratios together, and raising that result to the reciprocal of the total number of stocks. Such a "paper" strategy cannot be replicated with real money.

the nineteenth century with earlier computations and reported that Siegel's (2014) omission of a major stock had a major impact on estimated returns. Omissions can also be numerous, and Zweig (2009) reported that Siegel omitted "97% of all the stocks that existed in the earliest years of the U.S. market." Graham and Zweig (2024, p. 86) observed that "more than 300 companies in various industries had been launched in the U.S. by 1801. Most ended up fading into oblivion, leaving no record of their hapless investors' losses. Yet the earliest of the data in *Stocks for the Long Run* tracks only seven bank stocks—all of which were selected because they did not go bust."

The large number of omissions from the index meant that it failed the test of macro-consistency. Moreover, unless an investor was clairvoyant—knowing which firms were destined to disappear—the investment strategy of the index could not have been replicated in real life.

Many real-world indices apply liquidity screens that take account of constituent information from before an index is rebalanced. Historical reconstructions can require a prospective constituent to have a minimum number of observations over the following year or to have other information for the year after rebalancing. In addition to rebalancing bias (e.g., Roll 1981; Lyon, Barber, and Tsai 1999), there may be a significant gap between estimated index returns and true buy-and-hold returns. We defer this concern to future research.

The expanded interest in research on long-term investment returns, supported by extensive digitization of historical data sources, has given rise to multiple approaches to creating and analyzing security price data. These include single-country studies, such as those mentioned previously for the United States and United Kingdom. More recent initiatives include the work of Annaert, Buelens, and Riva (2016), which covered more than two centuries of Brussels Stock Exchange history, and Hautcœur and Riva's (2018) comprehensive database on French stock markets since 1795.[2]

Total Return Estimation

The real return on a portfolio held over the long run is driven by the income it generates. The importance of income was recognized in the first careful studies of returns on the New York Stock Exchange by Fisher and Lorie (1964, 1968), who computed not only capital appreciation but also total returns including dividends. Ibbotson and Sinquefield (1976) also noted the importance of dividend income in their landmark study of US stock returns. As we go back in time, in general, asset price data are more easily obtained than dividend data, and so price-only return estimates tend to be more common than total return estimates. Accurate estimates of dividends are difficult to assemble, especially for early time periods and for markets with incomplete records.

Jorion and Goetzmann's (1999) analysis of investment returns from stock markets around the world was based on long-term capital appreciation indices in 39 countries. They noted that the inclusion of dividend income would elevate return estimates in both the United States and other countries. Moreover, small adjustments to estimated dividend yields have a sizable impact on long-term returns. Zweig (2009) highlighted inaccuracies in dividend estimates in Siegel's (1992) early data and the resulting bias in computed returns.

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[2]For additional information, refer to the Study Center for Companies and Exchanges at www.uantwerpen.be/scob and the Data for Financial History (DFIH) database at https://dfih.fr, respectively.

When we consider pre-1900 data, income return dominated price appreciation in the total real returns of stocks and bonds. However, income or payout data are harder to source than stock price data for that period. Collecting data on realized as opposed to contractual income payments becomes particularly challenging in the case of coupons on bonds. In the case of bond defaults, identifying recovery rates may not be possible. Plugging in contractual cash flows or interpolating data will overstate realized returns.[3]

We close this section with some remarks on best practice, in the spirit of Annaert et al. (2016) and Baltussen, van Vliet, and van Vliet (2023). Scholars should do the best they can with the available historical data, with all its inherent problems and shortcomings. At the same time, there should be a clear disclosure of data sources and design and measurement choices, and researchers should highlight challenges, potential biases, and interpolation or back-casting of data. Good practice involves robustness checks of reported results reflecting the various possible design choices. Finally, we should give full credit to previous researchers, especially those who have undertaken the painful effort to create and clean datasets and to make them available to others.

The Big Questions

With long and broad datasets, we can take a fresh look at many issues. The questions we discuss next represent those that we believe are of first-order importance to academics and practitioners alike and that have been directly addressed in the prior literature using data from the past century.

Equities: Was the Twentieth Century an Anomaly?

An abundance of evidence has shown that the total returns of equities have exceeded those of government bonds over various long-run periods since the beginning of the twentieth century—both in the United States (Ibbotson and Sinquefield 1976; Siegel 1994, 2022) and in the rest of the world (Jorion and Goetzmann 1999; Dimson, Marsh, and Staunton 2002, 2026). In this section, we address one of the central questions in empirical asset pricing: whether the evidence we have cited—that stocks consistently beat bonds over the long run—is robust.

As we noted previously, this evidence relies primarily on data series starting in 1900 or, in the case of the United States, 1926, when the University of Chicago's CRSP data starts. In this section, we first discuss the history of stock and bond returns before 1900/1926 and critically review these out-of-sample estimates of the equity risk premium before making comparisons with twentieth century estimates. As well as looking at the United States, we consider the United Kingdom—the home of the premier stock and government bond markets in the nineteenth century.

We will review the long-run evidence on the total returns achieved by stocks. The ideal measure of stock returns is the compound annual (geometric mean) total return, including price changes, dividends, and any other payouts to existing shareholders, for a market-capitalization-weighted universe of all listed stocks, adjusted for delistings and corporate actions.

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[3]Apart from total versus price-only returns, nominal versus real returns, and arithmetic versus geometric means, many return measurement issues have received increasing research attention but are beyond the scope of this chapter. Bessembinder, Chen, Choi, and Wei (2025) summarized issues related to the measurement horizon, the rebalancing strategy, the reinvestment rate assumptions of interim cash flows, and the gap between investment and investor return.

Researchers have undertaken admirable detective work in searching physical and digital archives to gather data and construct estimates of nineteenth century stock returns. In the United States, the first pre-CRSP evidence on stock returns drew on the efforts of Smith and Cole (1935), Macaulay (1938), and Cowles (1938). These estimates were later used by Schwert (1990) and Siegel (1992), among others, as their pre-CRSP source and were subsequently modified by Goetzmann, Ibbotson, and Peng (2001). More recently, Baltussen, van Vliet, and van Vliet (2023) made a detailed and valuable contribution to our understanding of US stock returns from 1866 to 1926 based on a careful data collection exercise. McQuarrie (2024) made a similar heroic effort going back to 1800 for the United States (with much help from Sylla, Wilson, and Wright 2005).

Similarly, in the United Kingdom, considerable efforts have been made to extend stock return histories back to 1829 (Acheson, Hickson, Turner, and Ye 2009; Campbell et al. 2021) and to preceding periods (Campbell, Quinn, Turner, and Ye 2018). An even earlier equity series, from Golez and Koudijs (2018), can be used to extend the Campbell et al. (2021) indices back to 1800. Thomas and Dimsdale (2018) provided the corresponding bond returns and inflation rates, reflecting the adjustments proposed by Klovland (1994).

Exhibit 17.1 summarizes the annualized nominal returns of equities and bonds, the equity risk premium (over bonds), and the annualized real returns of equities over 1800–1899, 1900–1999,

Exhibit 17.1. Annualized Percentage Returns on US Stocks and Bonds Since 1800

Period	Siegel (2014)	McQuarrie (2024)	Taylor (2023)	DMS (2026) Extended	Siegel (2014)	McQuarrie (2024)	Taylor (2023)	DMS (2026) Extended
	US Equity Nominal Return				US Bond Nominal Return			
1800–1899	6.8	5.5	6.8	5.5	5.1	6.2	5.5	6.2
1900–1999	10.5	10.2	11.2	10.3	4.8	4.9	4.4	4.5
2000–2025	8.3	7.8	7.5	7.9	4.8	4.8	3.7	4.9
1800–2025	8.6	7.8	8.8	7.9	4.9	5.5	4.8	5.3
	US Equity–Bond Premium				US Equity Real Return			
1800–1899	1.6	–0.6	1.2	–0.6	7.2	5.9	6.7	5.9
1900–1999	5.5	5.1	6.5	5.5	7.3	7.0	7.8	7.0
2000–2025	3.4	2.8	3.7	2.9	5.6	5.1	4.8	5.2
1800–2025	3.5	2.3	3.8	2.5	7.1	6.3	6.9	6.3

Sources: McQuarrie (2024), including his estimates of Siegel (2014); Taylor (2023); Dimson, Marsh, and Staunton, or DMS (2026). The DMS extended series merges the McQuarrie (2024) data up to 1899 with DMS (2026) estimates for 1900–2025. For 1800–1801, we used Siegel (2014) data to extend McQuarrie (2024) data back to 1800. We used DMS (2026) data to extend the McQuarrie (2024), Siegel (2014), and Taylor (2023) series forward. Not to be reproduced without express written permission from the authors.

and 2000–2025. It covers the US returns reported by Siegel (2014) and later roughly reconstructed by McQuarrie (2024), accompanied by estimates from Taylor (2023) and Dimson, Marsh, and Staunton (2026). All the quoted figures are geometric means (compound returns) and are thus lower than arithmetic means (simple average returns), with the difference between the two kinds of means being larger for more volatile series.

The main message is that the US equity premium over (government) bonds, observed to be 5% or greater in the 1900s, was considerably higher than estimates for the 1800s, which range between +1.6% and –0.6%. The disagreement between these two figures results from differing estimates of equity and bond returns in roughly equal measure. First, Siegel (1992, 2014) overestimated equity returns, and (as noted previously) his estimate suffers from both survivorship bias and a crucial stock omission. Second, there are problems with Siegel's (1992, 2014) attempts to proxy risk-free bonds in the nineteenth century.

McQuarrie (2024) eschewed such a risk-free proxy in favor of the return on a bond index, drawing on a comprehensive dataset of municipal, federal, and corporate bond returns. This method will inevitably capture some credit premium in municipal and corporate bonds and will thus not produce a pure riskless return, partly explaining McQuarrie's (2024) higher bond return and lower equity premium in the early data.[4] Hence, the 1800–99 US equity premium over truly riskless bonds would probably not be a negative figure but most likely a small positive number, yet still a lot smaller than the premium for the 1900s. Given that national government bonds did not exist on any sort of consistent basis during the nineteenth century in the United States, we look next at evidence for the United Kingdom, where default-free government bonds *did* exist.

Exhibit 17.2 provides geometric mean returns for equities and bonds in nominal terms, equities in real terms, and the realized equity premium over bonds in the United Kingdom over 1800–1899, 1900–1999, 2000–2025, and the full 1800–2025 period.

The UK equity–bond premium for the 1800s is estimated to be near 1.5%. We consider the UK estimate for the nineteenth century a more reliable measure of the equity premium than the US estimate for the same period, given that the bond returns are based on obligations of the British government (so-called consols)—the prime credit available to investors throughout the 1800s. The 226-year estimate of the annualized UK equity–bond premium is around 3%, well below the twentieth century premium of 4%–5%.[5]

Recent empirical studies of equity and bond returns in the nineteenth century for Belgium and France—both were among the most important capital markets in the world at this time—also indicate a low premium compared with the twentieth century. Annualized nominal returns for Belgian equities and government bonds have been estimated to be 4.0% and 4.4%, respectively, over 1838–1900 (Van Mencxel, Annaert, and Deloof 2024, Table 5). This slightly negative equity–bond premium contrasts with a 3% premium for 1900–1999 (Dimson et al. 2026, Table 24). In France, annualized nominal returns over 1854–1914 for equities were estimated at 5.3%

[4]All bond sources use long-dated government bonds since the 1920s, although with different maturities.

[5]There are fewer sources for short-term bill returns than long-term bond returns before 1900, so we do not include them in Exhibit 17.1 or Exhibit 17.2. Finaeon has estimated a 1.2% lower return for US bills than bonds in the 1800s, reflecting a healthy term premium (compared with a term premium of 0.7% in the 1900s and 2.3% in the 2000s). The term premium was lower in the United Kingdom: 0.2% in the 1800s, near 0% in the 1900s, and near 2% in the 2000s. Chen, Jiang, Lustig, Van Nieuwerburgh, and Xiaolan (2022) discussed the shifting location over several centuries of the world's dominant safe-haven asset supplier—from the Netherlands to the United Kingdom to the United States.

Exhibit 17.2. Annualized Percentage Returns on UK Stocks and Bonds Since 1800

Period	Taylor (2023)	DMS (2026)	DMS (2026) Extended	Taylor (2023)	DMS (2026)	DMS (2026) Extended
	UK Equity Nominal Return			UK Bond Nominal Return		
1800–1899	5.6	—	5.4	4.0	—	4.0
1900–1999	10.2	10.2	10.2	4.9	5.4	5.4
2000–2025	5.5	5.4	5.4	3.3	3.5	3.5
1800–2025	7.6	9.2	7.5	4.3	5.0	4.5
	UK Equity–Bond Premium			UK Equity Real Return		
1800–1899	1.5	—	1.4	5.8	—	5.4
1900–1999	5.0	4.6	4.6	6.0	6.1	6.1
2000–2025	2.1	1.9	1.9	2.0	2.8	2.8
1800–2025	3.1	4.0	2.9	5.4	5.4	5.5

Sources: Taylor (2023); DMS (2026); for equity returns, Golez and Koudijs (2018) over 1800–1829 and Campbell et al. (2021) over 1830–1899; for bond returns and inflation, Thomas and Dimsdale (2018) over 1800–1899. We used DMS (2026) data for the year 2025 to extend the Taylor (2023) series forward. Not to be reproduced without express written permission from the authors.

Note: All returns are annualized geometric means in local currency.

and for government bonds at 4.0%, implying an equity–bond premium of 1.3% (Le Bris and Hautcœur 2010, Table 10), compared with 4.3% for 1900–1999 (Dimson et al. 2026, Table 37). In short, the robust and substantially positive equity premium of the 1900s—almost universal across the countries in the Dimson et al. (2002, 2026) dataset—was much smaller and quite close to zero in the previous century.

A full discussion of the reasons for the lower equity returns in the nineteenth versus the twentieth century is beyond the scope of this chapter, but we will touch on them briefly. Mechanically, the lower return could reflect lower growth; indeed, the 1800s experienced lower growth in *per capita* income, lower productivity growth, and lower dividend growth relative to the 1900s. The payoff from the First Industrial Revolution (steam and the railroad) of the late eighteenth and early nineteenth centuries was modest compared with that of the Second Industrial Revolution (electricity, the internal combustion engine, and many other innovations) in the late nineteenth and early twentieth centuries and that of the Information Revolution (information and communication technology) starting in the late twentieth century.

A decomposition analysis of total equity returns supports such claims about the relatively poorer fundamentals of the 1800s. From a return source perspective, the components of total real equity returns are the dividend yield, the real growth in dividends per share, and the change

in equity valuation. The decompositions for the United States and the United Kingdom in the 1800s and 1900s show that dividend yield is overwhelmingly the most important contributor to returns in both centuries.[6] The real growth in dividends and the upward trend in equity valuations of the twentieth century were nowhere as apparent in the earlier period.

From a rational asset pricing perspective, these growth arguments are beside the point. Instead, lower average equity premiums over a century suggest less risk in the 1800s than in the 1900s, which seems hard to justify, especially in the United States, given political instability and immature markets. That said, measured equity market volatility was lower, and bonds were hardly riskless in the 1800s (with their high real return raising the bar for stocks).

Moreover, realized average stock returns may not reflect expected returns even over a century-long history, especially if there was significant repricing. The twentieth century saw many improvements in corporate governance and disclosure necessary to induce outside equity ownership, as well as improved equity investability (via pooling and diversification) and higher investor risk tolerance. All these developments likely contributed to the generally rising valuations of equities and to stocks outpacing bonds over the century. Realized stock returns were boosted by falling required returns (rising valuation multiples) and thus likely exceeded the returns investors had been expecting.[7]

To summarize, the equity risk premium was exceptionally high in the twentieth century and low in the nineteenth century—especially in the United States. The reasons for these differences are worthy of further research. Both centuries may have been abnormal. Consistent with this conjecture, leading experts at a recent equity premium symposium estimated a prospective equity–bond premium of between 0% and 5% (Siegel and McCaffrey 2023, Appendix A). The best guidance on future premiums may be to use a number between one drawn from the lucky 1900s and one from the disappointing 1800s.

Bonds: How Abnormal Were the Recent Low Bond Yields?

Having looked at bond returns in the previous section, here we turn to bond yields with a long-run perspective. Certainly, bond yields in the past decade were as low as they had been since 1900 (reaching negative real yields in major bond markets and even negative nominal yields in Japan, Germany, and the United Kingdom).

Given that bond markets have existed for much longer than stock markets, what do the pre-1900 data tell us about just how unusually low real yields became? The longest data sources relating to loan or bond yields are by Homer and Sylla (2005) and Schmelzing (2020). The former dates back to ancient times and the latter to the early fourteenth century. However, interpreting these estimates of historical bond yields is problematic. Bond contracts in the nineteenth century incorporated many features that make estimating a consistent series of bond yields

[6]Total equity return can be decomposed in increasingly granular ways. The most common decomposition is in the spirit of the dividend discount model, splitting the return into dividend yield (d/p), dividend-per-share growth, and valuation change, or $\Delta(p/d)$, components (e.g., Ilmanen 2022). Dimson et al. (2026, Table 12) presented this decomposition for 21 national markets over the 1900–2025 period. Kuvshinov and Zimmermann (2022) documented the declining role of dividend income in stock returns across centuries.

[7]The cyclically adjusted price-to-earnings ratio, or CAPE ratio, of US equities, based on 10-year averaging of inflation-adjusted earnings, rose from 18.5 at year-end 1899 to 44.2 at year-end 1999, contributing to roughly 1% annual repricing gains. Moreover, both average growth and average inflation likely surprised on the upside (see Exhibit 17.3).

very difficult. Beyond maturity and coupon, there are such complications as sinking funds and embedded options (mostly for the issuer's benefit), tax features, and even lotteries. Furthermore, bond ratings for either government or corporate bonds were not introduced until the 1900s, making credit risk virtually impossible to estimate before then.

Notwithstanding such challenges, Schmelzing (2020)—through his own efforts as well as those of others—assembled a global history of yields on loans or bonds since the early 1300s. We focus on GDP-weighted average yields across eight countries once each became available: Italy (1310), Great Britain (1310), Germany (1326), France (1387), Spain (1400), the Netherlands (1400), the United States (1786), and Japan (1870). Of the six European states, only France existed as a nation when the time series began, so the loans in the early sample were to local rulers, princes, or cities. As capital markets evolved, loans were replaced by tradable bonds, and for the past century, the dataset covers 10-year government bonds. Earlier, maturity and credit quality varied over time and across countries.

Exhibit 17.3 tracks the evolution of nominal and real (inflation-adjusted) bond yields, inflation, and real GDP growth. (The real GDP growth series is from the Maddison Project Database 2020 [Bolt and van Zanden 2020], discussed later.) The exhibit shows that nominal and real yields were in double digits in the Middle Ages but fell to approximately 5% near the First Industrial Revolution and, with episodic exceptions, ever lower thereafter.[8] Global inflation was mildly positive but near zero in most centuries before the 1900s. Century average inflation near zero did not mean stable inflation near zero, because there were oscillating waves of inflation and deflation, some of which were very large.

Exhibit 17.3. Nominal and Real Bond Yields, Inflation Rates, and Growth Rates, 1314–2018 (%)

Rate	1314–1399	1400–1499	1500–1599	1600–1699	1700–1799	1800–1899	1900–1999	2000–2018
Nominal rate	11.5	12.2	9.2	7.4	5.1	5.4	5.4	3.0
Real rate	10.4	11.5	7.1	6.8	4.2	4.9	1.0	1.3
Inflation rate	1.2	0.8	2.1	0.6	0.9	0.5	4.4	1.7
Real GDP growth per capita	0.4	0.1	0.2	0.2	0.2	0.9	2.2	1.1

Sources: Schmelzing (2020) and Bolt and van Zanden (2020). Not to be reproduced without express written permission from the authors.

Notes: All series are GDP-weighted averages across countries and arithmetic means across years of annualized rates from (up to) eight countries since data became available, in most cases before the birth of each nation. Nominal rate refers to loans or bonds, and real rate is the difference between the nominal rate and the seven-year centered average inflation rate. The last series, real GDP growth per capita, is from the Maddison Project Database 2020 (Bolt and van Zanden 2020) and where possible reflects the same GDP weights as the Schmelzing (2020) series.

[8]Looking back even farther, Homer and Sylla (2005) documented yields near 20% in Mesopotamia four or five millennia ago. A local trough occurred amid Pax Romana near AD 1, with perhaps 4% yields, before double-digit yields again became commonplace.

Schmelzing's (2020) data in Exhibit 17.3 reveal that despite fluctuating inflation rates, over century-long intervals there was little difference between nominal and real yields, both of which fell to the 3%–4% range by around 1900. The twentieth century saw more persistent price rises, however—in particular, the Great Inflation of the 1970s, which pushed nominal rates up to double digits, a level last seen in the 1500s except in wartime. The post-1982 Great Moderation witnessed global convergence in inflation rates toward 2%—back to the low long-term levels that characterized the pre-1900 economy.[9]

Even after inflation expectations stabilized at low levels in the 2000s, real yields and policy rates kept falling to negative territory. Eventually, even nominal yields in many European countries and Japan turned negative or reached record low levels in places where they remained positive (the United States and the United Kingdom). The global rise in inflation in 2021–2022 finally turned bond yields higher after a 40-year downtrend. The yield evidence in Exhibit 17.3 stretching back over centuries provides confirmation that the recent low (even negative) bond yields were truly exceptional.

Alongside real bond yield data, we have very long-run estimates of growth in *per capita* income across countries, assembled by the Groningen Growth and Development Centre (see Bolt and van Zanden 2020). Certain classic economic theories suggest that equilibrium real yields and real growth should be similar. However, very long-run empirical evidence suggests the opposite. Real economic growth was 0.1%–0.4% per year before the First Industrial Revolution, whereas the past two centuries have seen approximately 1%–2% real annual growth in advanced economies (last row of Exhibit 17.3). Thus, the recent two centuries of relatively fast economic growth and higher inflation coincided with low real yields, whereas the earlier centuries of slow growth and low inflation witnessed much higher required yields—contrary to the prediction cited previously.

Do Long Histories Give Us Clear Evidence on Excess Returns to Credit Risk?

We turn next to corporate credits. The credit premium is defined as the (expected or realized) excess return of corporate bonds over comparable government bonds. We discuss evidence on both realized excess returns and forward-looking credit spreads, and because the latter need to be adjusted for defaults, we also comment on the realized default experience. For much of the long histories we study, there are no available credit ratings, so we cannot split the results by rating class or between investment-grade and speculative-grade bonds. These and other related data issues make it nearly impossible to measure the credit premium in early corporate bond markets.

The financing needs of the railroads stimulated the growth of large corporate bond markets from the mid-nineteenth century onward in the United States and the United Kingdom. Consequently, there are a few studies that add to our knowledge in this area. Giesecke, Longstaff, Schaefer, and Strebulaev (2011) estimated annual value-weighted percentage default

[9]Real yield estimation requires estimates of inflation expectations, which are often based on rolling historical average inflation. The estimation challenge is made harder by structural changes in inflation and real rate processes. Farmer, Nakamura, and Steinsson (2024) stressed how pernicious gradual structural changes are because we learn about them very slowly.

rates for US non-financial corporate bonds over 1866–2008. The authors reported the annual time series of default rates and observed a decline over time, with rates averaging 4%, 1.4%, and 0.3% for 1866–1899, 1900–1945, and 1946–2008, respectively.[10]

To estimate the credit spread, Giesecke et al. (2011) used Homer and Sylla's (2005) yield data on high-grade railroad bonds and high-grade New England municipal bonds for 1866–1914 and for prime corporate bonds and long-term government bonds after 1914. These category definitions can only crudely take account of credit differences across firms. We also again note the problems of proxying US government bond yields before 1914.

Using these data, Giesecke et al. (2011) reported an average credit spread of 1.5% for the entire sample period of 1866–2008 (without disclosing the annual time series). The average default rate is also 1.5%. Given their broad-brush assumption of a 50% average recovery rate of losses upon default, the authors estimated the average credit risk premium to be approximately 0.75%.[11] This figure compares with an average credit premium of 1% for investment-grade corporate bonds from 1973 to 2020 (Ilmanen 2022).

Coyle and Turner (2013), studying the period 1861–2002, reported annualized real returns on UK corporate bonds of 2.4% and a credit spread of approximately 1% versus government bonds. The spread was higher, at 1.7%, for 1861–1913 than afterward. Because *ex post* default losses were negligible, the credit premium is of a similar magnitude. As with the United States, however, no information is available on corporate credit quality in the nineteenth and early twentieth centuries. Given that the sample comprised all corporate bonds traded on the London stock market, where listing requirements were relatively strict, we might infer that the credit quality of this bond sample was generally high.

A further data point on corporate bonds was provided in the recent study by Van Mencxel et al. (2024) of Belgium from 1838 to 1939. As mentioned previously, the Brussels stock market was relatively large in the 1800s, and there is an abundance of data. This study reports a small, positive corporate credit spread over government bonds of approximately 0.4%. There is no discussion of default losses and recovery rates to enable us to estimate the credit premium.

Overall, we can only measure corporate credit spreads and credit premiums quite crudely. In the absence of bond rating data for corporate bonds before the 1920s, it seems difficult for scholars to be able to provide more precise estimates of the corporate credit premium than the few we have. The existing sparse evidence suggests that there was a modest credit premium in the nineteenth and twentieth centuries. Given that Kizer, Grover, and Hendershot (2019) and McQuarrie (2020) found problems even with the US corporate bond return data in the early decades after 1926, it is likely to remain the case that the most reliable evidence on the credit premium begins only in 1973.

Finally, we have an estimate of the sovereign credit premium. Meyer, Reinhart, and Trebesch (2022) estimated a credit spread before default losses of 4.3% on foreign-currency government bonds over UK and US government bonds between 1815 and 2016. This spread was

[10]Van Mencxel (2023) estimated default rates for Belgian corporate bonds in the late nineteenth and early twentieth centuries.

[11]Giesecke et al. (2011, p. 243) cited research by Hickman (1960) that implies an average recovery rate of 62.5% of par value for 1900–1944.

approximately 1 percentage point lower for the first 100 years, 1815–1914. In credit events (sovereign debt restructurings), the typical realized haircut was less than half, implying an average annual default loss near 1%. The resulting average *ex post* sovereign credit premium of approximately 3% is considerably higher than that for corporate bonds.

Conclusion

The various approaches to research on long-run asset returns summarized in this chapter deserve both credit and encouragement. We especially salute Alfred Cowles, Lawrence Fisher, James Lorie, and Roger Ibbotson, who inspired many subsequent empirical researchers to create and analyze new series of raw historical data. Partly thanks to technological advances that made historical data extraction easier, we are experiencing a golden age in the research of financial history.

A growing cohort of applied researchers are addressing interesting questions using very long data histories from a variety of sources. Anarkulova, Cederburg, and O'Doherty (2022) deployed data from Finaeon to show that the frequency of negative long-horizon returns over almost 200 years is an order of magnitude higher when studying a global equity dataset than when looking at US-only equity returns. Arnott and Bernstein (2002) used data from Ibbotson Associates to study the components and determinants of the US equity premium. Some researchers combine both aspects—compiling new data and undertaking novel empirical tests. Baltussen, van Vliet, and van Vliet (2023) extended the CRSP dataset of US stocks back to 1866–1926 to study the robustness of cross-sectional return predictability (factor premiums), and Baltussen, Swinkels, van Vliet, and van Vliet (2023) analyzed asset class performance in different inflation environments.

It is increasingly important to evaluate best practices for research on long-term financial history. We emphasize the importance of good documentation of data sources, discussion of choices and assumptions, and a sharp focus on possible biases. The most obvious empirical research on US and UK equity and bond markets before 1900 has already been done, but it is desirable to refine these return series by improved estimates of delisting bias, default rates, broad payout measures, and so forth.

Another natural path is to extend empirical research beyond these core stock and bond markets to other countries and other asset classes. Any global comparisons will require data on foreign exchange rates (if unhedged), relevant short rates (if hedged), or purchasing power parity estimates. Some equity analyses could be extended before 1800 following the pioneering steps of Le Bris, Goetzmann, and Pouget (2019) and Golez and Koudijs (2018), among others. Relatedly, we reviewed the long-term returns from commodities and real estate in Chambers et al. (2024), and the long-term returns from aesthetic assets were examined in Dimson, Pukthuanthong, and Vorsatz (2026).

We chose to focus our empirical survey on the average returns of major asset classes. Further analysis of forward-looking expected returns (time-series predictability), as well as volatility and other higher moments, can supplement the analysis of historical average returns. Most importantly, relating asset returns to macro developments and various risk factors is essential for asset-pricing models. Longer and better-quality data histories of all these series will allow both larger samples and improved evaluation of long-horizon relationships.

Finally, very long historical datasets face methodological challenges. Their potential usefulness for long-horizon predictability studies is balanced by the statistical problems highlighted

by Boudoukh, Israel, and Richardson (2019, 2022). Similar econometric research may help deal effectively with structural changes, missing data and gradually improving asset breadth and data quality.

Key Takeaways

- Long-term index histories can provide valuable evidence on investment returns, but the quality of old financial data is limited. We highlighted four pervasive challenges: easy-data bias, macro-consistency, replicability, and total return estimation. Researchers should consider potential data biases and how they can be mitigated.
- Easy-data bias arises when researchers study intervals that are not representative of the long term. Macro-consistency is an issue when indices fail to measure the aggregate returns of investors as a whole. Replicability is important because investors should be able to reproduce index returns by buying index constituents. Index returns should incorporate both income and capital appreciation.
- We used the best available series for both the United States and the United Kingdom to study several important topics. In the nineteenth and twenty-first centuries, stock and bond returns were lower than in the widely cited twentieth century. The equity–bond risk premium was exceptionally high in the twentieth century. The current century may not provide as large a reward for risk as the last century did.

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