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STOCKS FOR THE LONG RUN? NEW EVIDENCE, OLD DEBATES

PAUL McCAFFREY

FOREWORD AND AFTERWORD BY
LAURENCE B. SIEGEL

CFA Institute
Research
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CONTENTS

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STOCKS FOR THE LONG RUN? NEW EVIDENCE, OLD DEBATES

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Foreword

The Ibbotson–Sinquefield and Jeremy Siegel Studies

The quest to understand how different asset classes have performed over time—and what that means for the future—was powerfully advanced by Roger Ibbotson and Rex Sinquefield's twin 1976 papers on "Stocks, Bonds, Bills, and Inflation."[1] The first paper was a reconstruction of historical returns on those asset classes starting in 1926, and the second was a set of probabilistic forecasts of how each asset class might perform in the future. This research was one of the first demonstrations that stocks had historically been the highest-returning asset class in the United States, followed by, respectively, corporate bonds, long-term Treasury bonds, short-term Treasury bills, and a hypothetical asset returning the rate of consumer price inflation.

Soon after, CFA Institute Research Foundation (at the time called the Financial Analysts Research Foundation) made the studies into a book, Ibbotson and Sinquefield's 1977 research monograph, also titled *Stocks, Bonds, Bills, and Inflation*.[2]

The historical returns and forecasts in these works quickly became popular for several uses:

- Helping with decisions on the asset mix of multi-asset investment funds
- Estimating the amount of risk in each asset class and portfolios thereof

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[1]Roger G. Ibbotson and Rex A. Sinquefield, "Stocks, Bonds, Bills, and Inflation: Year-by-Year Historical Returns (1926–1974)," *Journal of Business* 49 (January 1976): 11–47; Roger G. Ibbotson and Rex A. Sinquefield "Stocks, Bonds, Bills, and Inflation: Simulations of the Future (1976–2000)," *Journal of Business* 49 (July 1976): 313–38.

All important thoughts have antecedents, and the Ibbotson and Sinquefield work is no exception. Edgar Lawrence Smith's 1924 book *Common Stocks as Long Term Investments* (Macmillan) changed the attitude of a number of famous economists, including John Maynard Keynes and, in particular, Irving Fisher, who then became a well-known advocate of stocks. In 1960, an academic study by James Lorie and Lawrence Fisher of the University of Chicago documented long-term asset returns and declared stocks the "surprise" winner (even after considering the 1929–32 stock crashes that many believed put the final nail in stocks' coffin). The Ibbotson–Sinquefield studies were strongly influenced by Fisher and Lorie. Ibbotson and Sinquefield were the first to publish monthly total historical returns on each asset class and to measure the various risk premiums that had been attained by one asset class relative to another.

[2]Roger G. Ibbotson and Rex A. Sinquefield, *Stocks, Bonds, Bills, and Inflation: The Past (1926–1976) and the Future (1977–2000)* (Financial Analysts Federation, 1977).

- Financial planning and forecasting
- Determining the cost of capital or discount rate for businesses, projects, and securities with risky cash flows

Many years later, Jeremy Siegel, who had been an assistant professor at the University of Chicago at about the same time as Ibbotson, took an interest in historical returns on principal asset classes. In 1994, he published a book on the subject, *Stocks for the Long Run*, which became a bestseller and propelled Siegel to the first rank of both business-school professors and popular authors on investing.[3] Later editions sold even better. Siegel's book became the "bible" of the financial planning industry and helped move the typical allocation of individual investors—in particular, those saving for retirement—toward a larger weight in equities.

At the same time, pension funds, endowment funds, and other institutional investors were also increasing their equity allocations. This trend was, at least in part, motivated by the research of Ibbotson, Sinquefield, and Jeremy Siegel showing that stocks had roundly beaten other (fixed-income) asset classes, as well as inflation. All these authors theorized that the higher return of stocks was compensation for their greater risk. After all, stocks can go down as well as up and have on occasion had sharply negative returns.

Jeremy Siegel made the case that a long holding period (potentially spanning decades) reduced the risk of stocks, perhaps even to a level lower than that of long-term bonds—in part because stocks are a hedge against inflation and nominal bonds are not. But the other, more influential part of his reasoning was that over time, the wide swings of the stock market would cancel each other out, producing a smoother ride for those investors who could afford to hold stocks for long periods.

Ibbotson and Sinquefield's work did not support the "cancel out" argument, but their measured return on stocks was so much higher than that of bonds that the ups and downs did not need to cancel (in the sense of reducing risk) to justify large equity allocations.

Work by Other Researchers

Meanwhile, other scholars were seeking to expand the historical database across both time and place. Elroy Dimson, with co-authors Paul Marsh and Mike Staunton, studied returns on stocks and bonds in non-US markets.[4] G. William Schwert[5]—and later, Jeremy Siegel himself—extended the US data series back to roughly 1800 (different studies begin on different dates). William Goetzmann, sometimes with co-authors, went back even farther, to the first stirrings of joint-stock capitalism in Europe.[6] All of them found, as a general principle, that equities were a fruitful investment, although a rigorous comparison to bonds and inflation was not always possible.

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[3]Jeremy J. Siegel, *Stocks for the Long Run: A Guide to Selecting Markets for Long-Term Growth* (New York: McGraw-Hill, 1994).

[4]Elroy Dimson, Paul Marsh, and Mike Staunton. *Triumph of the Optimists: 101 Years of Global Investment Returns* (Princeton University Press, 2002).

[5]G. William Schwert, "Indexes of United States Stock Prices from 1802 to 1987," *Journal of Business* 64 (July 1990): 399–426.

[6]See, for example, William N. Goetzmann, *Money Changes Everything: How Finance Made Civilization Possible* (Princeton University Press, 2016).

Edward McQuarrie's Contribution and the Reason for This Brief

More recently, Edward McQuarrie undertook the arduous task of checking these various authors' work, stock by stock and bond by bond, back as far as the data would allow. McQuarrie's chief aim was to critique Jeremy Siegel's data series, which went back to 1802, so his reconstruction of the data begins then. He found, to the surprise of most users of the data, that the various scholars whom Jeremy Siegel relied on had made simplifying assumptions that overstated the returns of stocks relative to bonds in the nineteenth century and the first part of the twentieth.

In fact, McQuarrie contended, stocks and bonds had roughly the same returns for much of the nineteenth century. This finding caused him to question the idea of a stable or persistent equity risk premium, or expected additional reward to investors for taking the extra risk of stocks as compared with bonds.

McQuarrie's 2024 article in the *Financial Analysts Journal* revealing these findings, "Stocks for the Long Run? Sometimes Yes, Sometimes No,"[7] began the conversation that is documented in the CFA Institute video, "New Insights on Stocks for the Long Run."[8] The video features McQuarrie, Dimson, Jeremy Siegel, Roger Ibbotson, and Robert Arnott, with me, Laurence Siegel (no relation), from CFA Institute Research Foundation, as moderator.

Both before and after the video conversation, all the participants as well as Hendrik Bessembinder emailed each other with ideas and critiques. We thought that the email exchange was interesting enough to summarize and discuss in this brief and a second brief that will be completed shortly.

[7]Edward F. McQuarrie, "Stocks for the Long Run? Sometimes Yes, Sometimes No," *Financial Analysts Journal* 80 (First Quarter 2024): 12–28. https://rpc.cfainstitute.org/research/financial-analysts-journal/2023/stocks-for-the-long-run.

[8]CFA Institute Research and Policy Center, "New Insights on 'Stocks for the Long Run'" (28 June 2024). https://rpc.cfainstitute.org/research/multimedia/2024/new-insights-on-stocks-for-the-long-run.

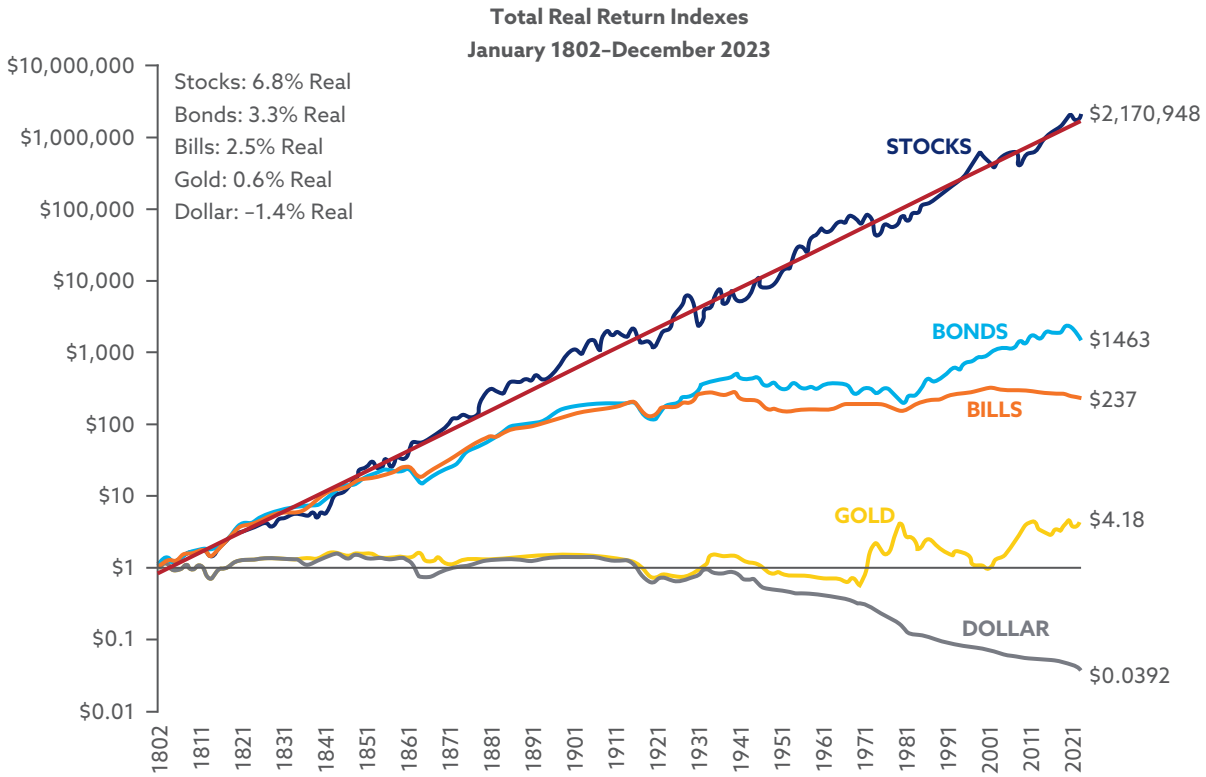
Jeremy Siegel's Iconic Chart: Origins and Criticism

In the 30 years since its initial publication in 1994, Jeremy Siegel's *Stocks for the Long Run* has been revised and updated to integrate new and better data. One chart, in particular, has undergone various changes over the years, even after it achieved iconic status decades ago.

That chart presents total return indexes, in real (inflation-adjusted) terms, for stocks, bonds, Treasury bills, gold, and the US dollar from 1802 to the present day. (Total returns include dividends or interest income, as well as price appreciation.) The most recent edition of *Stocks for the Long Run*, the sixth, includes data up through year-end 2021, which Siegel has extended through year-end 2023. The chart, shown in **Exhibit 1**, is, in effect, the *Stocks for the Long Run* thesis visualized and shows the extent to which equities have outperformed the other assets, on average over time, for more than 200 years. It distills much of the logical foundation of conventional investment finance into a single image.

The narrative set forth in the chart has not wavered even as the data and data sources have changed considerably. That is a key element of Edward McQuarrie's critique of the *Stocks for the Long Run* thesis. In his view, the data, particularly in the early part of the more than two-century period, could be improved, and although his new data do not disprove the thesis, they do not

Exhibit 1. Jeremy Siegel's Iconic Chart



Source: Jeremy J. Siegel, *Stocks for the Long Run: The Definitive Guide to Financial Market Returns and Long-Term Investment Strategies*, 6th ed. (New York: McGraw-Hill, 2022); updated through year-end 2023.

confirm it either. The whole exercise encourages a more cautious approach to the *Stocks for the Long Run* story.

With that caveat in mind, how did Jeremy Siegel compile the chart? How have the sources and data evolved? Why does McQuarrie believe he has better data? What are McQuarrie's critiques of the chart and ideas for how can it be made better?

Out with the Old?

To be sure, recordkeeping is much more advanced and comprehensive in the twenty-first century than it was in the twentieth, let alone the nineteenth. Accordingly, the bulk of McQuarrie's changes to the data behind Siegel's chart predominantly affect the older records, which, given their vintage, will likely always be incomplete and imperfect.

In the first few editions *of Stocks for the Long Run*, to fill out the years from 1802 to 1871, Siegel relied on G. William Schwert's compilation of stock price data[9] from Walter Buckingham Smith and Arthur Harrison Cole[10] and Frederick R. Macaulay.[11] For 1871–1897, he used data from Alfred Cowles[12] by way of Robert Shiller[13] and added an estimate of dividends.

By the fifth edition, published in 2014, Siegel had replaced the Schwert data covering 1825–1870 with share price–weighted data, featuring partially observed dividends, culled from research by William Goetzmann, Roger Ibbotson, and Liang Peng.[14] He continued to use the Schwert data for 1802 through 1824.

For McQuarrie, studying the chart and its various iterations and familiarizing himself with the source material gave him some perspective on its potential flaws and how it might be improved. For his *Financial Analysts Journal* article, McQuarrie relied largely on the fifth edition of *Stocks for the Long Run*, but he also analyzed earlier editions, as well as Siegel's 1992 papers for the *Financial Analysts Journal*[15] and the *Journal of Monetary Economics*.[16]

The Goetzmann data that Siegel used for the 1825–70 period in later editions indicate that stocks and bonds enjoyed similar performance during that time frame. But that had not always been obvious in Siegel's work. "That equivalence was not so visible or even a true statement in earlier book editions," McQuarrie said. "In this older data, the stock return line is always equal to or above the bond line, dipping only briefly to touch it (barely) after 1837 and 1857."

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[9]Schwert, "Indexes of US Stock Prices."

[10]Walter B. Smith and Arthur H. Cole, *Fluctuations in American Business 1790–1860* (New York: Russell & Russell, 1935).

[11]Frederick Macaulay, *The Movements of Interest Rates, Bond Yields and Stock Prices in the United States Since 1856* (New York: National Bureau of Economic Research, 1938).

[12]The cap-weighted Cowles indexes include all New York Stock Exchange stocks and dividends over the period in question.

[13]Robert Shiller, *Market Volatility* (Cambridge, MA: MIT Press, 1989).

[14]William N. Goetzmann, Roger G. Ibbotson, and Liang Peng, "A New Historical Database for the NYSE 1815 to 1925: Performance and Predictability," working paper (14 July 2000). doi:10.2139/ssrn.236982.

[15]Jeremy J. Siegel, "The Equity Premium: Stock and Bond Returns Since 1802," *Financial Analysts Journal 48* (January–February 1992): 28–38. doi:10.2469/faj.v48.n1.28.

[16]Jeremy J. Siegel, "The Real Rate of Interest from 1800–1990: A Study of the U.S. and the U.K.," *Journal of Monetary Economics* 29 (April 1992): 227–52.

The strength of the *Stocks for the Long Run* thesis thus varies somewhat depending on whether the data are from Schwert or Goetzmann.

The Schwert data had weighting errors, and the source on which they were based—research by Smith and Cole—did not report dividends and thus had its own shortcomings, according to McQuarrie. To estimate total returns, Siegel added an assumed constant dividend yield of 6.4% to Schwert's price series that he based on 1871–1925 dividend and macroeconomic data and that was consistent with other historical data on early dividend yields.

"Turns out, he wasn't too far off from what the Goetzmann series shows," McQuarrie said. "The midpoint of their high and low [dividend] estimate is 6.52%, slightly higher than the 6.4%."

So How Can the Iconic Chart Be Updated and Improved?

In proposing potential upgrades, McQuarrie began with the low-hanging fruit and suggested augmenting the chart with his own research data. "My dividend series is better (of course I'd say that)," he commented. "I [also] have a much more comprehensive price series." During certain months in the 1840s, for example, the Goetzmann data contain just a handful of stocks; McQuarrie has more. Moreover, McQuarrie managed to track down mid-nineteenth-century stock dividends from Henry Varnum Poor that previous researchers had not included.[17]

He believes that his new historical data series is more in line with the scholarship of Goetzmann, Ibbotson, and Peng, because it shows more subdued stock performance in that nineteenth-century period.

But McQuarrie's recommendations went beyond just the data sources. He also proposed three major overhauls to the way the data are presented.

Inflation Needs Its Own Chart

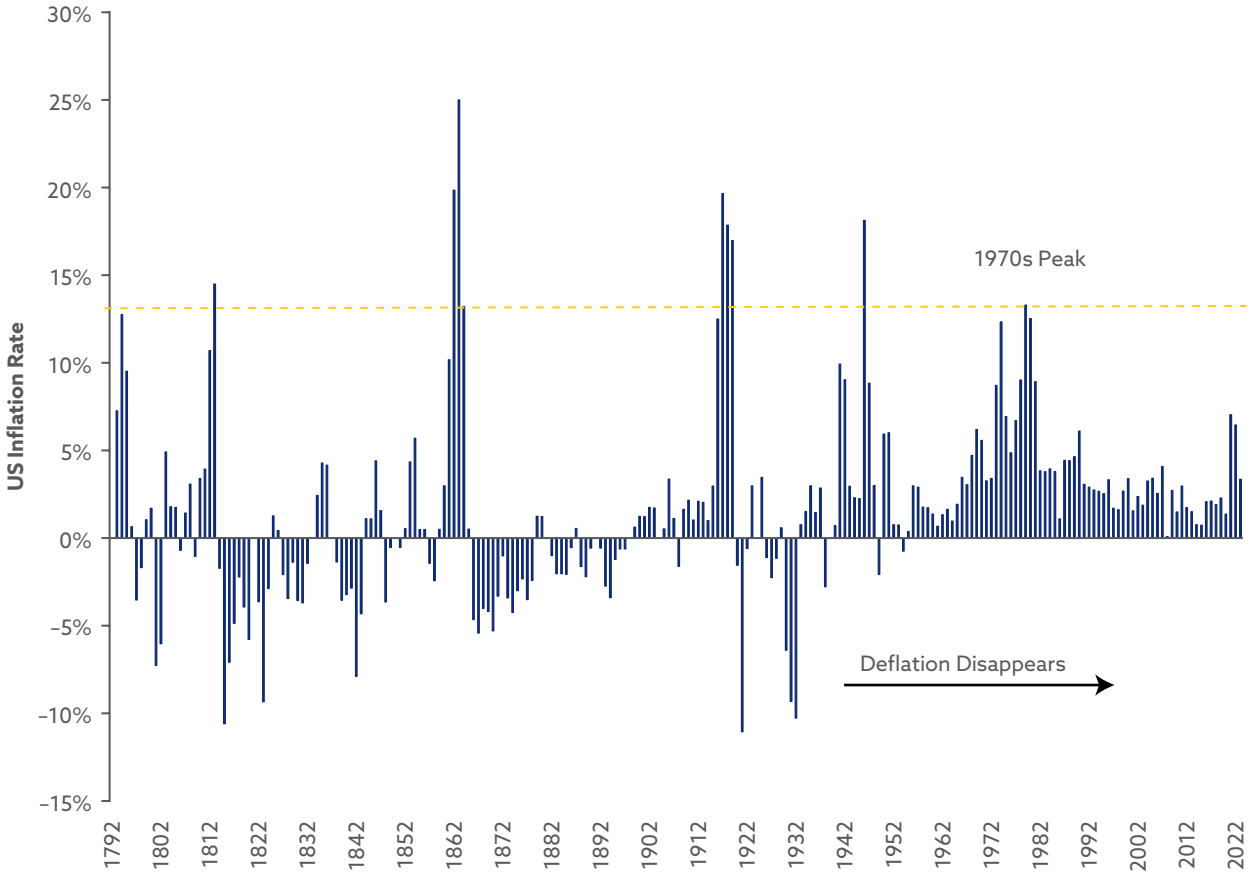
Inflation is a critical metric for investors. "But the nineteenth-century version was on a different scale than the stock and bond returns," McQuarrie said. "[Recent inflation] disappears when charted on a two-century semi-log chart." That chart design obscures inflation's volatility—the wartime spikes that dwarf those of the 1970s and early 1980s and the anomalous deflation induced by the Great Depression during the 1930s. He proposed two potential inflation treatments, a bar chart and a line chart that home in on inflation's volatility, shown in **Exhibit 2** and **Exhibit 3**, respectively.

"The 'Bills' Line Has to Go"

Embedded within the Bills line are returns on commercial paper from 1831 to 1920. These are not "riskless" US government issues. For the years before 1831, Siegel estimated US and UK long and short rates based on long- and short-term Treasury bond data when available and otherwise on the highest-grade municipal bond data. But according to McQuarrie, the modern Treasury bill, which helps determine today's risk-free rate and thus the equity risk premium,

[17]Henry Varnum Poor, *History of the Railroads and Canals of the United States of America* (New York: John H. Schultz, 1860).

Exhibit 2. Annual US Inflation Rate, 1792–2023



Sources: Edward McQuarrie, based on data from the US Bureau of Labor Statistics, the US Department of Commerce, and Samuel H. Williamson, "The Annual Consumer Price Index for the United States, 1774–Present" (2024): www.measuringworth.com/datasets/uscpi/result.php.

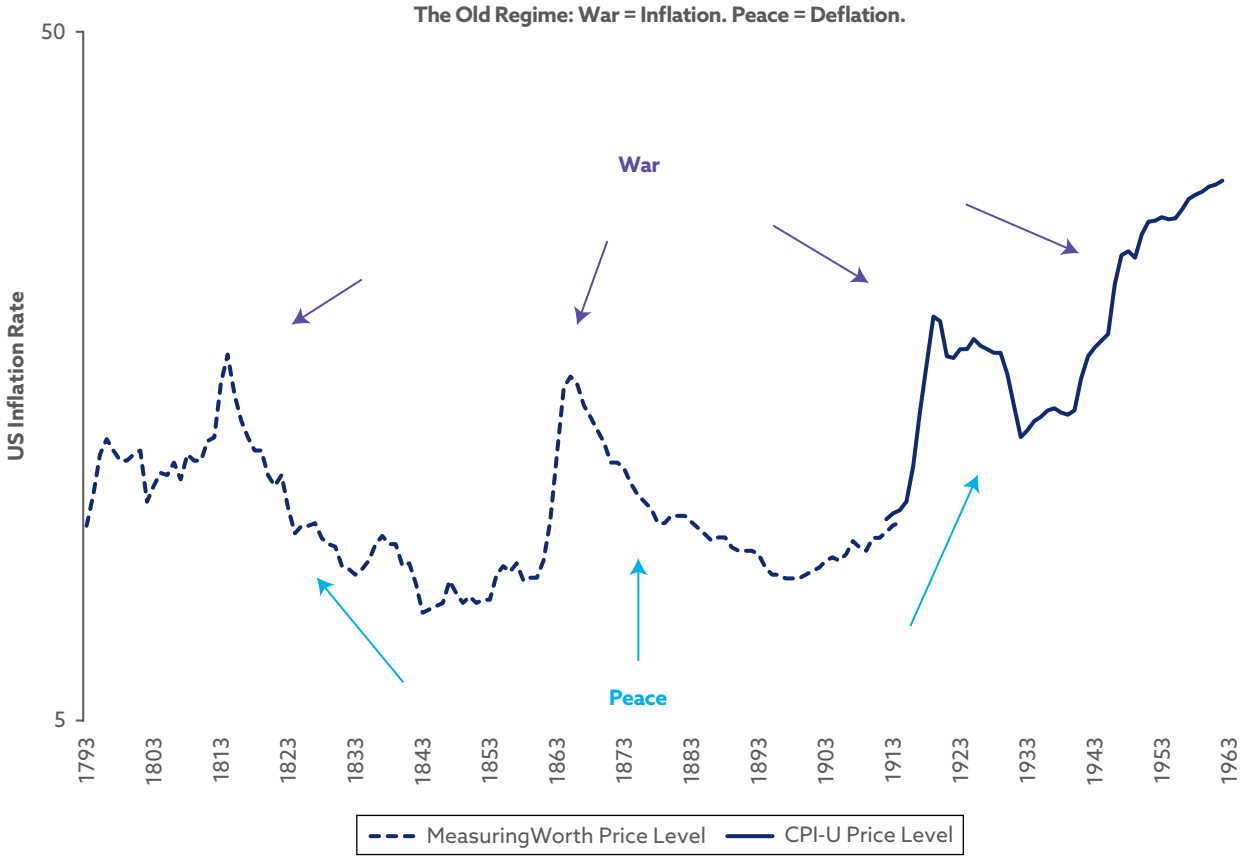
dates back only to 1929. There was no equivalent in the nineteenth century. "There is *not* a record of Treasury bills from 1802," McQuarrie said. "An ownable, continually offered, short-term, risk-free instrument is a twentieth-century creation, at least here in the United States."

Out with the Barbarous Relic?

Why not remove the gold data? "No one cares about gold," McQuarrie said, "particularly not during the century-plus when it was simply cash."

Gold's role in the economy has changed so drastically over time that different eras, in McQuarrie's view, cannot be compared. But his criticism goes further than that. Although Siegel's latest chart has gold returning 0.60% compounded annually, in the third edition,

Exhibit 3. US Inflation, Cumulative Index, 1794–1963



Sources: Edward McQuarrie, based on data from the US Bureau of Labor Statistics, the US Department of Commerce, and Williamson, "The Annual Consumer Price Index for the United States, 1774–Present." www.measuringworth.com/datasets/uscpi/result.php.

he had gold's long-term real return at just about zero (see **Exhibit 4**). "It turns out that the estimated real return on gold has not been stable across the 30 years of *Stocks for the Long Run*," McQuarrie said.

Such wide variations made McQuarrie doubt that the latest reading, 0.60%, was accurate or indeed that gold's rate of return could be charted over hundreds of years with any degree of certitude. To prove his case, he decomposed gold's annualized mean return of 0.64%, from 1802 to 2021, which was Siegel's estimate in the sixth edition of *Stocks for the Long Run*. He observed that from 1802 to 1934, gold and the dollar delivered equivalent returns except for during the "greenback" period of the US Civil War, in the 1860s, when the federal government issued emergency paper currency. Once the war ended and the country returned to the gold standard, gold and the dollar moved in parallel again.

Exhibit 4. Varying Estimates of the Historical Real Return on Gold in *Stocks for the Long Run*

Edition	Data End Date	Gold Real Return (Annualized)
1	Year-end 1992	0.07%
2	Year-end 1997	–0.09%
3	Year-end 2001	–0.01%
4	Year-end 2006	0.33%
5	Year-end 2012	0.72%
6	Year-end 2021	0.64%
Last update	Year-end 2023	0.60%

Notes: Data are based on the ending value of $1 invested in gold at the beginning of 1802, as shown in the margin of the chart of long-term real asset returns found in Exhibit 1 and each edition of *Stocks for the Long Run*. McQuarrie and I took the *n*th root of each ending value, where *n* is the number of years in the sample, and subtracted 1.

Source: Edward McQuarrie and Paul McCaffrey.

In 1934, however, a big change in gold's relationship with the dollar occurred when President Franklin Delano Roosevelt devalued the dollar by raising the price of an ounce of gold from $20.67 to $35. That change manifested itself on the chart with an immediate boost of about 70% in gold's dollar value.

For the next 37 years, until President Richard Nixon decoupled the dollar from gold entirely, the real value of gold declined at a compound annual rate of 3%, as the Consumer Price Index rose from 13.4 to 41.1 while gold's dollar value remained at $35 per ounce.

Elroy Dimson shared McQuarrie's skepticism that gold's historical real return could be measured accurately given how the rate varied between countries. "Until 1971, the dollar was pegged to gold," Dimson said. "Over that period, the real price of gold (from an American perspective) was essentially driven by the US rate of inflation." But elsewhere, gold's story was unfolding quite differently, according to Dimson. To support his case, he shared **Exhibit 5**, which shows the annual rates of change in real exchange rates.

In the United States from 1971 until 1980, gold returned 23% per year (nominal) as inflation spun out of control; then, it declined at a rate of 7% a year for the next 20 years. Between 2000 and 2021, however, it again went positive, returning 7% annually, according to McQuarrie. "Over the 41 years starting in 1980, the real return was an annualized –0.13%," he said. "What is the meaning, in the sense of useful knowledge, of summarizing those regime changes with one single number? 'Gold has returned 0.6% real annualized over the past 220 years.' I do not see the useful knowledge. I think financial history has to move beyond these simple one-number summaries of return. Investors deserve better."

Exhibit 5. Real Exchange Rates Against the US Dollar, 1900–2023: Countries with Continuous Histories Since 1900

Country	Geometric Mean (%)	Arithmetic Mean (%)
Australia	–0.23	0.42
Austria	–0.82	2.14
Belgium	0.34	2.10
Canada	–0.19	–0.01
Denmark	0.26	0.95
Finland	–0.08	1.94
France	–0.29	2.14
Germany	0.07	12.55
Ireland	0.03	0.62
Italy	–0.06	3.45
Japan	–0.14	2.54
Netherlands	0.14	0.95
New Zealand	–0.38	0.39
Norway	–0.10	0.60
Portugal	–0.06	1.22
South Africa	–0.98	0.12
Spain	–0.13	1.20
Sweden	–0.33	0.26
Switzerland	0.68	1.24
United Kingdom	–0.46	0.16
United States	0.00	0.00

Source: Elroy Dimson, Paul Marsh, and Mike Staunton, "Global Investment Returns Yearbook 2024: Leveraging Deep History to Navigate the Future," UBS (2024).

Why Keep Gold in the Chart?

Jeremy Siegel was not convinced that gold does not belong in the chart. "You'd be surprised about how much interest that gold line gets," he said. "Some advisers said their clients eliminated or reduced their allocation to gold as a result of seeing this chart. Gold does have a 5,000-year history—longer, I believe, than any other asset."

Indeed, financial scholarship has long compared the buying power of gold in different time periods. William Bernstein, Roy Jastram, and even some of the panelists have demonstrated how an ounce of gold could variously buy a good toga in the Roman era or a fine men's suit in Elizabethan England, 1900, and today.

But gold's status as a so-called store of value has also led to some misapprehensions—for example, that gold should not generate any real return at all but merely maintain its worth in goods. Siegel does not believe that anything in theory suggests that gold's real return should be zero. After all, its price depends in part on the cost of extraction and investor preferences. "In a growing economy, assets with fixed supply will generally rise in real price," he said.

Robert Arnott agreed that the gold line should not be jettisoned from the chart. Gold does have reliable constituencies, he said: inflation hawks, for example, as well as two varieties of doomers who are perennially drawn to it—those who anticipate global instability and economic collapse and those concerned about governments taxing them into penury. "Gold does best when all three constituencies are worried," Arnott said. "It's an asset that we should hope does badly, because when it does well, things are going awry."

Stocks: Not What They Used to Be?

For Arnott, however, data sourcing questions and the relevance of the gold line are less of an issue than how stock behavior has changed since the second half of the twentieth century. In this way, he echoed McQuarrie's comment about "one-number summaries of returns."

In a 2003 *Financial Analysts Journal* Editor's Corner piece, "Dividends and the Three Dwarfs,"[18] Arnott shared a chart showing that prior to the post–World War II era, dividends were responsible for most of the long-term return of equities. Inflation, real income growth, and "revaluation alpha" contribute, too, but to a much lesser degree.

In Arnott's update of that graph through mid-2022 (see **Exhibit 6**), again, dividend income was the largest return driver. "Buying stocks in 1800 (using Schwert data), and earning only the dividends, with no other source of return, gets us 26,500 times our money," he explained. "Inflation [red] magnifies that 30 times in nominal (but obviously not in real) terms. Real dividends [orange] have grown 10 times in 220 years (1% per year). And revaluation alpha [yellow] finishes the job, as investors today pay four times as much for each $1 of income as in 1802."

Arnott's use of the term "alpha" here is figurative. Because alpha, properly understood, is return in excess of the market return, the return of the market itself cannot include any alpha.

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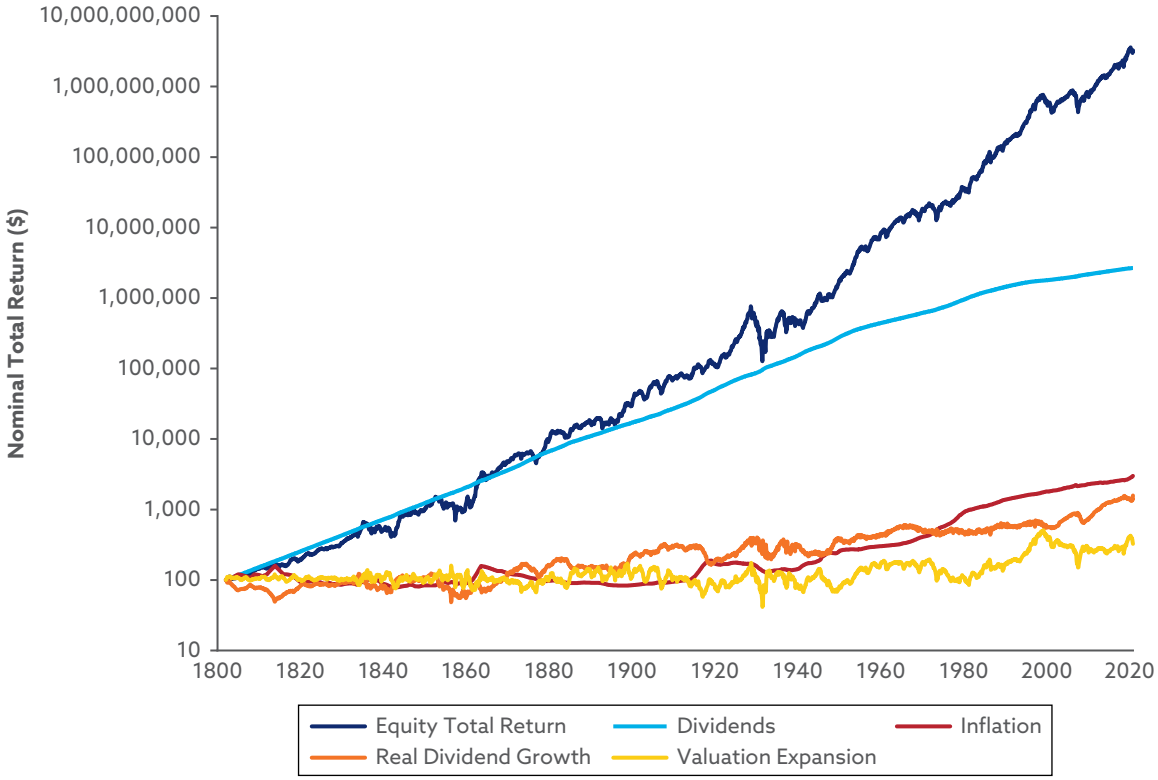
[18]Robert D. Arnott, "Dividends and the Three Dwarfs," *Financial Analysts Journal* 59 (March–April 2003): 4–6. doi:10.2469/faj.v59.n2.2510.

Exhibit 6. Components of the US Equity Market Nominal Total Return, 1800–2022 (1800 = $100)



Note: This chart starts the dollar values at $100, whereas the other charts in this brief start at $1.

Source: Robert D. Arnott, Research Affiliates LLC.

What Arnott calls revaluation alpha is the part of the market return derived from the market's rising price-to-dividend ratio over the period.

A 1%–2% dividend yield, which has been more or less the norm for the last 25 years, indicates that dividends have become a much smaller part of equity returns than they were before the 1990s. The dominant source of returns since 1982 has been revaluation, or soaring valuation multiples.

This analysis suggests that nineteenth century stocks operated much like bonds. Modern equities, however, seem to be an entirely different beast.

According to Laurence Siegel, "In the 1800s, many companies paid out all the earnings as dividends, keeping the stock price stable and making the stock essentially into an income bond." An income bond, now rarely found in the markets but important historically, is one with a variable interest rate linked to the profits of the issuer.

"Nineteenth century stocks were basically high-yield bonds with a possible growth kicker," Arnott concluded. "The *Stocks for the Long Run* graph shows stocks as producing a near-linear return (in log space) for 200-plus years, but the equity risk premium looks like a hockey stick with an inflection at mid-twentieth century. Plus, other countries look very different."

How different? The United States has not fought a high-level, sustained conflict on its soil since the 1860s, and it emerged from the two world wars and the assorted social and political upheavals of the twentieth century better than most other countries. Few nations have enjoyed more than a century and a half of such relative stability. This means that the US example may not be transferable to the rest of the world—but Dimson, Marsh, and Staunton did show that stocks beat bonds in every country they examined, albeit by different amounts depending on the country.

Stocks Are Still Stocks. Or Are They?

But are stocks really so different today, now that they are no longer comparable to their earlier counterparts? Are twenty-first century stocks such as Tesla and Nvidia in any way analogous to, say, mid-nineteenth century railroad stocks? Or is this an apples-to-oranges comparison?

Laurence Siegel believes old stocks were still "stocks"—that is, risky growth assets. "Nineteenth-century equities have been described as structurally more like bonds with a kicker," he said. "But doesn't that still make them options to buy the firm from the bondholders, just like twentieth century equities?"

To make his case, he referenced the concept of what economists call a toy economy, wherein only one firm exists and there are no riskless assets. "If the firm issues two securities, a fixed claim and a variable (remainderman) claim, and those are the only claims on the firm's net assets, the variable claim will have the basic risk and return characteristics of a modern stock, no matter what century the claims were issued in," he explained. "The specifics will depend on the underlying firm's risk and leverage."

That framework suggests that twenty-first century stocks are comparable to those of other eras, provided we acknowledge that there were no riskless claims in the old days. (Some would argue that no security is ever riskless, at least in real terms.)

Such a model comes close to reflecting the reality of post–Civil War railroad companies, according to McQuarrie, which issued both equity and bonds. But railroad companies in the 1870–1900 period often required payments from stockholders to keep their shares and maintain ownership during reorganizations. "The notion that equity could be simply extinguished in bankruptcy had not yet evolved," McQuarrie explained. "Bondholders typically got stuffed with a mix of new first-lien bonds, junk bonds, and preferred stock. The enterprise continued, often returning to paying dividends on the common stock after the crisis was past."

And Isn't Fixed Income Different Now, Too?

Of course, today's bonds and other fixed-income assets do not look exactly like their counterparts two centuries ago either. "I found no corporate bonds before 1832, and they were scarce on the ground before the 1850s," McQuarrie said. "It was stocks versus government bonds in that era." By "government bonds," McQuarrie means not only US Treasury bonds but,

occasionally, municipal bonds, which were spliced into the data during the brief periods when the US Treasury had no debt.

Nineteenth century bond markets were not diversified to anywhere near the degree they are today. Issuing bonds was pretty much the exclusive domain of railroad companies until the late 1800s. "Even when industrials started to issue bonds after about 1910, these were short-term, 10-year maturities rather than 40 or 50 years for railroads," McQuarrie said. "The bond market, weighted by issue par value, was a railroad market until the 1930s bust." And only in the 1930s did the 30-year public utility bond become integral to the fixed-income market.

These observations raise the question: Data issues notwithstanding, if the same asset is arguably not comparable from one era to another, why do we compare different assets across different eras at all? This question gets to the crux of McQuarrie's critique. From his perspective, the *Stocks for the Long Run* chart's flaws are not limited to the quality, depth, and provenance of the data but, rather, speak to something more fundamental.

McQuarrie summed up his arguments in three points:

"**1.** The returns-generating process, for this asset [gold] just as for stocks and bonds, is not stationary.

"**2.** Mashing together different regimes is like mixing apples, oranges, and kiwi fruit.

"**3.** Taking geometric averages of centuries-long series, that is, calculating the compound annual return, is uninformative at best and misleading at worst."

Small Stocks for the Long Run: Do Charts Need a New Style?

"Can we please stop reporting two-century averages as if these were meaningful to human investors thrown into some much shorter investment horizon?" McQuarrie asked.

In McQuarrie's view, Jeremy Siegel's iconic *Stocks for the Long Run* chart is not an isolated case of specious graphic design in finance. Rather, it highlights more generalized shortcomings in how modern finance visualizes data and reflects the need for a fundamental rethink of chart standards within the discipline.

The problem, as McQuarrie sees it, is that standard finance charts often share four key characteristics.

1. They are presented in semi-logarithmic form—that is, with the *y*-axis (growth-of-wealth axis) drawn logarithmically and the *x*-axis (date axis) arithmetically.
2. They extend over a long time frame, often of a century or more.
3. They present compounded returns as one steady line of accumulated wealth.
4. They compare long-term outcomes across two or more distinct asset classes or categories.

When combined, such stylistic choices make these charts easy to misread and can present an oversimplified impression of long-term investment performance. Specifically, these designs nudge readers in two counterproductive directions, what are effectively two forms of what McQuarrie calls "right-side bias."

Small Stocks for the Long Run and Right-Side Bias

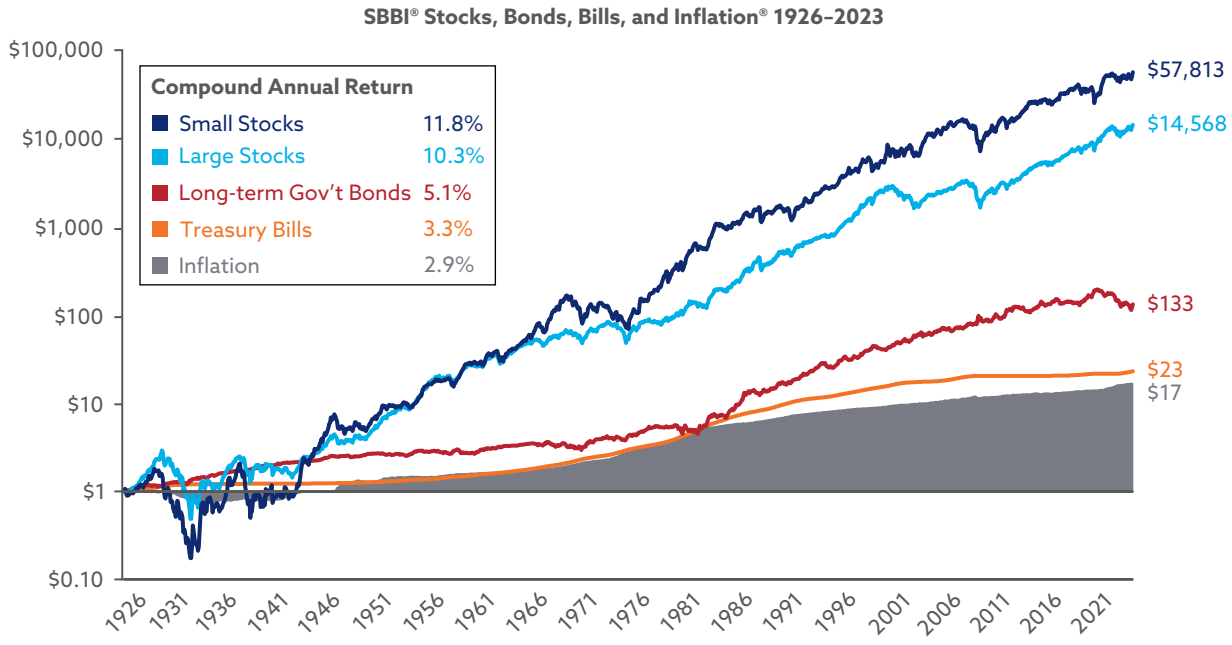
The design encourages readers to filter out the chart's lower left corner and instead zoom in on the right-hand side and the line that comes out the highest. To illustrate his point, McQuarrie presented a chart from Roger Ibbotson's Stocks, Bonds, Bills, and Inflation (SBBI) data that depicts the so-called size effect, which is that small stocks outperformed their larger peers—as well as other assets—over the long run (see **Exhibit 7**).

The chart's key implication is that since 1926, small stocks outdistanced large stocks at a compounded annual rate of 1.5 percentage points, or 11.8% to 10.3%. So, over the 90-plus years under review, an investment in small stocks generated nearly four times as much wealth as an equivalent investment in large stocks. This seems like a compelling margin in favor of small caps.

According to McQuarrie, however,

> what's easy to miss is that, over the early decades of the examination period, large and small stocks produced about the same returns. That is also true over the last 40 years. If we take out the essential period from the mid-1970s to the mid-1980s, when small

Exhibit 7. Roger Ibbotson's Small Stocks for the Long Run Chart, 1926–2023



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> stocks roared ahead, there was no return advantage to holding small stocks (which, incidentally, had more risk). There was also a very strong period for small stock performance in the 1940s. Inasmuch as finance is all about weighing risk and return over different and possibly indeterminate time horizons, this is an absolutely critical nuance.[19]

Nevertheless, for the initiated and uninitiated alike, that enormous caveat is buried by the sheer—and deceptive—magnitude of the size effect as depicted in the chart.

McQuarrie applies the same critique to Jeremy Siegel's *Stocks for the Long Run* chart. "No journalist has ever reported that 'Professor Siegel claims that stocks and bonds can perform about the same for very long stretches of time, 50 years or more,'" he quipped. "But that is exactly what the lower left corner of Jeremy's iconic chart shows."

Distorted Dollar Amounts: Right-Side Bias II

Jeremy Siegel's *Stocks for the Long Run* chart (see Exhibit 1) and Ibbotson's Small Stocks for the Long Run chart (see Exhibit 7) share another feature that McQuarrie believes can potentially lead investors off course. A dollar amount for each asset is listed on the right side of the charts to indicate the total cumulative wealth generated by the end of the examination period—usually the present time or some time close to it. The gaps between the asset values are sizable. The Ibbotson chart shows that $1 invested in small stocks in 1926 becomes nearly $58,000 in 2023. A dollar in Treasuries over the same time period compounds only to $23, barely ahead of inflation.

"The wealth values help give meaning to the difference in annualized return, which most humans have trouble assessing," McQuarrie said. Over 96 years, how substantive in terms of real-life investment outcomes is an annualized 11.8% return versus a 10.3% return? That is not entirely clear, but the huge difference in final capital depicted in the Small Stocks for the Long Run chart would certainly encourage investors to overweight small stocks.

"Skewering the Size Effect"

The real story of the outperformance of both large stocks and small stocks, according to McQuarrie, is how skewness influences the results of the dollar outcomes relative to the percentage returns.

For stocks in general, Hendrik Bessembinder made the case in his study of their performance versus Treasuries. Based on his analysis of the Center for Research in Security Prices (CRSP) database since 1926, he wrote, "The implication is that slightly more than 4% of the firms contained in the CRSP database collectively account for all of the net wealth creation in the US stock market since 1926."[20] The other approximately 96% of firms kept pace with monthly Treasury bills on average, with some creating wealth (relative to bills) and others destroying it.

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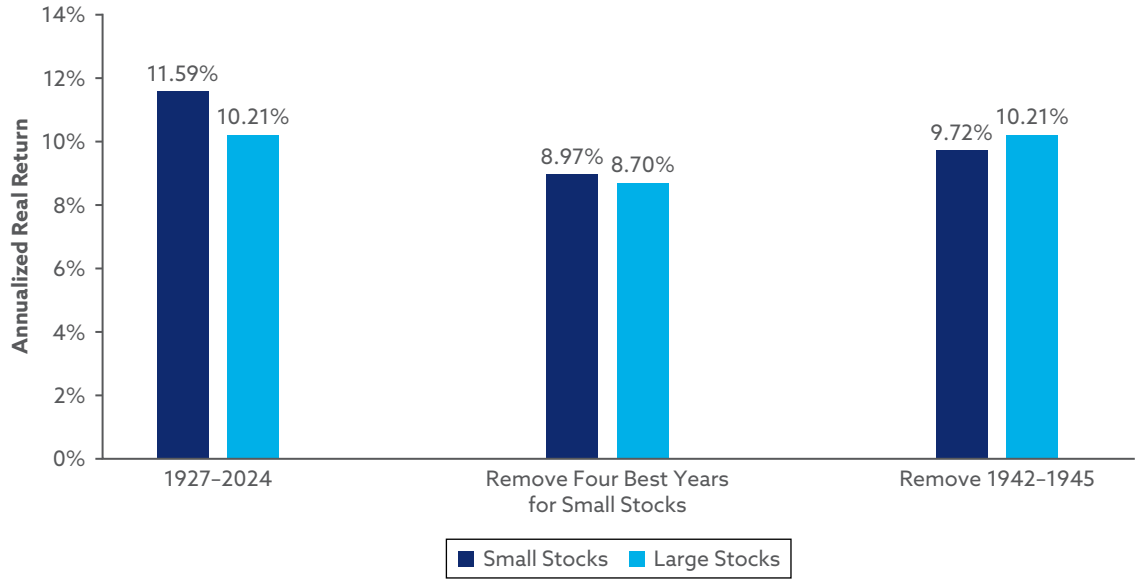
[19]This quote from a research paper by Edward McQuarrie appears in David Stevenson, "Monthly Fund Focus: Small Cap Investing, The Saba Saga, Investment Trust Ideas," ShareScope (7 February 2025). https://knowledge.sharescope.co.uk/2025/02/07/monthly-fund-focus-small-cap-investing-the-saba-saga-investment-trust-ideas/.

[20]Hendrik Bessembinder, "Do Stocks Outperform Treasury Bills?," *Journal of Financial Economics* 129 (September 2018): 440–57.

Exhibit 8. Dependence of the Size Effect on Skewness of the Small Stock Premium Series



Note: The exhibit shows annual returns for all 98 years from 1927 to 2024, with the four best individual years for small stocks removed, and with the best four-year period (1942–1945) removed.

Source: Dimensional Fund Advisors, with underlying data from the Kenneth R. French Data Library (https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html).

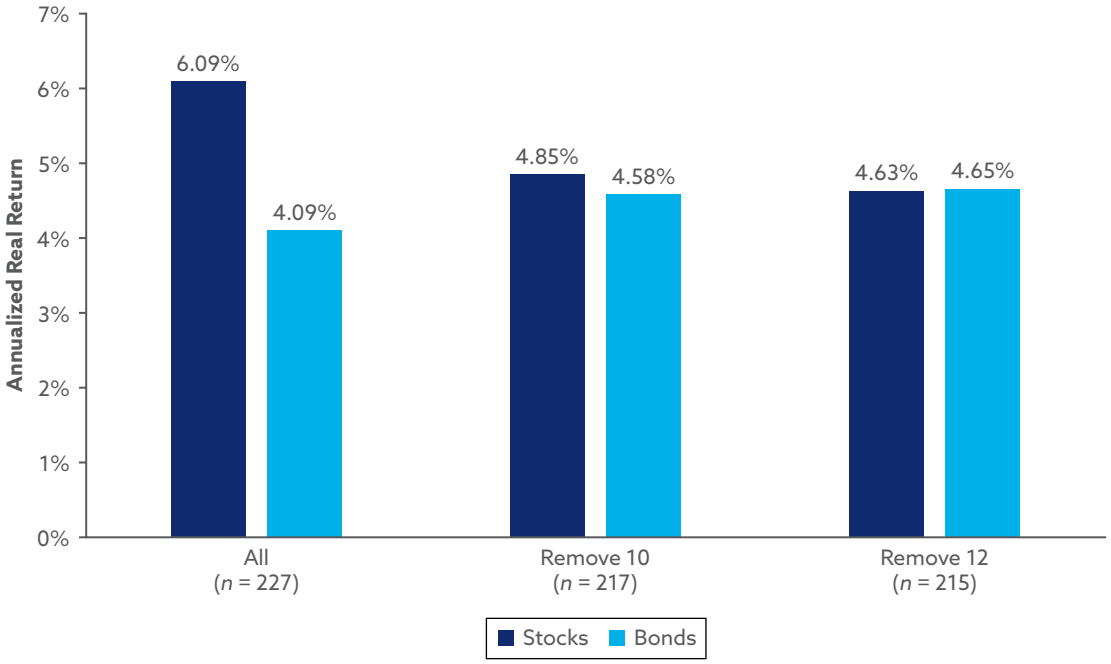
To demonstrate the influence of skewness on the size effect, McQuarrie presented a chart that did not include the four years with the greatest outperformance of small versus large stocks (see **Exhibit 8**).

When the four outliers are removed, the size effect vanishes, and when the 1942–1945 period is cropped out, it declines by 75%. A similar story holds for Siegel's *Stocks for the Long Run* chart, according to McQuarrie. Take out the best 10 or 12 years of stock market returns out of 227 years—a period many times longer—and the *equity premium* disappears. "Are small stock returns even more skewed than large stock returns? Or does the greater volatility of small stocks turbocharge an equivalent level of skewness into a greater impact?" McQuarrie asked.

"My beef with the Roger [Ibbotson]/Jeremy [Siegel] style of chart concerns the ways in which it misleads the ordinary investor to think that the size effect is a steady add-on, slowly mounting up to achieve the wealth outcomes shown," McQuarrie continued. "The spotty, episodic character of small stock outperformance—the fact of the matter—disappears from view." The average investor reading the chart would thus have a hard time noticing that the size effect is simply the result of several outlier years and not something to be taken as a given.

The same holds, albeit to a lesser extent, for the equity premium itself. **Exhibit 9** shows that when the 12 top years for stocks are excluded, equities actually underperform bonds over the 1793–2019 sample.

Exhibit 9. Dependence of the Equity Premium on Skewness of the Stock Series



Notes: The exhibit shows annual real returns for all 227 years from 1793 to 2019 and with the best 10 and 12 years removed. Best = Largest excess return of stocks over bonds.

Source: McQuarrie, "Stocks for the Long Run?".

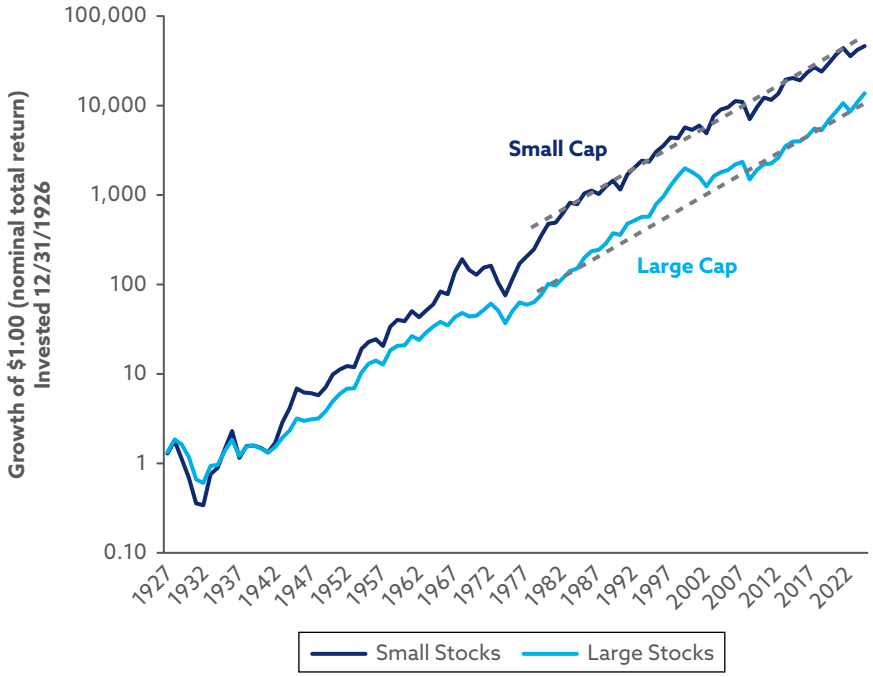
In response, Laurence Siegel, who helped create the Small Stocks for the Long Run chart, said that obviously the focus in the chart, as with its *Stocks for the Long Run* counterpart, should be on the changing distance between the lines. He also observed that since 1980, large-cap and small-cap returns have been more or less equivalent. That year is also around the time when the size effect was first identified, which is not a coincidence. **Exhibit 10** bears this out.

"When any factor is discovered, its future excess return has usually been arbitraged away by the large past return that caused the factor to be discovered," he said. "In simpler English, if you know about the factor, it's already too late."

The more or less static distance between the small stock and large stock lines in the Small Stocks for the Long Run chart (Exhibit 7) after 1980 might lead chart readers to conclude that their returns were about the same, McQuarrie acknowledged. But that was not the whole story of the size effect over the last 40-plus years.

A chart of the size effect's recent history supports his critique (see **Exhibit 11**).

Exhibit 10. Growth of $1 Invested in Small and Large Stocks, 1927–2024



Source: Dimensional Fund Advisors, with underlying data from the Kenneth R. French Data Library.

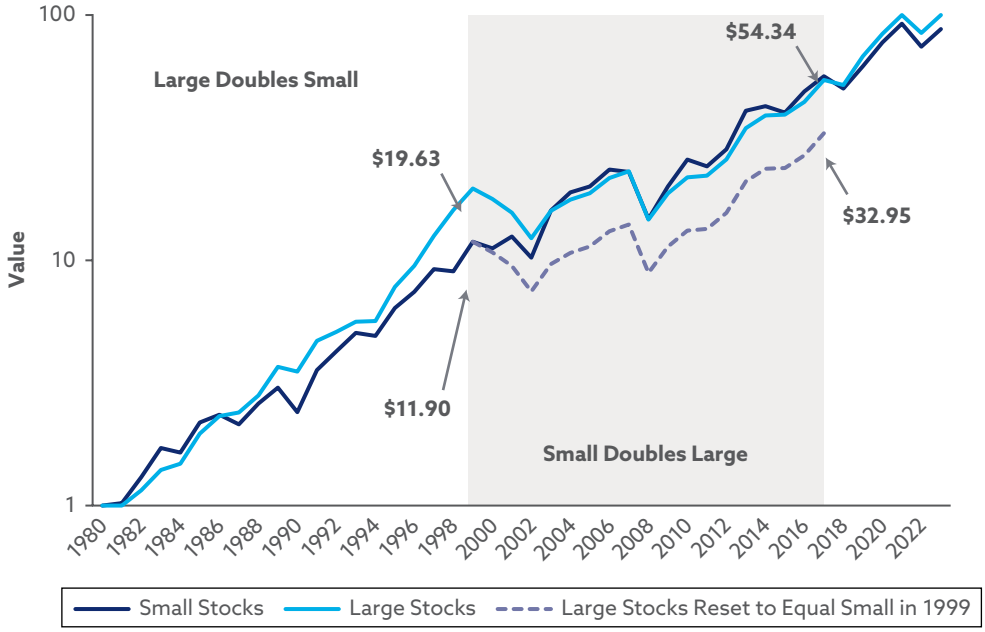
From around 1981, when Rolf W. Banz and Marc R. Reinganum first independently identified the size effect,[21] through 1999, the phenomenon seemingly disappeared as large caps effectively lapped small caps over those 18 years, backing up Laurence Siegel's claim that after being discovered, a factor is quickly arbitraged out of existence or already has been. But then the tide reversed, and small caps doubled the wealth of large caps over the subsequent 18 years.

According to McQuarrie, this dynamic does not make sense. "Arbitrage is ongoing, permanent; the factor can't come back once uncovered," he said. "I prefer an explanation of size and other factors in terms of random fluctuations of uncertain periodicity and magnitude."

Among the other size effect anomalies in the examination period, McQuarrie also pointed to a downswing before World War II that effectively canceled out a subsequent post-war upswing. "Stepping back—because this particular century-long sample in the SBBI study included three upswings and two downswings—on average, small stocks outperformed, and the lines end up separate on [Ibbotson's] chart," he said. "A different century-long sample, were it to include three downswings and two upswings, would conclude instead that there is a size effect favoring

[21]Rolf W. Banz, "The Relationship Between Return and Market Value of Common Stocks," *Journal of Financial Economics* 9 (March 1981): 3–18. doi:10.1016/0304-405X(81)90018-0. Marc R. Reinganum, "Abnormal Returns in Small Firm Portfolios." *Financial Analysts Journal* 37 (March–April 1981): 52–56. doi:10.2469/faj.v37.n2.52.

Exhibit 11. Small vs. Large Stocks, 1980–2024



Source: Dimensional Fund Advisors, with underlying data from the Kenneth R. French Data Library.

large stocks, and clever analysts would introduce explanations about the superior resilience of large businesses with ample capital buffers to explain 'the large cap effect.'"

Altogether, McQuarrie believes that the nuances of the size effect's performance are concealed in the chart design used by Ibbotson and Jeremy Siegel. The charts give investors the mistaken idea that a premium is effectively guaranteed. No such certainty exists in finance.

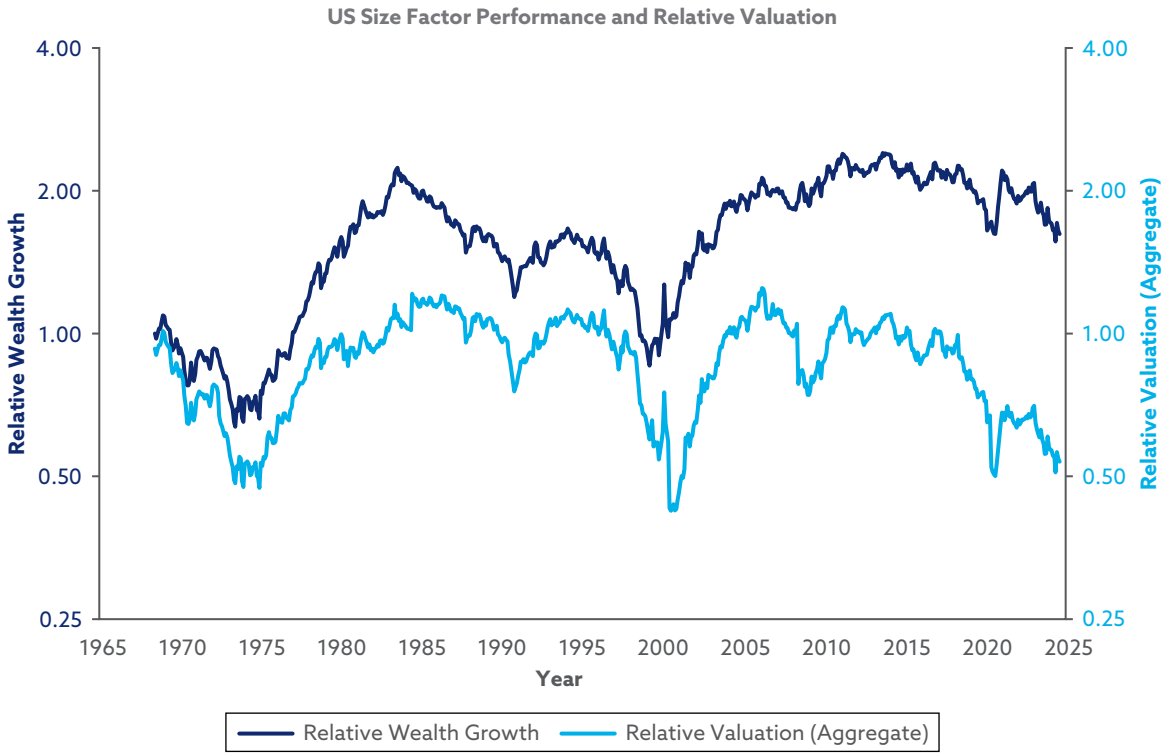
"We should do better by investors who consume our research in search of guidance for what to expect in their own investments going forward," McQuarrie concluded. "A new style of chart is required."

Murphy's Law, or "You're Buttering the Wrong Side"

Although McQuarrie is agnostic on the size effect, Elroy Dimson opposes investing on the basis of it. Dimson referred to his finding, in research with Paul Marsh, theorizing that the size effect adheres to Murphy's Law wherein "bread always falls with the buttered side down,"[22] meaning, in this case, that an anomaly once discovered is likely to reverse. But Dimson adds that Mrs. Murphy said we can never know which side to butter—that is, an anomaly that we believe will reverse is just as likely to continue full speed ahead. So, anomaly picking, much like stock picking, is as likely to produce losers as winners.

[22]Elroy Dimson and Paul Marsh, "Murphy's Law and Market Anomalies," *Journal of Portfolio Management* 25 (Winter 1999): 53–69. doi:10.2139/ssrn.135681.

Exhibit 12. Relative Return and Relative Valuation Analysis of US Small vs. US Large Stocks, 1968–2024



Source: Robert D. Arnott, Research Affiliates LLC.

But not everyone involved in the discussion agreed that the size effect is a chimera or simply the result of several outlier years. The size effect has not gone anywhere, according to Arnott. To support his case, he presented the chart shown in **Exhibit 12**.

Regarding Exhibit 12, Arnott said that "the excess return for the size effect is basically the dark blue line (left axis, growth of $1.00 in small divided by large). But the relative cheapness of small versus large is the light blue line (right axis, small-stock P/E divided by large-stock P/E). They're joined at the hip," he said. "When small stocks underperform, it's generally because the valuation spread between small and large is getting cheaper. So the power of the size effect is roughly captured by the widening wedge between the two lines."

What that means is when the light blue line falls faster than the dark blue line, small-cap investors would have generated excess returns had relative valuations remained static. Based on the chart, the size effect disappeared for about 15 years, between 1983 and 1998, which matches Dimson and Marsh's Murphy's Law periods.

Exhibit 13. Relative Return and Relative Valuation Analysis of Small US vs. Large US Stocks at Decade Intervals

Date	Cumulative Relative Return	Relative Valuation	Performance Net of Revaluation
March 1973	0.74	0.55	
March 1983	2.18	1.07	+51%
September 1993	1.62	1.08	–26%
September 2003	1.78	0.93	+28%
September 2013	2.40	1.08	+16%
September 2023	1.77	0.59	+35%

Source: Robert D. Arnott, Research Affiliates LLC.

"By the end of September 2023, the dark blue line was at 1.77," Arnott said. Based on a 1968 starting point, "a small-cap investor was 77% wealthier than a large cap investor, over this 55-year span." Yet that excess wealth was all created before March 1981, according to Arnott. Over the next 42.5 years, the size effect produced no excess return.

"But look how much the relative valuation of small-cap has tumbled!" he said. "In 1981, small cap was at 0.95 relative valuation, or 5% cheaper than large cap. It's now at 0.59, 41% cheaper than large-cap."

Arnott next presented the size effect's returns over the last five decades, shown in **Exhibit 13**.

The small-cap effect is suffering from the same affliction as the value factor, he concluded—"a horribly negative revaluation alpha," in Arnott's words—but for far, far longer.

So What's Next?

This deeper analysis of the size effect lends credence to McQuarrie's contention that some chart conventions may be counterproductive. "Size has been underwater for as long as 30 years," Dimson said. That is a significant span of time in most investors' lives. But most investors would have a hard time recognizing that wrinkle simply by looking at Ibbotson's Small Stocks for the Long Run chart. "The ordinary investor," McQuarrie said, "could not even conceive the possibility that a few outlier years are what drive that seemingly open-and-shut demonstration that small stocks produce more wealth than large stocks."

It requires, instead, a more skilled and discerning perspective both to recognize the various regimes and to identify the role skewness plays in them. Or as McQuarrie put it, "Do Small Stocks Outperform? Sometimes Yes. Sometimes No."

Afterword

Stocks are good for the long run. We cannot participate in the growth of the economy (outside our little personal corner of the world) without owning them. And the world economy will continue to grow as far into the future as the eye can see. There are no binding growth constraints other than the physical size of the planet, the resources within it, and the energy reaching it from the Sun. We are nowhere near reaching those. So, buy equities.

But, as Cliff Asness wrote in the *Journal of Portfolio Management* some time ago, bonds are also good for the long run.[23] There are worse things than earning a predictable 4% or 5% in interest, with price fluctuations averaging out to zero if we buy the bond at par and redeem it at par. So, buy bonds.

The equity premium is the expected difference between these two "good" investments (either of which can turn out to be bad investments for longer than we can remain solvent, as an aphorism often attributed to John Maynard Keynes reminds us). Why should this difference be a positive number? Because of the basic principle of the toy economy that the panelists discussed earlier: If there is a bond and a stock issued by the same issuer, the stock must be riskier because the bond has a senior claim on the issuer's cash flows. And no rational investor will choose the stock in this toy economy unless the investor reasonably expects the stock to have a higher return.

Extrapolating this principle to the whole economy and saying that "stocks in general" should outperform "bonds in general" is a bit of a stretch, because the two assets do not necessarily come from the same issuer and because there are, in this broader example, macro risks that do not exist in the toy economy. That said, the expectation of a positive equity premium is more likely to be correct than not.

But, as Peter Bernstein liked to say, "only for the most part!" Edward McQuarrie's research demonstrates that there can be long periods, some as long as an individual investor's adult life, when stocks and bonds have essentially the same returns. Investors need to be aware of this fact, which is supported by McQuarrie's and others' careful examination of history through the centuries and across many countries. And studying history is the best way for investors to understand the future. When it comes to investments today, the future is the only time period that matters, but we cannot see even a wisp of it. So study history—and, as history would tell us, allocate our assets between stocks and bonds, not "all equities all the time."

[23]Personal communication.

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