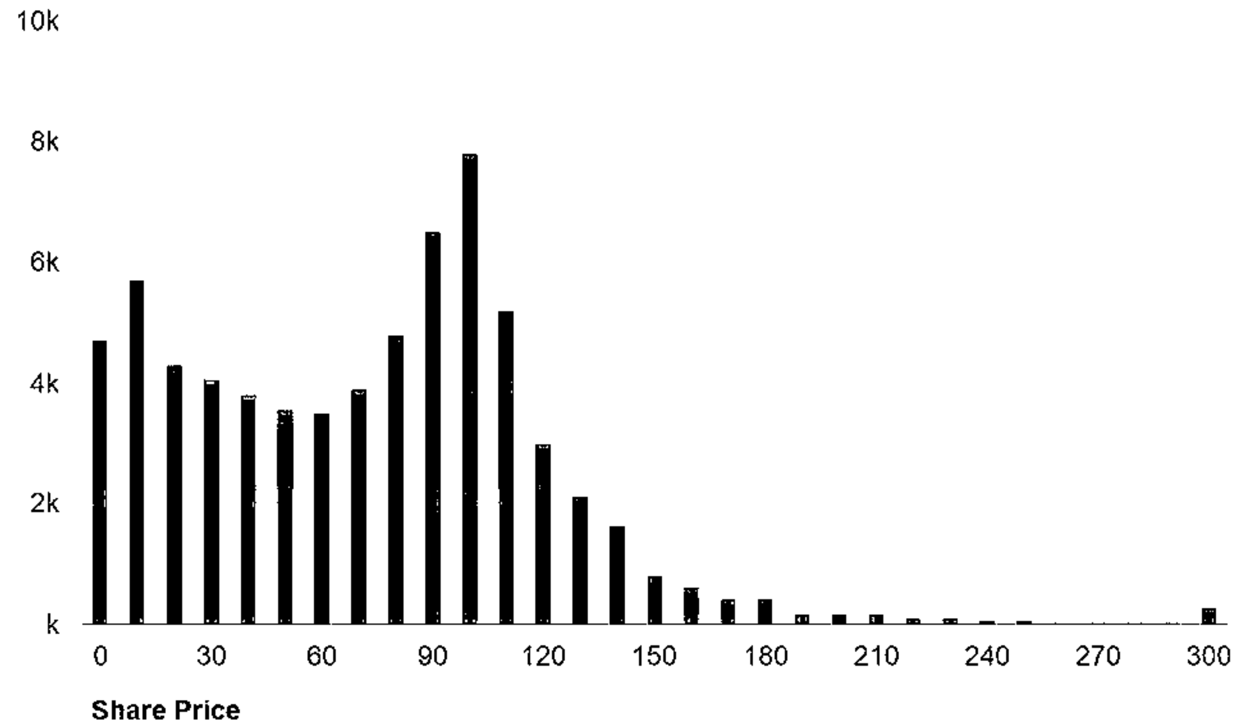
Share prices for much of the period of analysis remained around $100. Exhibit 11.1 illustrates this point. The graph shows that the most common price of a share of stock was around $100. The distribution of stock prices is significantly skewed to the left with only a few trading above $200. Such a distribution suggests that management maintained a ceiling on stock prices by paying out most earnings as dividends. No reports of stock splits over the period of data were discovered.

Exhibit 11.1: Distribution of Raw Stock Prices 1815–1925



Source of underlying data: Morningstar, Inc. Used with permission.

Dividend Collection

Dividend data was collected for the period 1825 to 1870 by identifying the semiannual dividend announcements for equity securities as reported in *The New York Shipping and Commercial*, *The Banker's Magazine*, *The New York Times*, and *The New York Herald*. From 1871 to 1925, aggregate dividend data from the Alfred Cowles [211] series was used. Whether the above publications reported dividends for all NYSE stocks is unknown; as a result, there is no way of knowing whether missing dividends meant that they were not paid or possibly not reported. Dividend records were collected for more than 500 stocks in the sample and most stocks paid dividends semiannually.

Two approaches were used to estimate the income return for each year. The first approach, the low-dividend return estimate, consisted of the summation of all the dividends paid in a given year

[211] Cowles, A. 1939. *Common Stock Indices* (Bloomington, Ind.: Principia Press).

by firms whose prices were observed in the preceding year. This number is then divided by the sum of the last available preceding year prices for those firms. The second approach, the high-dividend return estimate, focused solely on firms that paid regular dividends and for which price data was collected. The sample is restricted to firms that have two years of dividend payments (four semiannual dividends) and for which there was a price observation. Using the second approach, dividend yields tend to be quite high by modern standards. It is important to note that when both a high- and a low-income return series were present, the average was computed. This holds true for the summary statistics table in this chapter as well as the graphs/tables presented throughout. Also, due to missing income return data for 1868, an average of the previous 43 years was computed.

Price Index Estimation

Index Calculation Concerns

When attempting to construct an index without having market capitalization data readily available, one is left with one of two options: an equal-weighted index or a price-weighted index. One key concern with an equal weighted index is the effect of a bid-ask bounce. Take for example an illiquid stock that trades at either $1.00 or $2.00 per share. When it rises in price from $1.00 to $2.00, it goes up by 100%. When it decreases in price from $2.00 to $1.00, it drops by 50%. Equally weighting these returns can produce a substantial upward bias. This led us to the construction of a price-weighted index.

Calculation of the Price-Weighted Index

The procedure used for calculating the price-weighted index is rather simple. For each month, returns are calculated for all stocks that trade in two consecutive periods. These returns are weighted by the price at the beginning of the two periods. The return of the price-weighted index closely approximates the return to a "buy-and-hold" portfolio over the period. Buy-and-hold portfolios are not sensitive to bid-ask bounce bias. We believe that the price-weighted index does a fairly good job of avoiding such an upward bias. Companies were rather concentrated into specific industries. In 1815, the index was about evenly split between banks and insurance companies. Banks, transportation firms (primarily canals and railroads), and insurance companies made up the index by the 1850s. By the end of the sample period, the index was dominated by transport companies and other industrials.

A Look at the Historical Results

It is important to note that there are a few missing months of data that create gaps in the analysis. The NYSE was closed from July 1914 to December 1914 due to World War I. This is obviously an institutional gap. There are additional gaps; we are missing returns for 1822, part of 1848 and 1849, parts of 1866, all of 1867 and January 1868. We do not know whether the records missing from the late 1860s are due to the Civil War, but the NYSE was certainly open at that time –

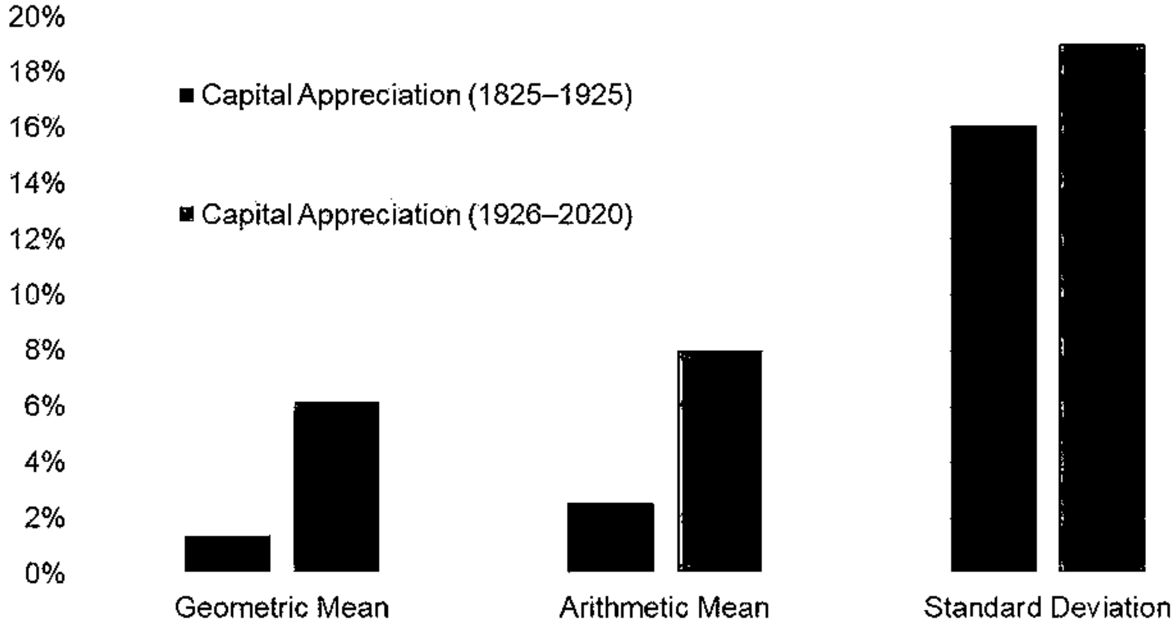
among other things, it was the era of heated speculation and stock price manipulation by legendary financiers Gould, Fisk, and Drew.

The number of available security records was quite lower after 1871. A change in the range of coverage by the financial press is the likely culprit for this. Further data collection efforts hopefully will allow these missing records to be filled in.

Price Return

Exhibit 11.2 illustrates the annual geometric mean, arithmetic mean, and standard deviation of large-cap stock capital appreciation (i.e., price) returns as measured over two different time horizons: 1825–1925, and 1926–2020. It is interesting to note that large-cap stocks had an annual geometric capital appreciation return from 1825 through 1925 of slightly more than 1%. This number is significantly *lower* when compared to the annual geometric capital appreciation return experienced by large-cap stocks from 1926 to 2020 (slightly more than 6%). This once again alludes to the suggestion that dividend policies have evolved over the past two centuries, and that managers of old companies most likely paid out earnings to keep their stock prices lower. In today's financial world, capital appreciation is accepted as a substitute for dividend payments.

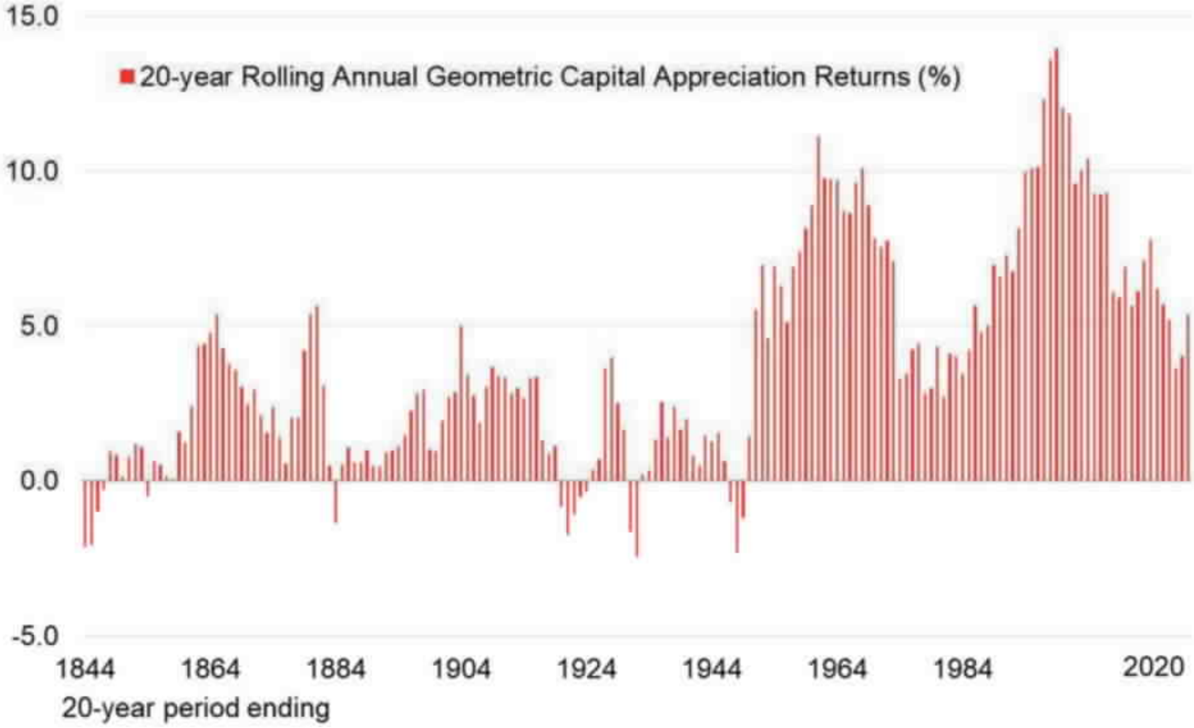
Exhibit 11.2: Large-Cap Stocks Capital Appreciation (i.e., "Price") Returns; Annual Geometric Mean, Geometric Mean, and Standard Deviation (%)
1825–1925 and 1926–2020



Source of underlying data: Morningstar, Inc. Used with permission. All rights reserved. Calculations by D&P/Kroll.

The rise in capital appreciation returns over the years is more evident when viewing returns on a 20-year rolling period basis as Exhibit 11.3 demonstrates. In Exhibit 11.3, the annual geometric (i.e., compound) capital appreciation return is calculated for all 20-year periods ending 1844 through 2020. For example, the leftmost bar in Exhibit 11.3 represents the annual compound rate of return over the period 1825–1844, and the rightmost bar in Exhibit 11.3 represents the annual compound rate of return over the period 2001–2020.

Exhibit 11.3: Large-Cap Stocks: 20-year Rolling Annual Geometric Capital Appreciation Returns (%) 1825–2020

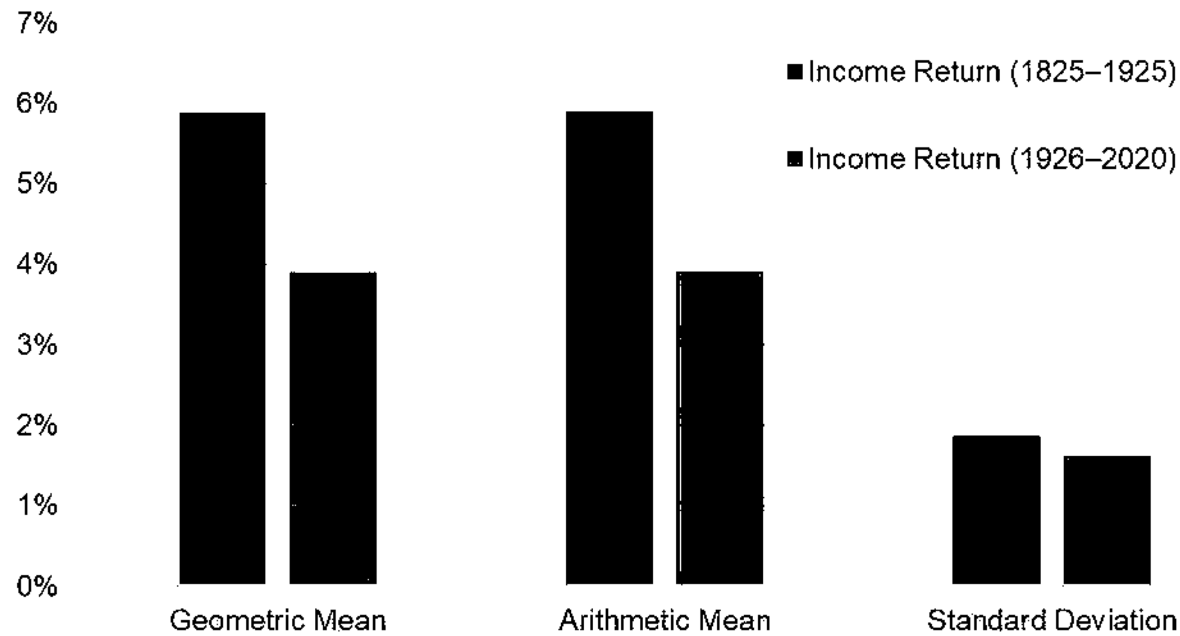


Source of underlying data: Morningstar, Inc. Used with permission. All rights reserved. Calculations by D&P/Kroll.

Income Return

Exhibit 11.4 illustrates the annual geometric mean, arithmetic mean, and standard deviation of large-cap stock income returns as measured over two different time horizons: 1825–1925, and 1926–2020. The *higher* income return of nearly 6% in the earlier period (1825–1925) compared to the *lower* income return in the later period (1926–2020) of less than 4%, and the fact the many stocks traded near par, once again suggest that most companies paid out a large share of their profits rather than retaining them.

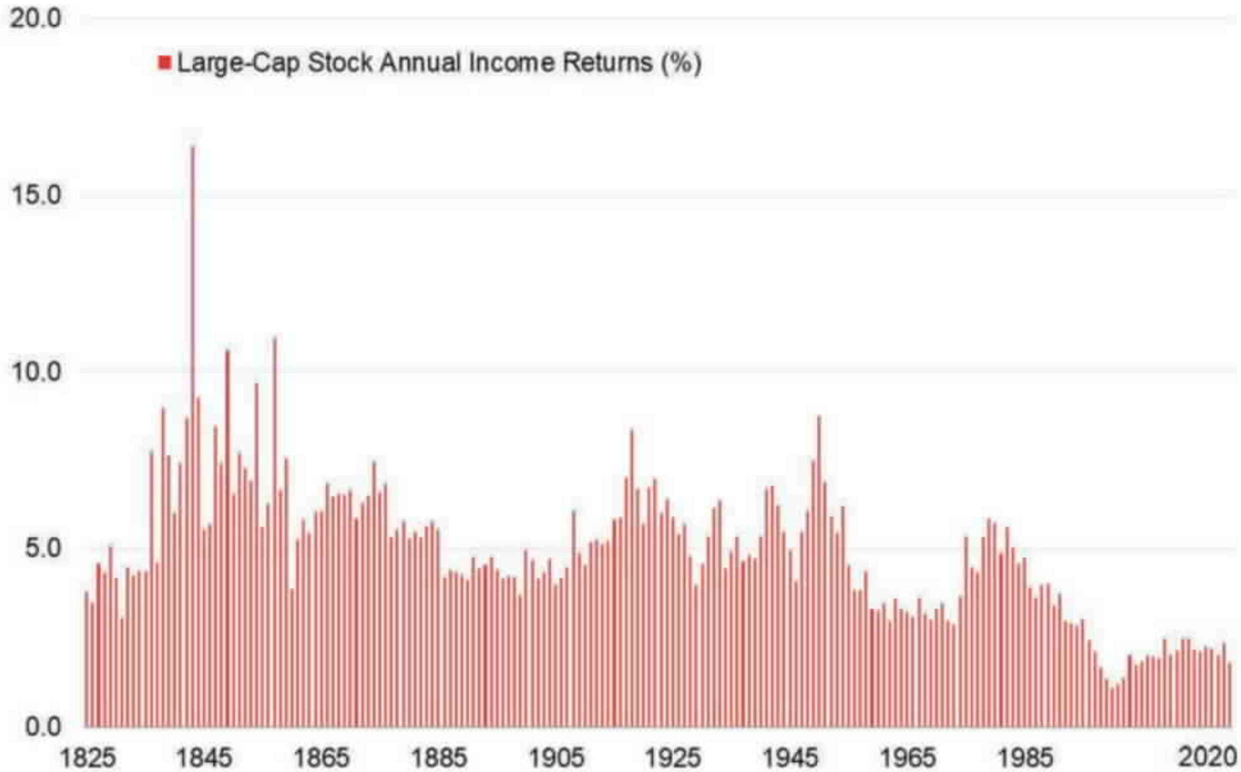
Exhibit 11.4: Large-Cap Stocks Income Returns; Annual Geometric Mean, Geometric Mean, and Standard Deviation (%)
1825–1925 and 1926–2020



Source of underlying data: Morningstar, Inc. Used with permission. All rights reserved. Calculations by D&P/Kroll.

Exhibit 11.5 shows large-cap stock annual income returns for 1825 to 2020. In fact, when looking at the time distribution of dividend changes over the new period, dividend decreases were only slightly less common than increases, suggesting that managers may have been less averse to cutting dividends than they are today. Perhaps in the pre-income tax environment of the 19th century, investors preferred income return as opposed to capital appreciation.

Exhibit 11.5: Large-Cap Stocks Annual Income Returns (%) 1825–2020



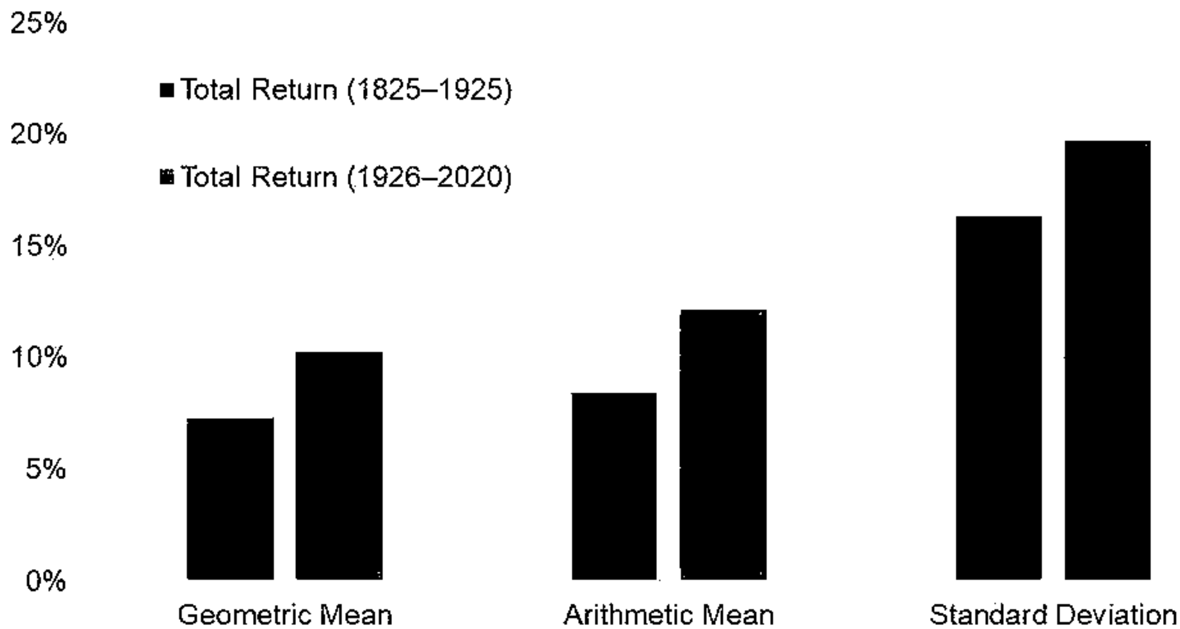
Source of underlying data: Morningstar, Inc. Used with permission. All rights reserved. Calculations by D&P/Kroll.

Total Return

Exhibit 11.6 illustrates the annual geometric mean, arithmetic mean, and standard deviation of large-cap stock total returns as measured over two different time horizons: 1825–1925, and 1926–2020.

It is interesting to notice that the annual geometric total return for large-cap stocks from 1825 to 1925 was a little over 7%. This is quite low when compared to the annual geometric total return of the commonly used 1926 to 2020 period (a little over 10%).

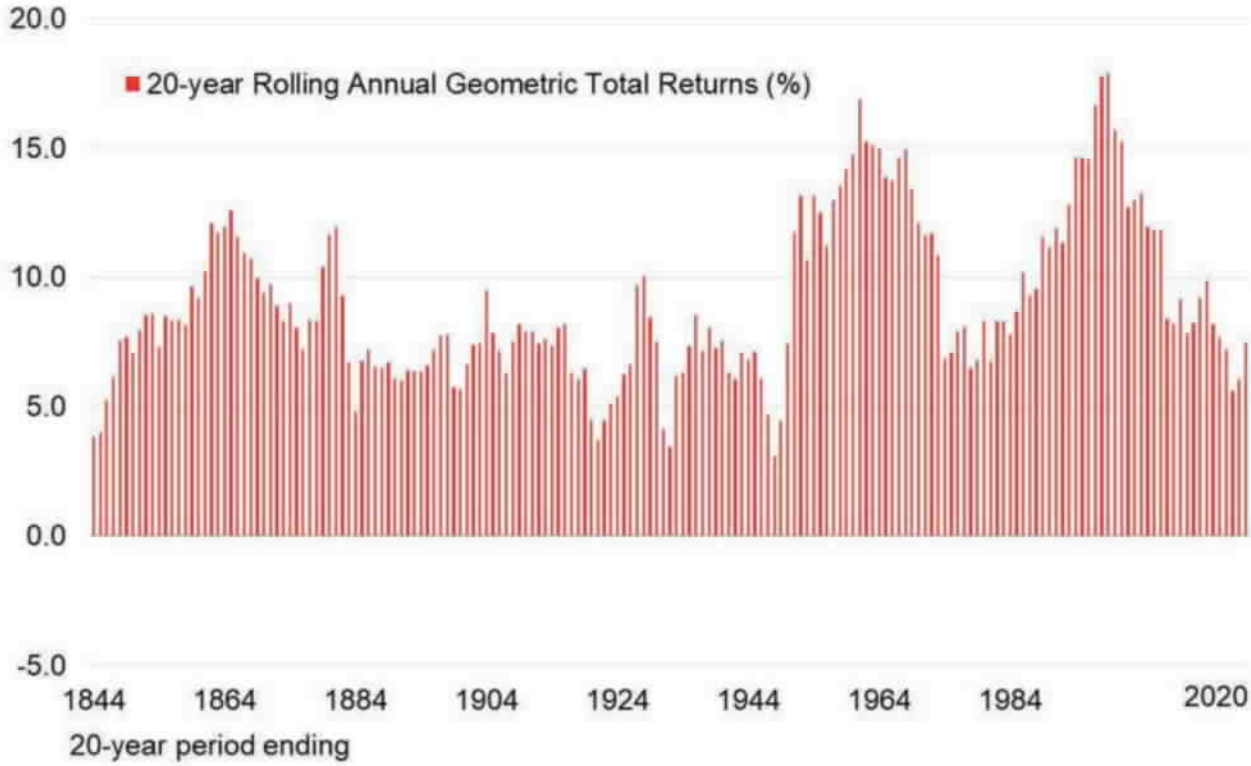
Exhibit 11.6: Large-Cap Stocks Total Returns; Annual Geometric Mean, Geometric Mean, and Standard Deviation (%)
1825–1925 and 1926–2020



Source of underlying data: Morningstar, Inc. Used with permission. All rights reserved. Calculations by D&P/Kroll.

In Exhibit 11.7, the annual geometric (i.e., compound) total return is calculated for all 20-year periods ending 1844 through 2020. For example, the leftmost bar in Exhibit 11.7 represents the annual compound rate of return over the period 1825–1844, and the rightmost bar in Exhibit 11.7 represents the annual compound rate of return over the period 2001–2020.

Exhibit 11.7: Large-Cap Stocks: 20-year Rolling Annual Geometric Total Returns (%) 1825–2020



Source of underlying data: Morningstar, Inc. Used with permission. All rights reserved. Calculations by D&P/Kroll.

150 Years of Stock Market Drawdowns

Those familiar with the history of U.S. capital markets as documented in this book may have found former Federal Reserve Chairman Alan Greenspan's characterization of the financial crisis of 2008 as a "once-in-a-century credit tsunami" quite surprising. A more appropriate statement may have been the one made by Leslie Rahl (founder of Capital Market Risk Advisors) more than a year before the crisis when she said, "We seem to have a once-in-a-lifetime crisis every three or four years."[212] Ms. Rahl was prescient – another "once in a lifetime" crisis occurred just 12 years later with the market crash in the first quarter of 2020 that was precipitated by the spread of the COVID-19 virus.

The contrast between Mr. Greenspan and Ms. Rahl's perspectives was the inspiration for an article in Morningstar magazine on the history of market meltdowns titled, "Déja Vu All Over Again."[213,214] In that article, Paul Kaplan, CFA, PhD (Director of Research, Morningstar Canada) illustrated the frequency and severity of the major drawdowns for various countries using time

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212 Wright, C. 2007. "Tail Tales." *CFA Institute Magazine*, March/April.

213 Morningstar magazine is a publication for financial advisors and institutional investors. For more information about Morningstar magazine, call 312 384-4000 or visit us online: global.morningstar.com/MorningstarMagazine.

214 Kaplan, P.D. 2009. "Déjà Vu All Over Again." *Morningstar Advisor magazine*, February/March, P. 28.

series of stock market total returns. For the U.S., Kaplan naturally used the SBBI® large-cap stock index (the SBBI® large-cap stock index is essentially the S&P 500 index). The results of the study clearly demonstrate the severity of the financial crisis of 2008 was not unique but was merely the latest chapter in a long history of market meltdowns.

In 2009, a team of researchers at Morningstar expanded the analysis into a complete study on global equity market history as a contribution to the CFA Institute book on the global history of market crashes.[215] In this study, the research team used monthly *real* total returns that go back into history as far as was possible with reasonably reliable data.[216] The benefit of using real returns is to make meaningful return comparisons as our study spans such a long period. The benefit of going further back in history is, of course, to give a longer-term and more robust historical perspective on market crashes in terms of frequency, length, and magnitude.

To complete the study, the research team needed to find monthly data from before 1925 on both stock returns and inflation and calculate real returns. Because there was no such return series in existence, they had to create one out of readable available data.

Robert J. Shiller, 2013 Nobel laureate in economic sciences and the Sterling professor of economics at Yale University, posts monthly U.S. stock market returns and inflation data on his website that go back to 1871. Unfortunately, Shiller's stock data is based on monthly average prices rather than month-end prices. So, the research team could use his inflation data, but not his stock market data. Separately, Roger Ibbotson and some colleagues created an annual price and total return series for the NYSE that goes back to 1815 (as previously discussed in this chapter).[217] However, annual returns are at too low a frequency to measure the largest drawdowns of the period, such as the large drop in the stock market during the panic of 1907. Fortunately, there is a book that contains daily price data on the Dow Jones Averages going back to 1885.[218] The team estimated the monthly price returns in the broader NYSE price index from the monthly price returns on the Dow Jones Averages and then interpolated the total returns by assuming that the dividend levels remained constant during each year.

The Morningstar team produced a time series of U.S. stock market real total returns from 1871 to 2020. The first 15 years of this history (1871–1885) is *annual* real total returns, and the remaining 135 years (1886–2020) is *monthly* total real returns, for a total of 150 years.

Truth in Numbers

The significance of this data is in the lessons that we can learn from it. Over the entire 150-year period, the Real U.S. Stock Market Index grew from $1.00 to $22,214.26in 1870 dollars. This is a compound annual real total return of 6.9%, almost the same as the post-1925 compound annual

[215] Kaplan, P.D., Idzorek, T., Gambera, M., et al. 2009. "The History and Economics of Stock Market Crashes." In *Insights into the Global Financial Crisis*. Edited by Laurence B. Siegel (Charlottesville, Va.: *CFA Institute*).

[216] That is, returns that include the reinvestment of dividends and are adjusted for inflation.

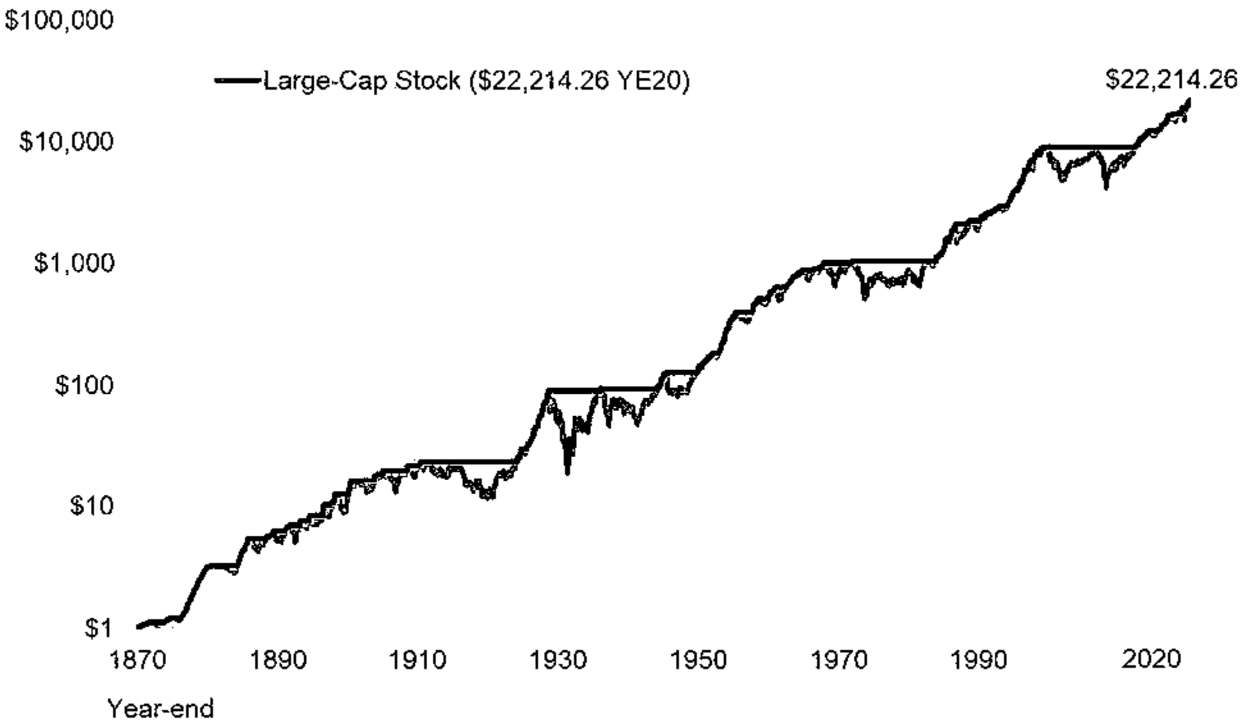
[217] Goetzmann, W.N., Ibbotson, R.G., & Peng, L. 2000. "A New Historical Database for the NYSE 1815 to 1925: Performance and Predictability." *Journal of Financial Markets*, Vol. 4, No. 1, P. 1.

[218] Pierce, P., ed. 1982. *The Dow Jones Averages 1885-1980* (Homewood, Ill.: Dow Jones-Irwin).

real total return of slightly over 7%. However, as Exhibit 11.8 shows, it was a very bumpy ride with a number of major drawdowns, some of which can be linked with specific economic and political events.

Exhibit 11.8 shows the growth of $1.00 invested in the U.S. stock market at the end of 1870 through December 2020 in *real* terms, along with a line that shows the highest level that the index had achieved as of that date (shown in gray).[219] Whenever this line is above the cumulative value line (shown in red), the index was below its most recent peak. The bigger the gap, the more severe the decline; the wider the gap, the longer the time until the index returned to its peak. Wherever this line coincides with the index line, the index was climbing to a new peak. The market crash in the first quarter of 2020 that was precipitated by the spread of the COVID 19 virus (when measured on a monthly basis) was significantly shorter and less acute than several of the drawdowns illustrated in Exhibit 11.8.

Exhibit 11.8: Large-cap Stocks: Real Return Index 1870–2020



Source of underlying data: Morningstar, Inc. Used with permission. All rights reserved. Calculations by D&P/Kroll.

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219 Beginning with the *2017 SBBI®* Yearbook, we changed Exhibit 11.8 compared to previous editions. The information in Exhibit 11.8 first appeared in the *2010 SBBI® Yearbook*. In the 2010 through 2016 *SBBI® Yearbooks*, the graph shown in Exhibit 11.8 included both *annual* returns (for years 1871–1885) and *monthly* data (for years 1886–present), which distorted the graph slightly. Beginning with the 2017 version, Exhibit 11.8 includes only *monthly* data points over the entire time horizon (1871–2020). For each of the first 15 years of the graph (1871–1885), the annual returns were converted to "monthly" returns by calculating the single monthly return that could be applied to each standard 12-month period (January through December) that would result in an annual geometric annual return matching the original study. For example, for year 1871 the original Morningstar study reported an annual return of 7.56%. The single value calculated for the imputed "monthly" returns for January 1871 through December 1871 was therefore 0.609% (1+7.56%)^(1/12).

Exhibit 11.9 lists all of the drawdowns that exceeded 20%. There were 17 such declines, including the most recent one that ended in May 2013. Not surprisingly, the largest of all market declines started just before the Crash of 1929 and did not recover until toward the end of 1936. The U.S. stock market lost 79% of its real value in less than three years and took more than five years to recover. The most recent drawdown, the global financial crisis, was the second greatest decline, and it lasted nearly a decade. The combined effect of the crash of the Internet bubble in 2000 and the global financial crisis of 2008 caused the U.S. stock market to lose 54% of its real value from August of 2000 to February 2009.

The history of stock market drawdowns presented here shows that investing in stocks can be very risky, and the most recent crisis was hardly a “once-in-a-century” event. We should use this long-run data to better gauge the potential risks and long-term rewards of investing in risky assets such as stocks.

Exhibit 11.9: Largest Declines in U.S. Stock Market History, in Real Total Return Terms 1870–2020

Peak	Trough	Decline (%)	Recovery	Event(s)
Aug. 1929	May 1932	79.00	Nov. 1936	Crash of 1929, 1st part of Great Depression
Aug. 2000	Feb. 2009	54.00	May 2013	Dot-com bubble burst (00-02), Crash 07-09
Dec.1972	Sep. 1974	51.86	Dec, 1984	Inflationary Bear Market, Vietnam, Watergate
Jun.1911	Dec. 1920	50.96	Dec. 1924	WWI, Post-war Auto Bubble Burst
Feb.1937	Mar. 1938	49.93	Feb. 1945	2nd part of Great Depression, WWII
May 1946	Feb. 1948	37.18	Oct. 1950	Post-war Bear Market
Nov.1968	Jun. 1970	35.46	Nov. 1972	Start of Inflationary Bear Market
Jan.1906	Oct. 1907	34.22	Aug. 1908	Panic of 1907
Apr.1899	Jun. 1900	30.41	Mar. 1901	Cornering of Northern Pacific Stock
Aug.1987	Nov. 1987	30.16	Jul. 1989	Black Monday
Oct.1892	Jul. 1893	27.32	Mar. 1894	Silver Agitation
Dec.1961	Jun. 1962	22.80	Apr. 1963	Height of the Cold War, Cuban Missile Crisis
Nov.1886	Mar. 1888	22.04	May 1889	Depression, Railroad Strikes
Apr.1903	Sep. 1903	21.67	Nov. 1904	Rich Man's Panic
Aug.1897	Mar. 1898	21.13	Aug. 1898	Outbreak of Boer War
Sep.1909	Jul. 1910	20.55	Feb. 1911	Enforcement of the Sherman Anti-Trust Act
May 1890	Jul. 1891	20.11	Feb. 1892	Baring Brothers Crisis

Source of underlying data: Morningstar, Inc. Used with permission. All rights reserved. Calculations by D&P/Kroll. In Exhibit 11.1, the Ibbotson Associates “Large Company Stocks” series represents U.S. equities for all dates from January 1926 forward. The Ibbotson Associates “Large Company Stocks” series is essentially the S&P 500 index.

In the fall of 2018, U.S. equity indices experienced significant declines. The S&P price index peaked at 2,930.75 on September 20, 2018; By December 24, 2018, the S&P 500 price index had declined to 2,351.10, or –19.8%, just short of the –20% threshold necessary to qualify it to appear in Exhibit 11.8.

Most recently, the market crash in the first quarter of 2020 that was precipitated by the spread of the COVID-19 virus (when measured on a monthly basis, as the analysis presented in Exhibit 11.8 is) also did not meet the 20% threshold. As of December 31, 2019 the S&P 500 total return index ($1.00 = December 31, 1925) was $9,243.90, a record high. By the end of March 2020 the index had fallen to $7,432.28, a drop of 19.6%. On a daily basis, however, the S&P price index was 3,386.15 on February 19, 2020. By March 23, 2020 this index had fallen to 2,237.40, representing a 33.9% decline.[220]

Traditional measures of risk, such as standard deviation, can underestimate the risk of drawdowns that are many standard deviations away from the mean (i.e., on the left tail of a distribution). We suggest that these traditional measures of risk be supplemented with measures that better capture the "fat tailed" nature of the historical returns and drawdowns as presented here. A complete discussion of incorporating fat-tailed distributions into risk measures is found in Chapter 10.

Reaching Back Beyond 1926

Collection efforts have yielded a comprehensive database of NYSE security prices for nearly the entire history of the exchange. The goal of these studies is to assemble a NYSE database for the period prior to 1926. The 1926 starting date was approximately when high-quality financial data came into existence. However, with a pre-1926 database assembled, researchers can expand their analyses back to the early 1800s. It is our hope that the long time series outlined in this chapter will lead to a better understanding of how the U.S. stock market evolved from an emerging market at the turn of the 18th century to the largest capital market in the world today.

The Origin of Market Bubbles

As we've seen so far in this chapter, we have witnessed many asset-price bubbles. In each case, the story seems to be the same: Positive feedback and herding among speculative investors produce runaway prices until the deviation from equilibrium is so large that the market becomes unstable, creating a high probability (or an inevitability) of a crash. This raises the question: Do asset-price bubbles typically share the same characteristics and do all bubbles originate in the same manner? If yes, can we identify these factors beforehand and predict when a bubble will burst? James Xiong, head of quantitative research at Morningstar Investment Management, addressed these questions in an article in Morningstar magazine, "The Chinese Art Market and the Origin of Bubbles."[221] The rest of this section has been written by Xiong and adapted from his article.

[220] Source of daily S&P 500 price index data: Yahoo Finance at https://finance.yahoo.com/.

[221] Xiong, J. 2012. "The Chinese Art Market and the Origin of Bubbles." *Morningstar magazine*, August/September, P. 64.

Herd Behavior and Market Bubbles

A number of studies have considered herd behavior as a possible explanation for the excessive volatility observed in financial markets.[222] The thinking behind this approach is simple: Interaction of market participants through herding can lead to large fluctuations in aggregate demand, leading to heavy tails in the distribution of returns. In the popular literature, "crowd effects" often have been associated with large fluctuations in market prices of financial assets.

Robert Shiller provides evidence to support his argument that "irrational exuberance" played a role in producing the ups and downs of the stock and real estate markets.[223] He listed 12 precipitating factors that gave rise to the booms in the stock markets and housing markets. These factors are amplified via feedback loops and naturally occurring Ponzi schemes, aided by the media, and can ultimately lead to market crashes.

Shiller also demonstrates that psychological factors, such as herd behavior and epidemics, are exerting important effects. For example, the influence of authority over people can be enormous; people are ready to believe authorities even when they plainly contradict matter-of-fact judgment.

He cites many other factors, including that people tend to follow other people and choose not to exercise their own judgment about the market; also, most people purchase stocks based on direct interpersonal communication instead of independent research.

Rama Cont and Jean-Philippe Bouchaud[224] provide a mathematical model to link two well-known market phenomena: the heavy tails observed in the distribution of stock market returns on one hand and herding behavior in financial markets on the other hand.

Predicting Crashes

In the 1990s, two groups of researchers[225] independently discovered an apparent tendency of stock prices to exhibit log-periodic power laws (LPPL) before a crash. The fundamental hypothesis of the model is that financial crashes are macroscopic examples of critical phenomena. A critical phenomenon indicates a highly correlated unstable market. In other words, as some traders say, "In a market crisis, all correlations jump to one."

Collective behaviors in people emerge through the forces of imitation, which leads to herding. Herding behavior of investors can result in a significant deviation of financial prices from their

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222 See three references: Bannerjee, A.V. 1992. "A Simple Model of Herd Behavior," *Quarterly Journal of Economics*, Vol. 107, P. 797. Topol, R. 1991. "Bubbles and Volatility of Stock Prices: Effect of Mimetic Contagion," *The Economic Journal*, Vol. 101, P. 786. Shiller, R.J. 1989. *Market Volatility* (Cambridge, Mass.: MIT Press).

223 Shiller, R.J. 2005. *Irrational Exuberance*, 2nd ed. (Princeton, N.J: Princeton University Press).

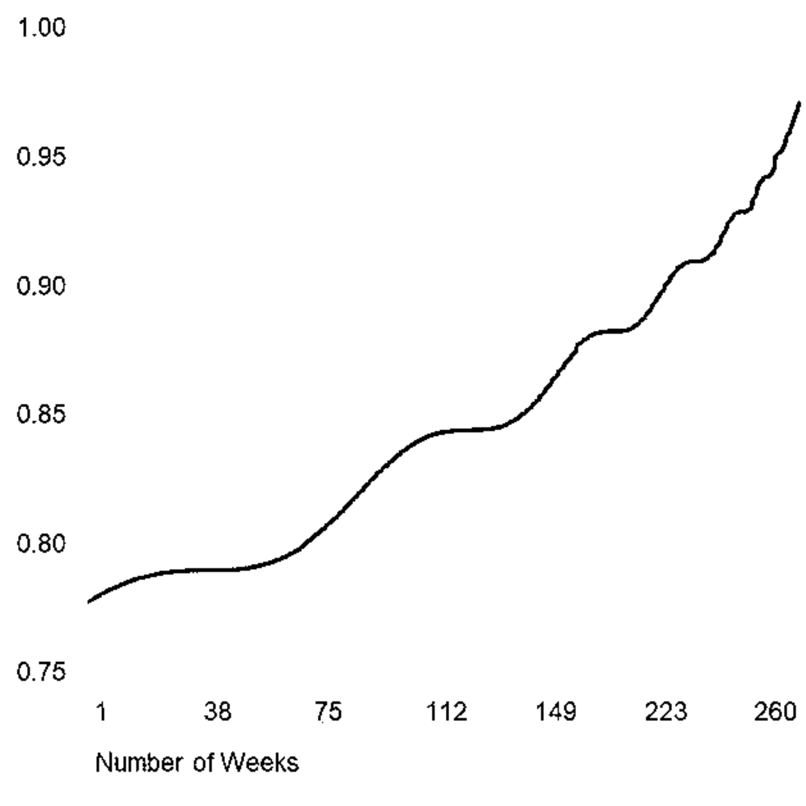
224 Cont, R. & Bouchaud, J.-P. 2000. "Herd Behavior and Aggregate Fluctuations in Financial Markets," *Journal of Macroeconomic Dynamics*, Vol. 4, P. 170.

225 See two references: Sornette, D., Johansen, A. & Bouchaud, J.-P. 1996. "Stock Market Crashes, Precursors and Replicas," *J. Phys. I.* (France), Vol. 6, P. 167. Feigenbaum, J. & Freund, P.G.O. 1996. "Discrete Scale Invariance in Stock Markets Before Crashes," *International Journal of Modern Physics B*, Vol. 10, P. 3737.

fundamental values. A speculative bubble, which is caused by a positive feedback investing style, also leads to a faster-than exponential power law growth of prices.[226] The competition between such nonlinear positive feedbacks and negative feedbacks contributes to nonlinear oscillations. For example, technical investors who have a positive view of the market bid up prices at the expense of fundamental investors, who view the market as ridiculously overpriced. The result is that a log-periodic modulation of the price accelerates up to the crash point. Exhibit 11.10 shows an example of what smooth log-periodic oscillations look like. Notice how the oscillations and the index value increase at an increasing rate as the date gets closer to the crash date.

Like any other models, the LPPL model has been debated and challenged, and we will not attempt to discuss that here. Major stock market crashes around the world, however, can be quantitatively explained by this model. These crashes include the 1929 crash, the 1987 crash, the crash of the Russian market in 1998, the 1990 Japanese Nikkei Index crash, several Hong Kong crashes in the 1990s, the Internet bubble crash in 2000, the financial crisis of 2008–2009, and more than 20 emerging-markets crashes. All of these market bubbles appeared to show the similar LPPL before they crashed.

Exhibit 11.10: Example of Log-Periodic Oscillations



[226] Sornette, D. 2003. *Why Stock Markets Crash: Critical Events in Complex Financial Systems* (Princeton, N.J.: Princeton University Press).

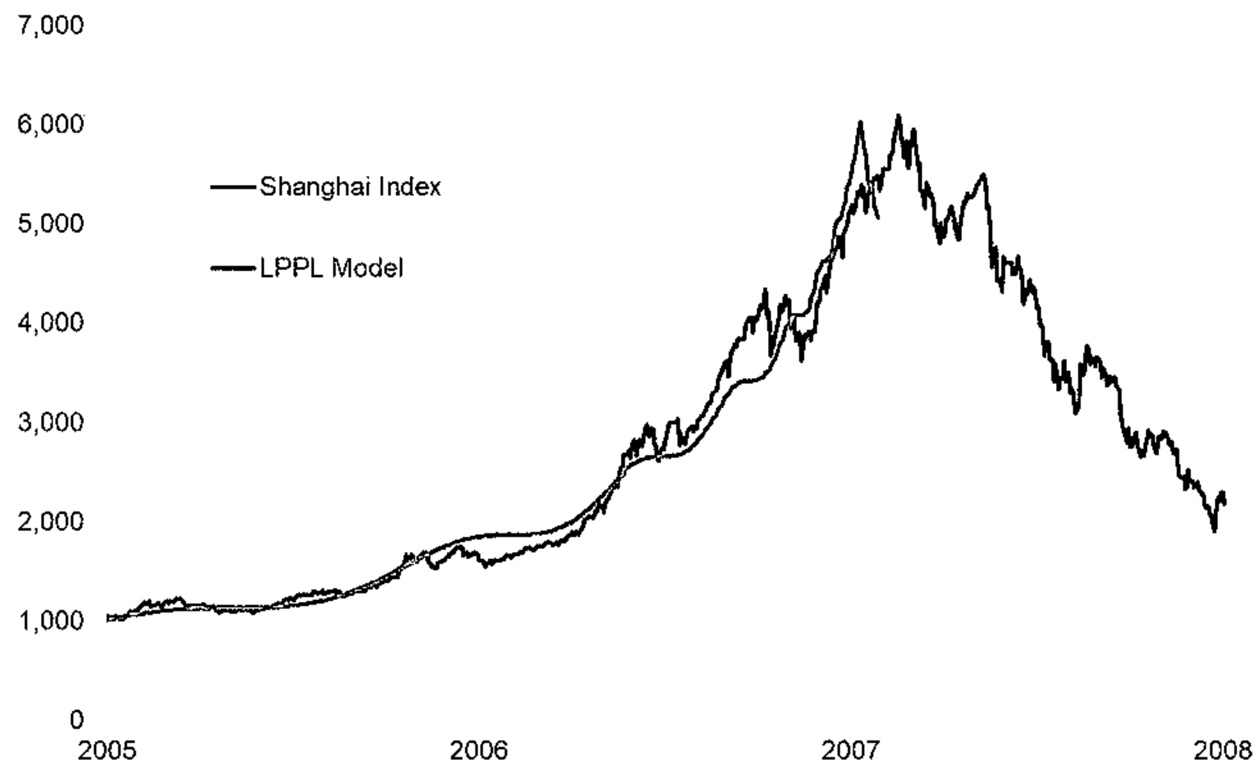
Chinese Stock Market Crash of 2007

Greed and fear are rooted in human nature, so it is unlikely that people will change anytime soon. Greediness and fear also drive herding and positive feedbacks, so investors should expect these factors to remain in markets. The latest herding example occurred not too long ago, in 2007. In particular, we'll look at the Chinese stock market crash.

We use the Shanghai Stock Exchange Composite Index to represent the Chinese stock market. The Chinese stock market is dominated by individual investors, unlike equity markets in developed countries where a form of polarization exists between individual and institutional investors. Millions of new Chinese small investors flooded into the booming Chinese stock market from 2005 to 2007, indicating a strong herd behavior. The bubble burst in October 2007. A year after the crash, the Shanghai Composite had lost about 64% of its value, a classic example of herd behavior leading to a market crash in an emerging market.

Using the LPPL model, Exhibit 11.11 shows that the Chinese stock market crash in 2007 was predictable. The gray line charts the price of the index. The red line is the calculated curve based on the LPPL model. The out-of-sample test was made Sept. 25, 2007. The model predicted a crash date of Sept. 5, 2007. The actual crash started Oct. 17, 2007, 42 days later than predicted. The time series price index is reasonably fitted by the log periodic power law model; we can see the precursors of log periodic oscillations before the crash occurred.

Exhibit 11.11: Chinese Stock Market Crash Predicted by LPPL Model



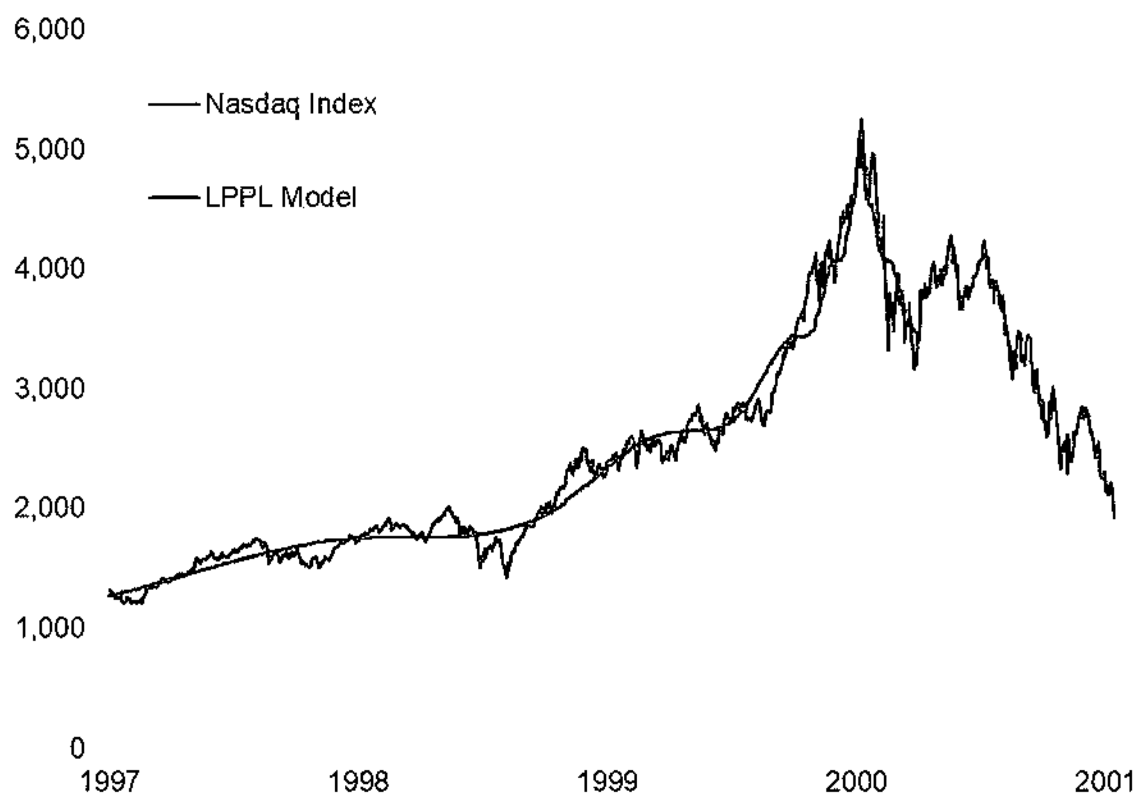
NASDAQ Crash of 2000

History provides many examples of bubbles driven by unrealistic expectations of future earnings. These types of bubbles do not just occur in developing markets. An example is the NASDAQ crash of 2000.

The NASDAQ Composite Index consists mainly of technology stocks, such as Internet, e-commerce, software, computer hardware, and telecommunications names. When the NASDAQ closed at a high of 5,049 on March 10, 2000, many stocks were trading at four-digit price/earnings (P/E) ratios.[227] Brocade Communications Systems, for example, had a P/E of 6,185; Trend Micro ADR had a P/E of 4,350; and SeaChange International traded at a P/E of 3,765. Investors in these companies seemed to be focusing on high future earnings and seemingly did not focus on other economic fundamentals.

Exhibit 11.12 shows the bubble phase of the NASDAQ. The red line stands for the price of the index. The red line is based on the LPPL model. Again, the model clearly picked up the signals of an impending crash and almost perfectly predicted it.

Exhibit 11.12: NASDAQ Market Crash Predicted by LPPL Model



[227] The March 10, 2000 closing level (5,049) was an all-time high close for the NASDAQ at the time. The NASDAQ did not close above this price until over 14 years later, April 23, 2014, when the index closed at 5,056.06.

The LPPL Model

The log-periodic power law can be quantified as:[228]

$$\ln[p(t)] = A - B\tau^m + C\tau^m \cos[\omega \ln(\tau) - \varphi]$$

Where:

- $p(t)$ = price
- A = The peak value of $\ln(p(t))$
- B = Base for the slope of the logarithmic curve
- τ = $t_c - t$; which is the distance to the end of the bubble
- m = Growth accelerator; must be $0 < m < 1$
- C = Base for the oscillations; must be > 0
- ω = Angular log-frequency
- φ = Arbitrary phase determining the unit of time

A geometric description for LPPL Model is that a log-periodic modulation of the ln(price) accelerates up to the crash point. The combination of *B* with a value greater than 0 and *m* with a value between 0 and 1 accelerates the slope so that it is faster than a typical exponential acceleration. The combination of *C* and the cosine segment determines the amplitude and frequency of the log-periodic oscillations.

We used the Levenberg Marquardt algorithm to predict the crash for the two bubbles (Exhibits 11.11 and 11.12). The fitted parameters are exhibited in Exhibit 11.13.

Exhibit 11.13: Best Fitted Parameters for the Shanghai Composite Index and the NASDAQ Index

Stock	t_c	m	w	ϕ	A	B	C
Shanghai Index	September 2007	0.64	10.90	4.91	2.17	0.15	-0.01
NASDAQ Index	March 2000	0.45	6.45	5.26	8.61	0.88	0.06

[228] Sornette, D. 2003. *Why Stock Markets Crash: Critical Events in Complex Financial Systems* (Princeton, N.J.: Princeton University Press).

Power of the Model

We showed that two recent market bubbles displayed the same LPPL signature before they crashed. Our analyses indicate that all the bubbles have the same origins and similarly move toward a crash.

Positive feedback and herding produce runaway prices until the deviation from equilibrium is so large that the market is unstable and has a high probability to crash. When the stock price accelerates at a much faster rate than the exponential growth rate, the skyrocketing return will always come with an increased crash hazard rate.

Financial markets are complex systems. In such systems, a speculative bubble can easily be created through positive feedback. What is more challenging is that, as complex systems grow, two things happen.[229] These systems require exponentially greater amounts of energy to keep operating, and they become vastly more risky and prone to catastrophic failure.

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[229] Rickards, J. 2011. *Currency Wars: The Making of the Next Global Crisis* (New York: Portfolio/Penguin).

Chapter 12
International Equity Investing[230]

International investment opportunities are growing rapidly, encouraged by open markets and the accelerating economies of many nations. The evidence in favor of taking a global approach to investing is plentiful, as are the possible rewards an investor can reap.

However, significant risks are present as well – risks that apply strictly to the international marketplace. In this chapter, we consider both the rewards and the risks associated with international investments.

Construction of the International Indexes

Our analysis of international investing uses the indexes created by Morgan Stanley Capital International, Inc. The MSCI® indexes are designed to measure the performance of the developed and emerging stock markets, reflecting the performance of the entire range of stocks available to investors in each local market.[231,232]

From January 1970 to October 2001, inclusion in the MSCI indexes was based upon market capitalization. Stocks chosen for the indexes were required to have a target market representation of 60% of total market capitalization.

MSCI has enhanced its index construction methodology by free-float-adjusting constituents' index weights and increasing the target market representation. Target market representation increased

[230] This chapter is an overview of international equity investing that is limited to analyzing the relative historical performance of international (versus U.S.) equities, and does not include the much-expanded analyses of country-level risks and industry level risks (on a global scale) that are available in the D&P/Kroll online Cost of Capital Navigator platform's (i) International Cost of Capital Module, and (ii) International Industry Benchmarking Module. To learn more about the Capital Navigator, visit dpcostofcapital.com. These two resources are summarized as follows: International Cost of Capital Module: Provides measures of relative country risk for over 175 countries from the perspective of investors based in over 50 countries. Other data includes equity risk premia for 16 countries, risk-free rates for developed markets, industry betas for a global index as well as for developed markets, and long-term inflation expectations and corporate income tax rates for over 175 countries. Full country risk premia (CRPs) and relative volatility (RV) factor Tables by country (depending on subscription level). International Industry Benchmarking Module: Provides industry-level cost of capital estimates (cost of equity capital, cost of debt capital, and weighted average cost of capital, or WACC) plus detailed industry-level statistics for sales, market capitalization, capital structure, levered and unlevered betas, valuation multiples, financial and profitability ratios, equity returns, aggregate forward-looking earnings-per share (EPS) growth rates, and more. Over 300 critical industry-level data points are calculated for each industry (depending on data availability). Industries are organized by global industry classification standard (GICS) code. The International Industry Benchmarking Module can be used to benchmark, augment, and support the analyst's own custom analysis of the industry in which a subject business, business ownership interest, security, or intangible asset resides. The Cost of Capital Navigator also has two U.S.-centric modules: the U.S. Cost of Capital Module and the U.S. Industry Benchmarking Module. For more information about the Cost of Capital Navigator visit dpcostofcapital.com.

[231] The international stock series presented throughout this chapter is represented by the MSCI EAFE® equities index. The MSCI EAFE Index is an equity index which captures large- and mid-cap representation across Developed Markets countries around the world, excluding the US and Canada. With 918 constituents, the index covers approximately 85% of the free float-adjusted market capitalization in each country. To learn more about MSCI, visit msci.com.

[232] All returns and statistics in this chapter are expressed in $USD, unless otherwise noted.

from 60% of total market capitalization to 85% of free-float-adjusted market cap within each industry group, within each country. MSCI defines the free float of a security as the proportion of shares outstanding that is deemed to be available for purchase in the public equity markets by international investors.

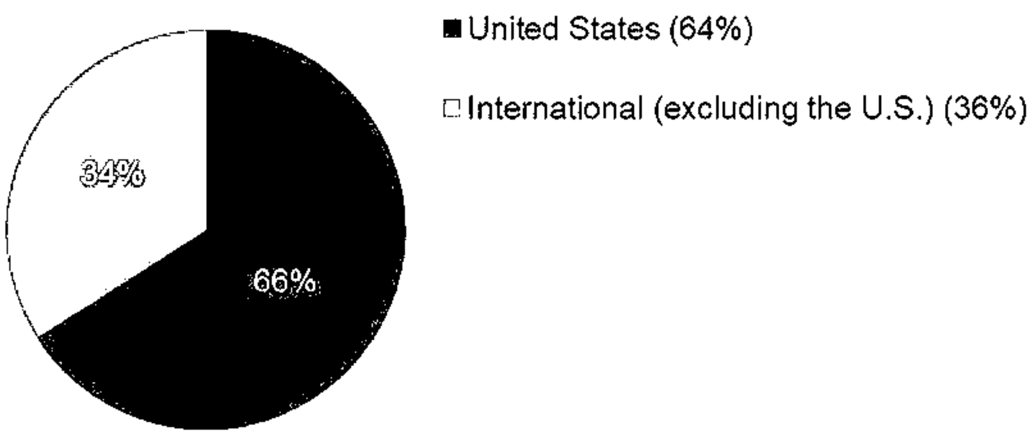
Benefits of Investing Internationally

The arguments for investing internationally can be powerful. Examples may include (i) participation in the more than half of the world's investable assets that exist outside the U.S., (ii) growth potential, (iii) diversification, and (iv) potential improvement of the risk/reward trade-off.

Investment Opportunities

An investor who chooses to ignore investment opportunities outside of the U.S. is missing out on a significant percentage of the investable developed stock market opportunities in the world. Exhibit 12.1 presents the relative size of international and domestic developed markets as of February 2021. As of February 2021, the total developed world stock market capitalization was $52.1 trillion, with $17.7 trillion representing international stock market capitalization.[233]

Exhibit 12.1: MSCI World Stock Market Capitalization: $52.1 Trillion
February 2021



[233] **Source:** MSCI World Index Equity Fact Sheet. For more information, visit: msci.com.

Growth Potential

Exhibit 12.2 Illustrates the growth of $1.00 invested in international stocks (as represented by the MSCI EAFE index), and U.S. large-cap stocks (i.e., the S&P 500 total return index), long-term government bonds, U.S. Treasury Bills, and a hypothetical asset returning the inflation rate over the period from the end of 1969 to the end of 2020.[234] Of the asset classes shown in Exhibit 12.2, the $1.00 invested at year-end 1969 in U.S. large-cap stocks grew the most by year-end 2020 (over $180), followed by International Stocks (over $90).

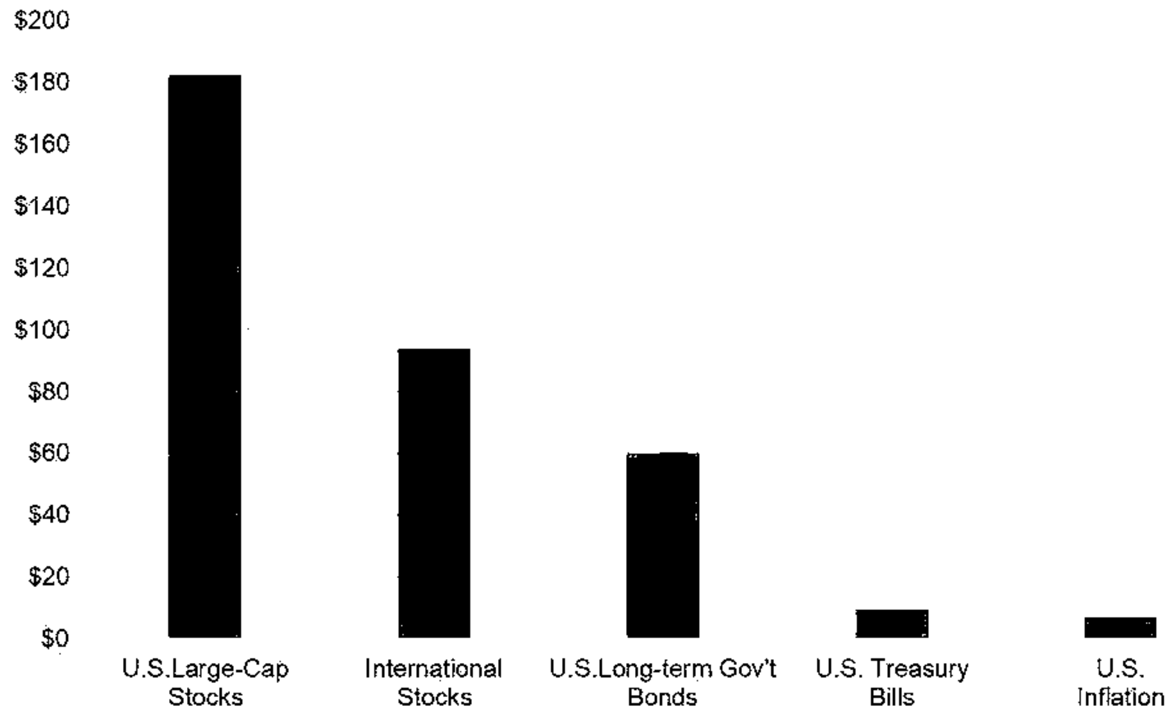
In the time horizon over which this analysis is performed (1970–2020), international stocks generally outperformed U.S. large-cap stocks from 1970 through the late 1990s, but in more recent years U.S. large-cap stocks have generally outperformed international stocks.

To illustrate this seeming reversal of relative performance in more recent years, consider that a $1.00 investment at year-end 1969 in U.S. large-cap stocks would have grown to nearly $19 by end of 1995, but the same dollar invested in international stocks would have grown to nearly $25. However, a $1.00 investment at year-end 1995 in U.S. large-cap stocks would have grown to nearly $10 by the end of 2020 (25 years), but the same dollar invested in international stocks would have grown to slightly a little more than $3.70.

Both U.S. and international stocks were affected by the 2008 financial crisis. In 2008, U.S. large-cap stocks fell nearly 37% and international stocks fell over 43%. In the twelve-year period after 2008, both U.S. large-cap stocks and international stocks have recovered, with U.S. large-cap stocks producing an approximate 15% annual return, significantly outperforming international stocks which produced an annual return of just over 8%.

[234] In this chapter, the "U.S." series used are the same "SBBI" series used throughout the rest of this book. "U.S." is added to these series' names in this chapter only to differentiate them from the MSCI EAFE equities index, which is used to represent "international" equities in this chapter.

Exhibit 12.2: Global Investing
Index (Year-end 1969 = $1.00) 1970–2020

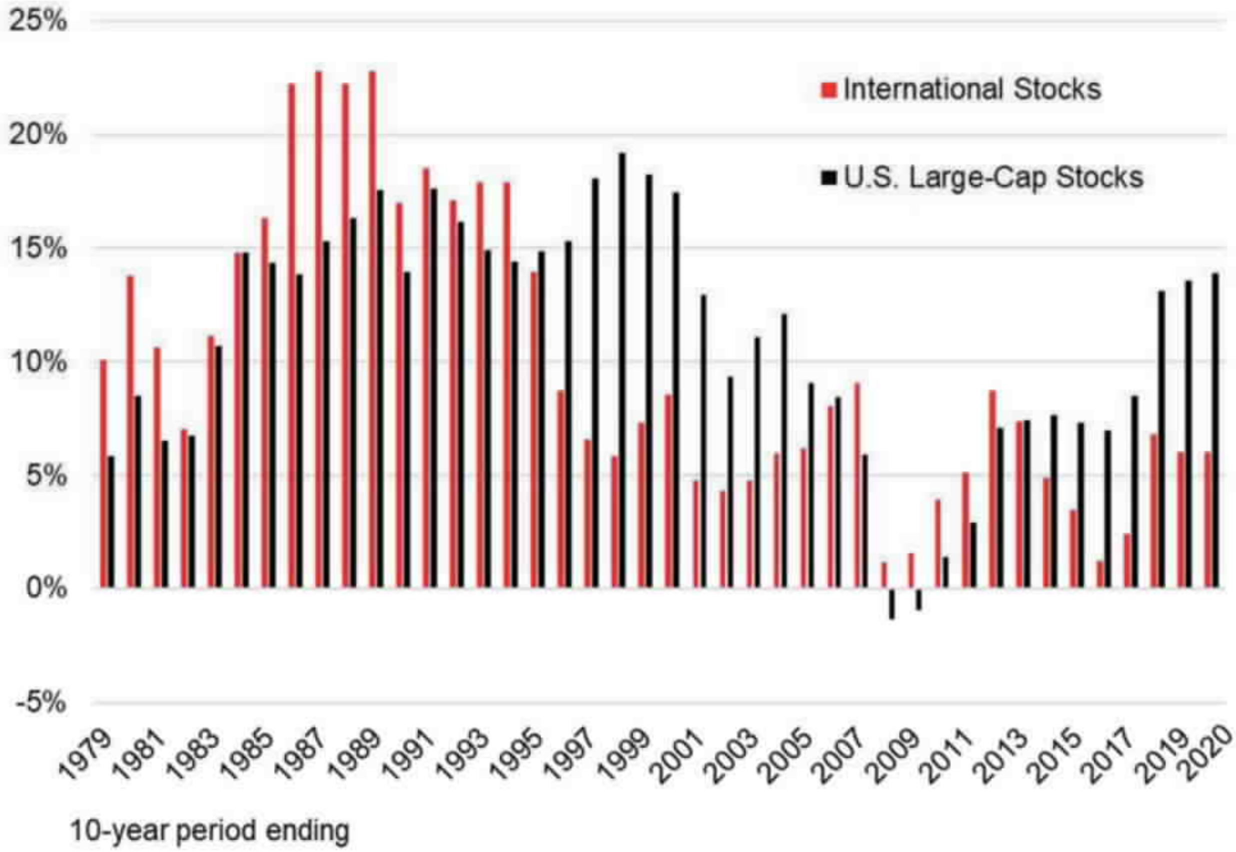


Source 1 of underlying data: Morningstar, Inc. Used with permission. All rights reserved. Calculations by D&P/Kroll. Asset classes and inflation represented by the Ibbotson Associates (IA) Stocks, Bonds, Bills, and Inflation® (SBBI®) series, as follows: (i) Large-Cap Stocks: IA SBBI® US Large Stock TR USD Ext, (ii) Long-Term (i.e. 20-year) Government Bonds: IA SBBI® US LT Govt TR USD, (iii) (30-day) Treasury Bills: IA SBBI® US 30 Day TBill TR USD, and (vii) Inflation: IA SBBI® US Inflation. For a detailed description of the SBBI® series, see Chapter 3, "Description of the Basic Series". "Stocks, Bonds, Bills, and Inflation" and "SBBI" are registered trademarks of Morningstar, Inc. All rights reserved. Used with permission. **Source 2 of underlying data:** The international stock series is represented by the MSCI EAFE® equities index. To learn more about MSCI, visit msci.com.

An additional perspective of the relative returns of U.S. large-cap stocks and international stocks is provided in Exhibit 12.3, which shows the annual compound performance of international and U.S. large-cap stocks over rolling 10-year holding periods ending 1979 through 2020.

International stocks outperformed in each of the 10-year periods ending 1979 through 1994, but U.S. large-cap stocks outperformed International stocks in 20 out of the 26 10-year periods ending 1995 through 2020, sometimes quite significantly. For example, in the twelve-year period since 2008, U.S. large-cap stocks have outperformed international stocks by a factor of two (approximately 15% annual compound return versus just over 8% annual compound return, respectively).

Exhibit 12.3: U.S. Large-Cap Stocks and International Stocks, 10-Year Holding Period Compound Annual Total Returns (%) 1970–2020

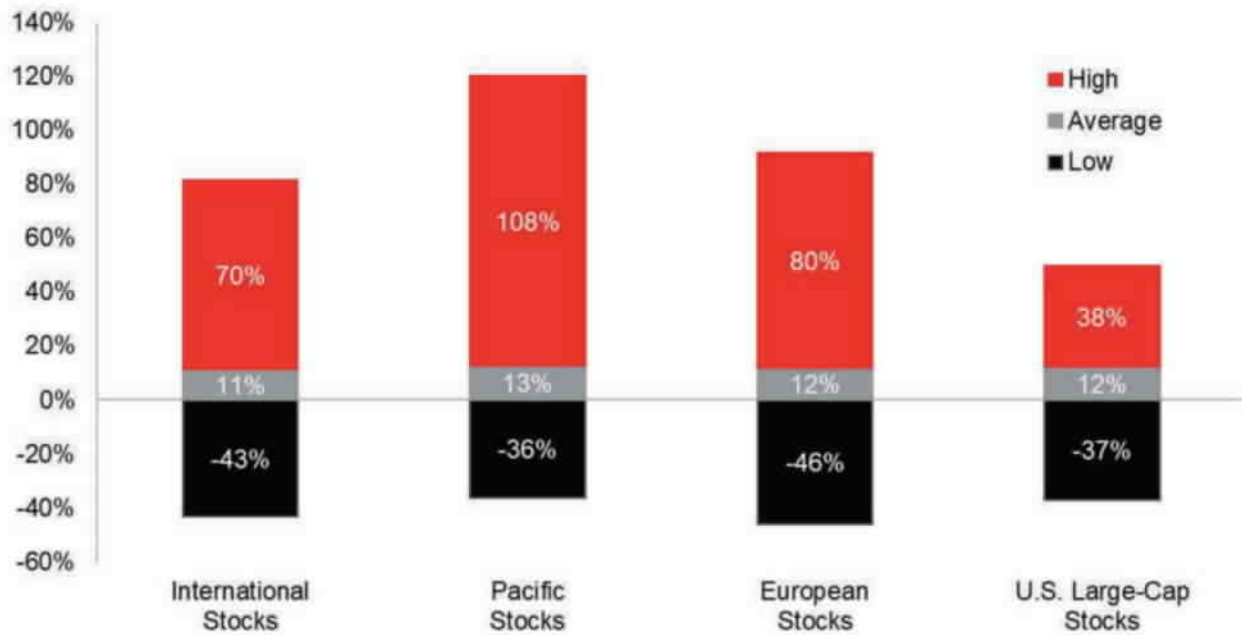


Source 1 of underlying data: Morningstar, Inc. Used with permission. All rights reserved. Calculations by D&P/Kroll. Asset classes represented by the Ibbotson Associates (IA) Stocks, Bonds, Bills, and Inflation® (SBBI®) series, as follows: (i) Large-Cap Stocks: IA SBBI® US Large Stock TR USD Ext. For a detailed description of the SBBI® series, see Chapter 3, "Description of the Basic Series". "Stocks, Bonds, Bills, and Inflation" and "SBBI" are registered trademarks of Morningstar, Inc. All rights reserved. Used with permission. **Source 2 of underlying data:** The international stock series is represented by the MSCI EAFE® equities index. To learn more about MSCI, visit msci.com.

Just as U.S. stock prices fluctuate from one period to the next, prices of international stocks are subject to significant gains and declines. However, past returns from international stocks have fluctuated even more so than the returns of U.S. stocks. Annual ranges of returns provide an indication of the historical volatility (risk) experienced by investments in various markets.

Exhibit 12.4 illustrates the range of annual returns for U.S. large-cap stocks and international stocks, as well as European and Pacific regional equity composites, over the period 1970 through 2020. Although all of the composites have similar compound returns over the period, the three international composites exhibit greater volatility than the U.S. composite. All investments have the potential of dramatic ups and downs; however, a long-term approach to investing may help reduce the pain of volatility.

Exhibit 12.4: Global Stock Market Returns: Annual Ranges of Returns (%) 1970–2020



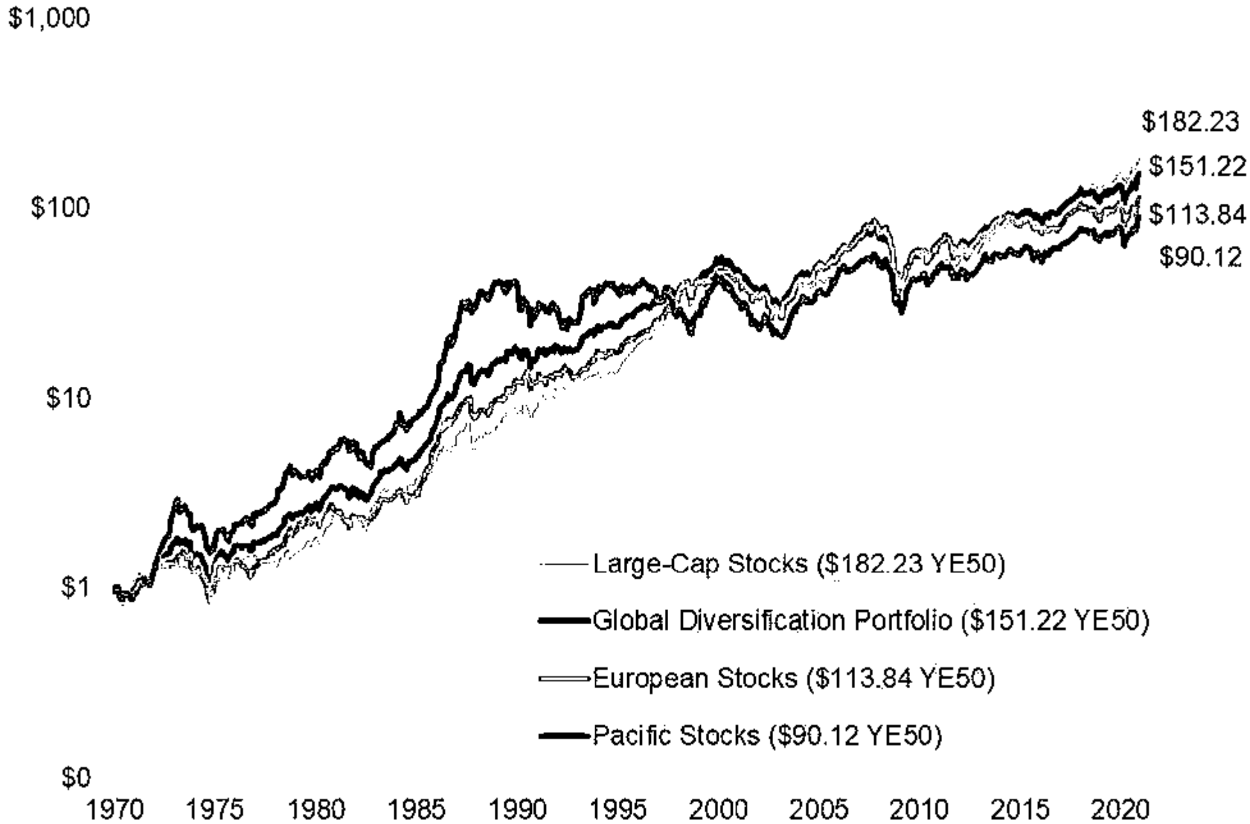
Source 1 of underlying data: Morningstar, Inc. Used with permission. All rights reserved. Calculations by D&P/Kroll. Asset classes represented by the Ibbotson Associates (IA) Stocks, Bonds, Bills, and Inflation® (SBBI®) series, as follows: (i) Large-Cap Stocks: IA SBBI® US Large Stock TR USD Ext. For a detailed description of the SBBI® series, see Chapter 3, "Description of the Basic Series". "Stocks, Bonds, Bills, and Inflation" and "SBBI" are registered trademarks of Morningstar, Inc. All rights reserved. Used with permission. **Source 2 of underlying data:** International stocks are represented by the MSCI EAFE® equities index. Pacific stocks are represented by the MSCI Pacific GR USD index. European stocks are represented by the MSCI Europe GR USD index. To learn more about MSCI, visit msci.com.

Diversification

Diversification can be another important benefit of international investing. By spreading risks among foreign and U.S. stocks, investors can potentially lower overall investment risk and/or improve investment returns. Fluctuations may occur at different times for different markets, and if growth is slow in one country, global investing provides a means of possibly participating in stronger market returns elsewhere. Investing abroad may help an investor balance such fluctuations. Because it is almost impossible to forecast which markets will be top performers in any given year, it can be very valuable to be invested in a portfolio diversified across several countries.

Exhibit 12.5 depicts the growth of $1.00 invested at year-end 1969 in U.S. large-cap stocks, European, and Pacific stocks as well as a "global diversification portfolio" that is comprised of an equally weighted mix of the U.S. large-cap stocks, European, and Pacific stocks. Notice that the U.S. large-cap stocks index was the top performer, followed (in order of performance) by the global diversification portfolio, Europe, and Pacific indexes at the end of the 51-year period.

Exhibit 12.5: Benefits of Global Diversification Index (Year-end 1969 = $1.00) 1970–2020

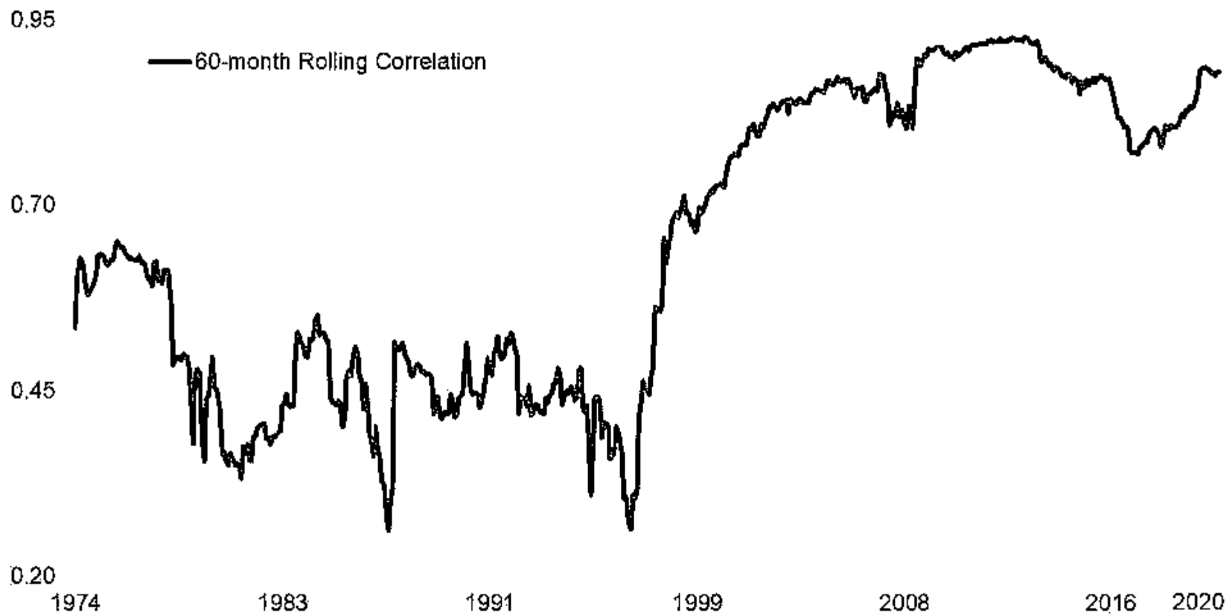


Source 1 of underlying data: Morningstar, Inc. Used with permission. All rights reserved. Calculations by D&P/Kroll. Asset classes represented by the Ibbotson Associates (IA) Stocks, Bonds, Bills, and Inflation® (SBBI®) series, as follows: (i) Large-Cap Stocks: IA SBBI® US Large Stock TR USD Ext. For a detailed description of the SBBI® series, see Chapter 3, "Description of the Basic Series". "Stocks, Bonds, Bills, and Inflation" and "SBBI" are registered trademarks of Morningstar, Inc. All rights reserved. Used with permission. **Source 2 of underlying data:** International stocks are represented by the MSCI EAFE® equities index. Pacific stocks are represented by the MSCI Pacific GR USD index. European stocks are represented by the MSCI Europe GR USD index. To learn more about MSCI, visit msci.com.

The cross-correlation coefficient between two series, covered in Chapter 6, measures the extent to which they are linearly related. The correlation coefficient measures the sensitivity of returns on one asset class or portfolio to the returns of another.

Exhibit 12.6 examines the 60-month rolling period correlation between international and U.S. large-cap stocks. Exhibit 12.6 illustrates the recent rise in cross-correlation between the two, suggesting that the benefit of diversification has suffered in recent years. The maximum benefit to an investor would have come in the 60-month period ending July 1987 where the cross-correlation was 0.26. The least amount of diversification benefit would have come in the 60-month period ending February 2013 where the cross correlation was 0.93. The monthly average over the entire period was 0.65.

Exhibit 12.6: Rolling 60-Month Correlations: U.S. Large-Cap Stocks and International Stocks 1970–2020



Source 1 of underlying data: Morningstar, Inc. Used with permission. All rights reserved. Calculations by D&P/Kroll. Asset classes represented by the Ibbotson Associates (IA) Stocks, Bonds, Bills, and Inflation® (SBBI®) series, as follows: (i) Large-Cap Stocks: IA SBBI® US Large Stock TR USD Ext. For a detailed description of the SBBI® series, see Chapter 3, "Description of the Basic Series". "Stocks, Bonds, Bills, and Inflation" and "SBBI" are registered trademarks of Morningstar, Inc. All rights reserved. Used with permission. **Source 2 of underlying data:** International stocks are represented by the MSCI EAFE® equities index. To learn more about MSCI, visit msci.com.

As discussed previously in regard to REITs (see Chapter 2), diversification is "spreading a portfolio over many investments to avoid excessive exposure to any one source of risk."[235] Put simply, diversification is "not putting all your eggs in one basket." Diversification offers the potential of higher returns for the same level of risk, or lower risk for the same level of return.

A low correlation between assets in a portfolio allows for the possibility of an increase in returns without a corresponding increase in risk, or alternatively, a reduction in risk without a corresponding decrease in return.

[235] Cara Griffith, "Practical Tax Considerations for Working with REITs," State Tax Notes (October 31, 2011): 315–320, quoting Jennifer Weiss: 316. In 2009, the IRS issued guidance that indicates that the distributions may be in the form of cash or stock in certain instances.

Risks Typically Associated with International Investment[236]

The risks associated with international investing can largely be characterized as *financial, economic,* or *political.* Many of these are the types of risks associated with investing in general – the possibility of loan default, the possibility of delayed payments of suppliers' credits, the possibility of inefficiencies brought about by the work of complying with unfamiliar (or burdensome) regulation, unexpected increases in taxes and transaction fees, differences in information availability, and liquidity issues, to name just a few. Some risks, however, are typically associated more with global investing – currency risk, lack of good accounting information, poorly developed legal systems, and even expropriation, government instability, or war.

Financial Risks

Financial risks typically entail an issue that is specifically money-centric (e.g., loan default, inability to easily repatriate profits to the home country, etc.). Among these types of risks, currency risk is probably the most familiar. Currency risk is the *financial* risk that exchange rates (the value of one currency versus another) will change unexpectedly.

For example, when a French investor invests in Brazil, he or she must first convert Euros into the local currency, in this case the Brazilian Real (BRL). The returns that the French investor experiences in local currency terms are identical to the returns that a Brazilian investor would experience, but the French investor faces an additional risk in the form of currency risk when returns are "brought home" and must be converted back to Euros.[237]

Expected changes in exchange rates can often be hedged. However, even when currency hedging is used, exchange rate risk often remains. To the extent the Euro unexpectedly *increases* in value versus the Real (i.e., the Euro appreciates against the Real), the French investor is able to purchase fewer Euros for each Real he realized in the Brazilian investment when returns from the investment are repatriated, and his return is thus *diminished.*[238,239]

Conversely, to the extent the Euro unexpectedly *decreases* in value versus the Real (i.e., the Euro depreciates against the Real), the French investor is able to purchase more Euros for each

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236 The following section is largely excerpted from the D&P/Kroll online Cost of Capital Navigator's International Cost of Capital Module's "Resources" section. For more information and to purchase the Cost of Capital Navigator's International Cost of Capital Module, visit dpcostofcapital.com.

237 For this example, we assume that the French and local investor are both subject to the same regulations, taxes, and local risks when investing in the same local asset.

238 We say "unexpectedly" for a reason. If the investor had been able to predict (at the time of investing) the precise exchange rate at which he/she would be repatriating his/her returns, these "expected" changes to the exchange rate would have been reflected in the expected cash flows of the investment at inception.

239 For example, say the French investor had achieved a 10% return in local (Brazilian) terms on his investment in a given year, but the Euro had unexpectedly appreciated by 3% in value relative to the Real over the same period. When the returns are repatriated, the French investor's overall return is diminished to approximately 6.7% [(1+10%)*(1-3%)-1] in Euro terms. Conversely, had the Euro depreciated in value versus the Real by 3%, the repatriated returns would be enhanced to approximately 13.3% [(1+10%)*(1+3%)-1]

Real he realized in the Brazilian investment when returns from the investment are repatriated, and his return is thus *enhanced*.

For example, in 2007 Brazilian equities returned an astonishing 50% return in local terms (see Exhibit 12.7). Because the Euro *depreciated* against the Real in 2007, French-based investors in Brazilian stocks experienced an even *higher* return (62%) when they repatriated their returns and converted them to Euros. Similarly, in 2009 the Euro *depreciated* relative to the South African Rand (ZAR), and French-based investors realized higher returns in Euros once again versus the local South African investors. In a more recent example, U.S.-based investors investing in U.S. equities realized an approximate return of just 1.0% in 2015, but French investors making a similar investment in the U.S. realized an approximate 13% return when they repatriated their returns and converted them to Euros (the Euro *depreciated* against the U.S. Dollar in 2015, so the French investors could purchase *more* Euros with their Dollars when they repatriated their returns).

It is important to note that currency conversion effects can also work to *diminish* realized returns. For example, in 2015 Brazilian equities returned -12% in local terms. Because the Euro *appreciated* against the Real in 2015, French-based investors in Brazilian stocks experienced an even *lower* return (-34%) when they repatriated their returns and converted them to Euros.

Exhibit 12.7: Currency Conversion Effects

Year	Currency	Return in Local Terms	Return to French Investors (EUR)	Currency Conversion Effect
2007	Brazil (BRL)	50%	62%	12%
2009	South Africa (ZAR)	26%	53%	27%
2015	Japan (JPY)	10%	22%	12%
2015	Switzerland (CHF)	2%	13%	11%
2015	Brazil (BRL)	-12%	-34%	-22%
2015	Argentina (ARS)	52%	11%	-41%
2015	United States (USD)	1%	13%	12%
2016	United Kingdom (GBP)	19%	3%	-16%

Source 1 of underlying data: Morningstar, Inc. Used with permission. All rights reserved. Calculations by D&P/Kroll. Asset classes represented by the Ibbotson Associates (IA) Stocks, Bonds, Bills, and Inflation® (SBBI®) series, as follows: (i) Large-Cap Stocks: IA SBBI® US Large Stock TR USD Ext. For a detailed description of the SBBI® series, see Chapter 3, "Description of the Basic Series". "Stocks, Bonds, Bills, and Inflation" and "SBBI" are registered trademarks of Morningstar, Inc. All rights reserved. Used with permission. **Source 2 of underlying data:** Morgan Stanley Capital International (MSCI) Brazil, South Africa, Japan, Switzerland, Brazil, and Argentina, gross return (GR) equity indices. For more information about MSCI, visit msci.com.

A common misstep we often encounter is companies constructing forward looking budgets or projection analyses in local currencies, and then converting these projections to the currency of the parent company using the spot rate.

This mistakenly assumes that the exchange rate will not change in the future. Projections, which are inherently forward-looking, need to embody expected currency conversion rates. We are interested in currency risks over the period of the projected net cash flows, not just in the spot market. Even then, these are merely estimates of future currency exchange rates and the actual exchange rate can vary from these estimates.

Does currency risk affect the cost of capital? One team of researchers found that emerging market exchange risks have a significant impact on risk premiums and are time varying (for countries in the sample). They found that exchange risks affect risk premiums as a separate risk factor and represent more than 50% of total risk premiums for investments in emerging market equities. The exchange risk from investments in emerging markets was found to even affect the risk premiums for investments in developed market equities.[240]

While exchange rate volatility appears to be partly systematic, researchers have found that despite not being a constant, the currency risk premium is small and seems to fluctuate around zero.[241] A recently published academic paper set out to study whether corporate managers should include foreign exchange risk premia in cost of equity estimations. The authors empirically estimated the differences between the cost of equity estimates of several risk-return models, including some models that have an explicit currency risk premia and others that do not. They found that adjusting for currency risk makes little difference, on average, in the cost of equity estimates, even for small firms and for firms with extreme currency exposure estimates. The authors concluded that, at a minimum, these results applied to U.S. companies, but future research would still have to be conducted for other countries.[242]

Rather than attempting to quantify and add a currency risk premium to the discount rate, using expected or forward exchange rates to translate projected cash flows into the home currency will inherently capture the currency risk, if any, priced by market participants.[243]

Economic Risks

Global investors may also be exposed to *economic* risks associated with international investing. These risks may include the volatility of a country's economy as reflected in the current (and expected) inflation rate, the current account balance as a percentage of goods and services, burdensome regulation, and labor rules, among others. In the current environment, an economic risk that has come to the forefront is the sovereign debt crisis. The recent economic and financial crisis in Greece, for example, has prompted many governments around the world to re-think their

240 Francesca Carrieri, Vihang Errunza, and Basma Majerbi, "Does Emerging Market Exchange Risk Affect Global Equity Prices?" *Journal of Financial Quantitative Analysis* (September 2006): 511–540.

241 Sercu, Piet (2009), *International Finance: Theory into Practice*, Princeton, NJ: Princeton University Press, Chapter 19.

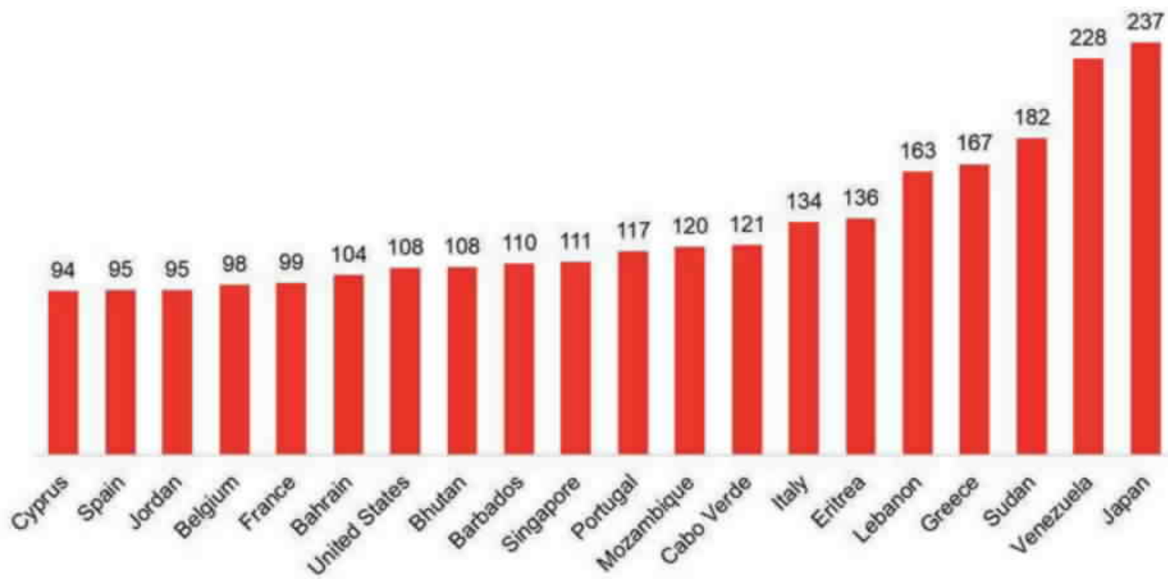
242 Krapl, A. and O'Brien, T. J. (2016), "Estimating Cost of Equity: Do You Need to Adjust for Foreign Exchange Risk?," *Journal of International Financial Management & Accounting*, 27: 5–25.

243 This assumes that the valuation is being conducted in the home currency, by discounting projected cash flows denominated in the home currency, with a discount rate also denominated in home currency. Alternatively, the analyst can conduct the entire valuation in foreign currency terms (projected cash flows and discount rate are both in foreign currency terms), in which case the estimated value would be translated into the home currency using a spot exchange rate.

own fiscal policies as it becomes evident that current debt loads are likely unsustainable in many of these countries.

In Exhibit 12.8a, the 20 countries with the *overall* highest estimated government debt-to-GDP ratios are shown (regardless of the size of their economies), as of 2020. For example, the United States has a debt-to-GDP ratio of 108% (i.e., the United States' government debt is 8% *larger* than the United States' annual GDP), and France has a debt-to-GDP ratio of 99% (i.e., France's government debt is 1% *less* than France's annual GDP).

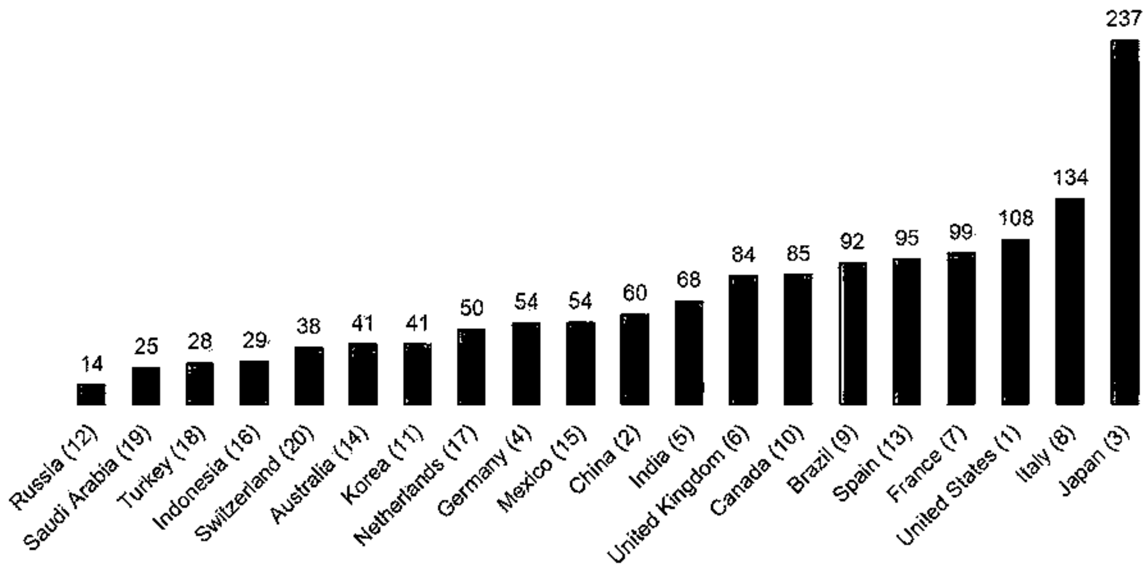
Exhibit 12.8a: 2020 Government Debt-to-GDP (in percent)



Source of underlying data: World Economic Outlook Database from the International Monetary Fund (IMF). For additional information, please visit: http://www.imf.org/external/pubs/ft/weo/2019/02/weodata/download.aspx.

In Exhibit 12.8b, the estimated government debt-to-GDP ratios for the 20 countries with the *largest* economies (as measured by GDP) are shown, also as of calendar year 2020. The rank of GDP size is shown in parentheses after each country's name. Switzerland (with a ranking of "20") is the smallest GDP, and the United States (with a ranking of "1") is the largest GDP.

Exhibit 12.8b: 2020 Government Debt-to-GDP (in percent), 20 countries with largest GDP



Source of underlying data: World Economic Outlook Database from the International Monetary Fund (IMF). For additional information, please visit: http://www.imf.org/external/pubs/ft/weo/2019/02/weodata/download.aspx.

There are costs that tend to go hand-in-hand with what might be considered unsustainable debt levels by governments. Lenders may demand a higher expected return to compensate them for additional default risk when investing not only in the country's sovereign debt, but also in businesses operating in those countries.

Governments may decide to increase the money supply in an effort to inflate their way out of debt. Ultimately, some governments may decide on outright currency devaluation or even a repudiation of debt (i.e., defaulting on their debt obligations). These risks are not entirely limited to less developed countries, but less developed countries may be more willing to resort to these extreme measures than developed countries.

Political Risks

Political risks can include government instability, expropriation, bureaucratic inefficiency, corruption, and even war. A relatively recent example of the effects of political risk is Venezuela's expropriation of various foreign owned oil, gas, and mining interests. These actions tend to reduce Venezuela's attractiveness to foreign investors who will likely demand a significantly higher expected return in exchange for future investment in the country – in effect raising their cost of capital estimates for projects located in Venezuela.

Exhibit 12.9 summarizes some of the risks that investors may view as unique or country-specific.

Exhibit 12.9: Reasons Typically Cited for Adding a Country Risk Premium Adjustment

Political Risks

- Repudiation of contracts by governments
- Expropriation of private investments in total or part through change in taxation
- Economic planning failures
- Political leadership and frequency of change
- External conflict
- Corruption in government
- Military in politics
- Organized religion in politics
- Lack of law-and-order tradition
- Racial and national tensions
- Civil war
- Poor quality of the bureaucracy
- Poorly developed legal system
- Political terrorism

Financial Risks

- Currency volatility plus the inability to convert, hedge, or repatriate profits
- Loan default or unfavorable loan restructuring
- Delayed payment of suppliers' credits
- Losses from exchange controls
- Foreign trade collection experience

Economic Risks

- Volatility of the economy
- Unexpected changes in inflation
- Debt service as a percentage of exports of goods and services
- Current account balance of the country in which the subject company operates as a percentage of goods and services
- Parallel foreign exchange rate market indicators
- Labor issues

International and Domestic Series Summary Data

Exhibit 12.10 shows summary statistics of annual total returns for various international regions and composites. The summary statistics presented are geometric mean, arithmetic mean, and standard deviation. From 1970 to 2020, the Pacific regional composite was the riskiest, with a standard deviation of 28.5 percentage points. The annual geometric mean of the Pacific regional composite over the 1920–2020 time period was 9.2%, less than the other composite analyzed, which were considerably less risky.[244]

[244] At the 2-digit level, the Pacific regional composite's annual geometric mean over the 1970–2020 time period was 9.17%, and Canada's annual geometric mean was 9.18%.

Exhibit 12.10: Summary Statistics of Annual Returns
1970–2020 (%)

Series	Geometric Mean	Arithemtic Mean	Standard Deviation
EAFE	9.3	11.4	21.5
Pacific	9.2	12.6	28.5
Europe	9.7	11.8	21.2
World	9.8	11.3	17.4
Canada	9.1	11.3	21.3
U.S.	10.7	12.1	16.9

Source 1 of underlying data: Morningstar, Inc. Used with permission. All rights reserved. Calculations by D&P/Kroll. Asset classes and inflation represented by the Ibbotson Associates (IA) Stocks, Bonds, Bills, and Inflation® (SBBI®) series, as follows: (i) Large-Cap Stocks: IA SBBI® US Large Stock TR USD Ext. For a detailed description of the SBBI® series, see Chapter 3, "Description of the Basic Series". "Stocks, Bonds, Bills, and Inflation" and "SBBI" are registered trademarks of Morningstar, Inc. All rights reserved. Used with permission. **Source 2 of underlying data:** Morgan Stanley Capital International (MSCI) Europe, Australasia and Far East (EAFE) index, and MSCI Pacific, Europe, World, and Canada GR indices. To learn more about MSCI, visit msci.com.

Exhibit 12.11 ranks the performance (as measured by compound annual rates of return) of U.S., EAFE, Pacific, Europe, World, and Canada equities for each decade from best performer (at top) to worst performer (at bottom). For example, in the 2010s the best performer was U.S. Large-Cap Stocks, and the worst performer was Canada.

Exhibit 12.11: The Relative Performance of U.S., EAFE, Pacific, Europe, World, and Canada Equities by Decade (Best Performer at Top, Worst Performer at bottom)

1970s	1980s	1990s	2000s	2010s
Pacific	Pacific	U.S.	Canada	U.S.
Canada	EAFE	Europe	Europe	World
EAFE	World	World	EAFE	Pacific
Europe	Europe	Canada	World	EAFE
World	U.S.	EAFE	Pacific	Europe
U.S.	Canada	Pacific	U.S.	Canada

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Exhibit 12.12 shows the annualized monthly standard deviations by decade for the various international regions and composites.

The World composite was the least risky in the 1970s, 1980s, and the 1990s. The Canadian index was the riskiest in the 2000s, while Europe was the riskiest in the most recent decade. The Pacific regional composite was the least risky in the most recent decade.[245]

Exhibit 12.12: Annualized Monthly Standard Deviation by Decade (%)

Series	1970s	1980s	1990s	2000s	2010s
EAFE	17.4	21.6	18.7	18.5	15.6
Pacific	22.1	26.6	24.8	18.2	14.1
Europe	18.6	21.5	16.8	20.4	17.5
World	15.1	17.6	15.7	16.9	14.4
Canada	20.6	24.8	18.6	25.9	16.3
U.S.	17.1	19.4	15.9	16.3	14.1

Source 1 of underlying data: Morningstar, Inc. Used with permission. All rights reserved. Calculations by D&P/Kroll. Asset classes represented by the Ibbotson Associates (IA) Stocks, Bonds, Bills, and Inflation® (SBBI®) series, as follows: (i) Large-Cap Stocks: IA SBBI® US Large Stock TR USD Ext. For a detailed description of the SBBI® series, see Chapter 3, "Description of the Basic Series". "Stocks, Bonds, Bills, and Inflation" and "SBBI" are registered trademarks of Morningstar, Inc. All rights reserved. Used with permission. **Source 2 of underlying data:** Morgan Stanley Capital International (MSCI) Europe, Australasia and Far East (EAFE) index, and MSCI Pacific, Europe, World, and Canada GR indices. To learn more about MSCI, visit msci.com.

Exhibit 12.13 presents annual cross-correlations and serial correlations from 1970 to 2020 for the six basic SBBI® series and inflation as well as international stocks, as defined by the MSCI EAFE Index. International stocks, when compared to U.S. large-cap stocks, provided a higher cross-correlation than when compared to U.S. small-cap stocks. The serial correlation of international stocks suggests no pattern, and the return from period to period can best be interpreted as random or unpredictable.

245 At the 2-digit level, the Pacific regional composite's annualized monthly standard deviation over the 1970–2019 time period was 14.11%, and the U.S. large stock composite's annualized monthly standard deviation was 14.14%.

Exhibit 12.13: Basic Series and International Stocks: Serial and Cross-Correlations of Historical Annual Returns 1970–2020

	Int'l Stocks	Large-Cap Stocks	Small-Cap Stocks	Long-term Corp Bonds	Long-term Gov't Bonds	Inter-term Gov't Bonds	U.S. Treasury Bills	Inflation
International Stocks	1.00							
Large-Cap Stocks	0.67	1.00						
Small-Cap Stocks	0.52	0.72	1.00					
Long-term Corp Bonds	0.06	0.27	0.09	1.00				
Long-term Gov't Bonds	-0.11	0.04	-0.13	0.89	1.00			
Inter-term Gov't Bonds	-0.11	0.03	-0.08	0.82	0.85	1.00		
U.S. Treasury Bills	0.03	0.03	0.04	0.04	0.08	0.43	1.00	
Inflation	-0.05	-0.12	0.06	-0.31	-0.26	-0.01	0.70	1.00
Serial Correlation	0.04	-0.02	-0.01	-0.11	-0.28	0.10	0.89	0.75

Source of underlying data: Morningstar, Inc. Used with permission. All rights reserved. Calculations by D&P/Kroll. Asset classes and inflation represented by the Ibbotson Associates (IA) Stocks, Bonds, Bills, and Inflation® (SBBI®) series, as follows: (i) Large-Cap Stocks: IA SBBI® US Large Stock TR USD Ext, (ii) Small-Cap Stocks: IA SBBI® US Small Stock TR USD, (iii) Long-term (i.e., 20-year) Corporate Bonds: IA SBBI® US LT Corp TR USD, (iv) Long-Term (i.e. 20-year) Government Bonds: IA SBBI® US LT Govt TR USD, (v) Intermediate-term (i.e., 5-year) Government Bonds: IA SBBI® US IT Govt TR USD, (vi) U.S. (30-day) Treasury Bills: IA SBBI® US 30 Day TBill TR USD, and (vii) Inflation: IA SBBI® US Inflation. For a detailed description of the SBBI® series, see Chapter 3, "Description of the Basic Series". "Stocks, Bonds, Bills, and Inflation" and "SBBI" are registered trademarks of Morningstar, Inc. All rights reserved. Used with permission. **Source 2 of underlying data:** The international stock series is represented by the MSCI EAFE® equities index. The MSCI EAFE Index is an equity index which captures large- and mid-cap representation across Developed Markets countries around the world, excluding the US and Canada. With 918 constituents, the index covers approximately 85% of the free float-adjusted market capitalization in each country. To learn more about MSCI, visit msci.com.

Conclusion

Country risk is generally described as financial, economic, or political in nature. These rules may create incremental complexities when developing cost of capital estimates for a business, business ownership interest, security, or an intangible asset based outside of a mature market such as the United States.

International investments are no different from any other investment when it comes to information gathering. Investors interested in or already taking part in the international marketplace should learn as much as possible about the corresponding significant rewards and risks. International investments are not for everyone, and the most appropriate mix for an individual investor depends on his or her risk tolerance, investment goals, time horizon, and financial resources.

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Schroders

10-year return forecasts (2023–32)

December 2022

Executive summary

Riaz Fidahusein
Head of Multi-Asset
Research & Analytics
(44-20)7658 5244

The Schroders Multi-Asset long-term capital market assumptions are forward-looking estimates of total returns which are an important component for the team's strategic asset allocation modelling and portfolio construction.

This note presents our latest 10-year capital market returns forecasts in local currency terms and provide a brief outline of our methodology. Our approach was developed using a framework predominantly based on market measures allowing for a transparent, timely and systematic process updated twice a year.

Return expectations across asset classes have been raised relative to our Jun-2022 forecasts largely due to further increases in government bond yields. The increased equity return forecasts have also been driven by continued falls in valuations since our last publication.

Cash returns

Developed market

On the basis that we are using the government bond return as an anchor, cash returns are estimated by determining an appropriate term premium. This has been distorted in recent years by central bank asset purchase programmes which have depressed the gap between short and long rates. Consequently, we have taken a pre-financial crisis term premium for the US and UK. For the eurozone and Japan where distortions still exist, and will continue to do so for some time in our view, we have used a smaller term premium than would be warranted by the historical data.

10-year forecast returns: 2023–2032 (p.a. %)

	US	EUR	UK	JP
Cash returns	2.6	1.8	2.2	0.3

Source: Schroders, Thomson Reuters DataStream.

Fixed income returns

Developed market and EM local government bonds

The yield to maturity (YTM) for a risk-free bond considers the coupon income and capital gain or loss that the investor will realise by holding the bond to maturity. However, this also assumes that all coupons can be re-invested at the YTM to the maturity date. Therefore, the relationship between initial yield on a 10-year US Treasury bond and its subsequent 10-year return will vary depending on the extent yields rise or fall in the subsequent 10 years. Despite this uncertainty in subsequent yield moves, Bogle (1991, 2015)[1] showed the strong empirical relationship between the initial yield on a 10-year US Treasury bond and its subsequent 10-year return since 1900.

We adopt this straightforward and intuitive approach to estimating 10-year returns expectations for government bonds in our framework. Specifically, we use the YTM on the 7–10 year Merrill Lynch index to estimate US, EUR, UK and JP bond returns for each calendar year. The return forecast for emerging market local debt was estimated by using the yield to maturity for the JPM GBI-EM Global Diversified Composite index. These estimates of 10-year government bonds act as a key 'anchor' for many of our other asset class return forecasts.

10-year forecast returns: 2023-2032 (p.a. %)

	US	EUR	UK	JP	EM local
Government bond forecasts	3.8	3.2	3.6	0.5	6.9

Source: Schroders, ICE indices, JP Morgan indices.

Inflation-linked government bonds

The yields on US Treasury Inflation Protected Securities (TIPS) have declined dramatically since they were first issued in 1997. TIPS transaction volume was very low relative to nominal Treasuries during an initial period between 1999 and 2004. A high liquidity premium explains why US TIPS have exhibited higher excess returns than nominal Treasuries over this initial period and during the financial crisis in 2008–09.

To mitigate the impact of the initial period after TIPS were first issued, we estimate the return basis between US Treasury bonds and inflation-linked bonds by taking an expanding average from 2004 of monthly excess returns (annualised) between MLX 7–10 year UST index and MLX 7–10 year TIPS index.

We use a similar methodology for the return basis for nominal gilts over inflation-linked gilts, ignoring the stellar returns earned by UK linkers in 2016 after the UK referendum.

10-year forecast returns: 2023–2032 (p.a. %)

	US	UK
Inflation-linked bond forecasts	4.2	4.1

Source: Schroders, ICE indices.

[1] Bogle, J.C., 1991. Investing in the 1990s: Occam's razor revisited. Journal of Portfolio Management, 18(1), pp.88–91.
Bogle, J.C. and Nolan, M.W., 2015. Occam's Razor Redux: Establishing Reasonable Expectations for Financial Market Returns. Journal of Portfolio Management, 42(1), p.119.

Credit returns

Investment grade, high yield and emerging market debt

In estimating 10-year credit total returns, we consider the following return components: government bond returns, returns due to additional spread yield and returns due to downgrades and defaults.

Returns due to the additional spread yield component are estimated using the current option-adjusted spread for a 7–10 year corporate bond index. For investment grade (IG) we take account of the effects of ratings downgrades in forecasting returns. Credit losses from defaults are estimated using long term S&P IG and high yield (HY) default and recovery rates.

10-year forecast returns: 2023–2032 (p.a. %)

	US	EUR	UK	EMD
Investment grade bond forecasts	5.1	4.4	4.9	6.6
High yield bond forecasts	6.6			

Source: Schroders, ICE indices, S&P.

Equity returns

We estimate equity returns by decomposing the country-level total return estimates into the following components:

$$equity\ return\ forecasts = bond\ yield + long\ term\ equity\ return\ premium$$
$$+ valuation\ adjustment$$

Long term country/ region-level equity risk premia (ERP) are estimated by taking an expanding window average of the rolling 12 month equity returns in excess of 10 year government yields. Given the lack of long term data in emerging markets over multiple cycles, we estimate the long-term emerging market ERP using a beta-adjustment to the long-term US ERP.

We believe valuations are an important return component for equities over a 10 year horizon and therefore adjust the long-term ERPs to account for valuations. The Cyclically-Adjusted Price Earnings (CAPE) ratio is a widely used metric that judges whether or not an equity market is fairly valued and forms the basis for our valuation adjustment. Theory supports the idea that valuations, and therefore the required return on equities, should vary with the macro environment. We therefore also estimate a 'macro-sensitive' CAPE for each country/ region and assume current CAPE levels will revert to their respective 'macro-sensitive' levels in order to determine each equity market's valuation adjustment. Given the lack of long term data in EM markets to estimate a robust 'macro-sensitive' CAPE, we assume emerging market country CAPE levels revert to their rolling 10 year average.

10-year forecast returns: 2023–2032 (p.a. %)

	Global	US	EUR	UK	JP	EM
Equity forecasts	9.3	9.1	8.3	9.7	8.2	11.8

Source: Schroders, MSCI indices, ICE indices.

Alternatives

Commodities

We decompose the total returns to commodities into the following components:

$$Commodity\ total\ return\ forecasts = cash\ return + roll\ return + spot\ return$$

The roll yield return reflects the return from rolling from the current futures contract to a longer-term contract to maintain exposure to the commodity after the current contract has expired. The spot return simply reflects the change in the price of the commodity futures for immediate delivery. We estimate the roll return through the long run historical difference between excess returns of the Bloomberg Commodity index, which includes the roll return, and the spot return, which measures only price return. Additionally we model the forecast spot return using the long-run annualised historical average of monthly spot returns of the Bloomberg Commodity index back to 1990.

Private equity

For private equities, we estimate the illiquidity premium by taking the long-term average excess returns over US equities and using the LPX50 index as our asset proxy.

Hedge funds

We use a 50/50 blend of the HFRI Fund of Funds composite index and the Credit Suisse Multi-Strategy Hedge Fund index as a proxy for the asset class returns. We estimate returns from hedge funds by taking the long-run average excess returns of this blended index over US cash.

10-year forecast returns: 2023–2032 (p.a. %)

	Commodities	US private equity	Hedge funds
Alternative asset forecasts	4.5	9.7	7.0

Source: Schroders, Bloomberg indices, HFRI indices, CS indices.

Volatility forecasts

For all assets we make an assumption that volatility will match that of the past 10 years. The measure we use is annualised monthly volatility of the asset's local currency returns, where available.

10-year local currency return and risk forecasts: 2023–2032 (p.a. %)

		Forecast return	Forecast volatility
Cash	US	2.6	0
	EUR	1.8	0
	UK	2.2	0
	JP	0.3	0
Government bonds	US	3.8	5.9
	EUR	3.2	5.5
	UK	3.6	6.7
	JP	0.5	1.9
	EM local (USD)	6.9	11.5
Inflation-linked bonds	US	4.2	6.1
	UK	4.1	6.7
Investment grade bonds	US	5.1	6.8
	EUR	4.4	7.3
	UK	4.9	7.9
High yield bonds	US	6.6	8.5
	EMD	6.6	9.0
Equity	Global	9.3	15.0
	US	9.1	15.0
	EUR	8.3	14.3
	UK	9.7	12.3
	JP	8.2	15.8
	EM	11.8	16.7
Alternatives	Commodities	4.5	14.1
	Private equity	9.7	21.3
	Hedge funds	7.0	8.8

Source: Schroders, Bloomberg indices, CS indices, HFRI indices, ICE indices, JP Morgan indices, MSCI indices, S&P.

Schroders

Schroder Investment Management Limited

1 London Wall Place, London EC2Y 5AU United Kingdom
Tel: + 44(0) 20 7658 6000

schroders.com

@Schroders

Schwab's 2023 Long-Term Capital Market Expectations

January 4, 2023 Eva A. XuSeth McMoore

Our current 10-year outlook highlights better opportunities for bonds and a steady outlook for stocks. We continue to project better return opportunities for international stocks.

To reach long-term financial goals, investors should have reasonable expectations for long-term market returns. Having overly optimistic expectations could lead investors to save too little, on the belief that their investments will grow fast enough to fund retirement or a child's college education. On the other hand, overly pessimistic expectations may cause an investor to save too much, at the expense of current spending and enjoyment.

To provide a guide for investors, our analysts at Charles Schwab Investment Advisory, Inc. annually update their long-term Capital Market Expectations (CMEs) to accommodate the ever-changing market environment and to provide investors with the most up-to-date projections. Schwab's long-term CMEs are quantitative forecasts that provide reasonable expectations for risks and returns over the next 10 years. These forecasts can play an essential role in a variety of decisions, such as determining optimal portfolio allocations and creating realistic retirement plans.

Our latest estimates are constructed using data as of October 31, 2022. These estimates, summarized in the chart below, cover the period from 2023 through 2032.

Over the next decade, we continue to expect market returns to fall short of long-term historical averages. Compared to last year's expectations, our outlook highlights better opportunities for bonds, driven primarily by higher starting yields. While expected stock returns were helped by more attractive starting valuations (i.e., lower market prices due to stock market declines during 2022), they were also hurt by company-level and macroeconomic headwinds, leading to slower-than-expected earnings growth. The net result may be a similar return outlook for stocks. As such, Schwab continues to project better return opportunities for international stocks over the next 10 years, relative to domestic stocks. Given recent market changes, now may be a good time for investors to review their long-term financial goals to ensure that they are based on projections grounded in disciplined methodology.

Historical and projected returns

Source: Charles Schwab Investment Advisory, Inc. Historical data from Morningstar Direct. All data as of 10/31/2022.

* Estimates published for 2022. Total return = price growth + dividend and interest income. The example does not reflect the effects of taxes or fees. Numbers rounded to the nearest one-tenth of a percentage point. Benchmark indexes: S&P 500® Total Return Index (U.S. Large-Company Stocks), Russell 2000® Total Return Index (U.S. Small-Company Stocks), MSCI EAFE Net Return Index® (International Large-Company Stocks), Bloomberg Barclays U.S. Aggregate Bond Total Return Index (U.S. Investment-Grade Bonds), and FTSE 3-Month U.S. Treasury Bill Index (Cash Equivalent). Note: U.S. Investment-Grade Bond return calculation starts in 1/30/1976 due to lack of prior data. **Past performance is no guarantee of future results.**

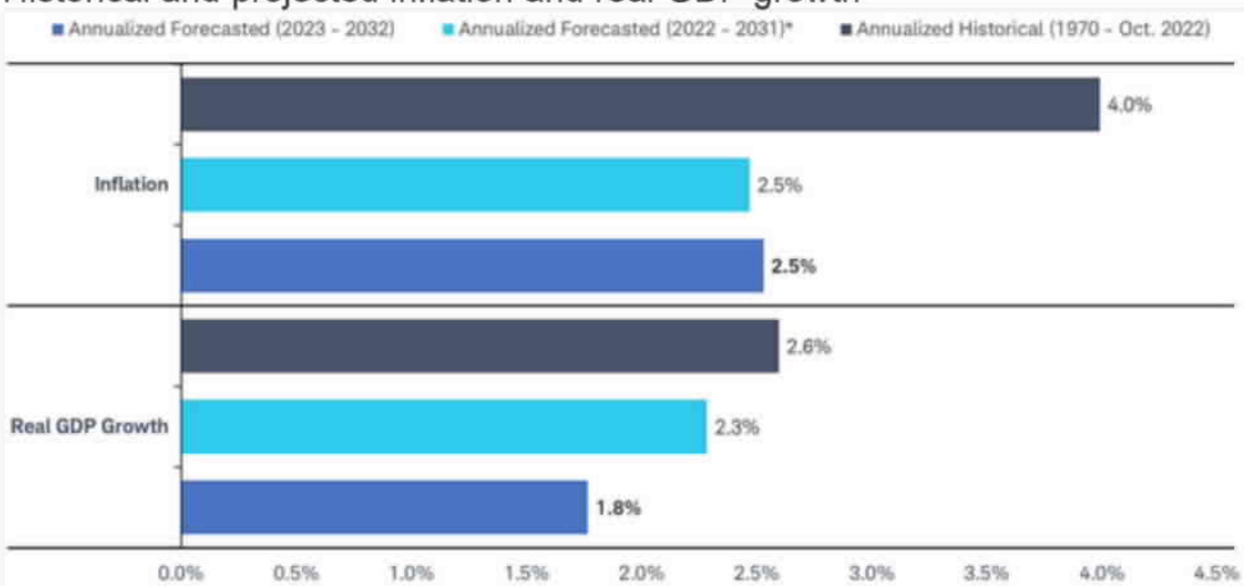
The past year proved to be challenging for investors as financial markets around the world, and across all major asset classes, suffered steep losses. The simultaneous decline of both stock and bond markets, a trend not frequently seen in the markets, was the result of myriad factors including rising interest rates, high inflation, slowing economic growth, and heightened geopolitical tensions. The volatility and asset repricing that occurred over this past year has led to some notable changes in our forecasts for 2023.

Macroeconomy. Inflation has been much higher and more persistent than many investors anticipated. Some factors fueling this are a decade of easy monetary policy, unexpected supply-chain disruptions, and tight labor markets. With the goal of lowering inflation, central banks, led by the Federal Reserve, have aggressively tightened monetary policy at the fastest pace in decades. A consequence of these interventions is an expectation of slower economic growth in the near term. When constructing our forecasts for inflation and real gross domestic product (GDP) growth over the next decade, we use a survey-based approach, which accounts for the entire 10-year path. This incorporates near-term effects of elevated inflation and dampened GDP prospects in our long-term estimate. Despite these disruptions in the short term, we expect inflation and GDP to return to a steady state. As such, inflation expectations remain similar to last year at 2.5% per year over the coming decade, while average annualized GDP growth expectations have come down from 2.3% to 1.8%.

Bonds. Bond yields surged in 2022 as central banks were forced to reassess their monetary policy, becoming more hawkish in response to high inflation. While bond investors incurred steep losses in 2022 due to asset repricing in response to rising interest rates, the resulting higher starting yields have doubled most of our bond expectations. For example, U.S. investment-grade bonds are expected to return 4.9% annually over the next decade, compared to our forecast last year of 2.3%. Similar to bonds, cash-equivalent investments such as Treasury bills also have benefited from these higher starting yields. A potential benefit of the shifting landscape is that real return forecasts (i.e., returns after removing the effect of inflation) are now positive for most bonds, providing a more attractive source of income.

Stocks. Stocks slumped worldwide during 2022, with the S&P 500® index down almost 20% by year end. Typically, a steep market decline would mean higher expected returns due to a lower and more attractive starting valuation. However, a lower market price isn't the only factor currently at play in the markets. Equity valuations are also driven by expected cash flows (i.e., earnings and dividends). Abrupt policy changes from central banks, going from supporting nominal growth at all costs to focusing on reining in inflation, have slowed economic growth expectations. The impact of all this feeds into our valuation model, suggesting that any potential attractiveness due to lower stock prices is offset by a more tepid earnings growth outlook. Note that while absolute return expectations remain similar to last year, the components that make up those returns have changed drastically. For example, expected equity risk premium, which indicates when stocks are expensive or cheap relative to a "risk-free" investment (such as a Treasury security), has steeply declined. This means that while stocks still tend to have higher expected returns than bonds, the spread has tightened greatly.

Historical and projected inflation and real GDP growth



Source: Charles Schwab Investment Advisory, Inc.

Historical inflation data from U.S. Bureau of Labor Statistics. Historical real GDP data from U.S. Bureau of Economic Analysis. Forecasted data from Consensus Economics. All data as of 10/31/2022.

* Estimates published for 2022. Numbers rounded to the nearest one-tenth of a percentage point. Annualized historical inflation based on monthly Consumer Price Index for All Urban Consumers. Annualized historical real GDP growth based on annual real Gross Domestic Product (Not Seasonally Adjusted). Note, real Gross Domestic Product (Not Seasonally Adjusted) for 2022 calculated using quarterly data through Q3 2022 (Second Estimate). **Past performance is no guarantee of future results.**

How do you calculate your long-term forecasts?

Schwab's long-term forecasts are constructed using a building-block approach, where return expectations are broken down into unique components. Each component is constructed using a quantitative and systematic approach, allowing for consistent forecasts across asset classes. To capture the broad movements of the market, we leverage reliable predictors such as equity valuations and bond yields when constructing the core return drivers of our framework. When possible, we use a forward-looking approach to forecasting returns, rather than basing our estimates solely on historical averages.

For **inflation and GDP** growth, we use a survey-based approach based on economist expectations. We find this approach beneficial for three reasons: (1) professional forecasters incorporate new, relevant information into their updated expectations; (2) these expectations tend to be consistent with prevailing views about economic policy; and (3) they provide a relatively stable forecast, which is a desirable feature for retirement planning and asset allocation models.

For **U.S. and international large-cap stocks**, we start with the belief that stock markets are a discounting mechanism, meaning the current price attempts to take into consideration all available information about present and future events. As such, we use a valuation-based model that discounts the future cash flows an investor is expected to receive to the current price of a stock. The effectiveness of this approach rests with the inputs that are used. We use forward-looking earnings estimates and macroeconomic forecast data to estimate two key cash-flow drivers: (1) recurring income (i.e., earnings) and (2) capital gains generated by selling the investment at the end of a predefined horizon, such as 10 years. To arrive at a return estimate, we answer the question: *What returns would investors make if they bought a stock at the current price and received these forecasted cash flows?*

For **U.S. small-cap stocks**, we leverage the valuation-based model used for large-company stocks as our base, then analyze and include a "size-risk premium." This is the return that investors in small-company stocks expect to earn over the returns on large-company stocks.

For **U.S. investment-grade bonds** (i.e., Treasuries, investment-grade corporate bonds, and securitized bonds), we believe the future level of return an investor will receive is anchored to a large extent by yields. For example, if an investor buys a 10-year Treasury note with a 3% yield-to-maturity and does not touch the investment until maturity, then the investor will realize a 3% return per year. Given this relationship, we consider the following components when forecasting bonds:

- ***Yield-to-maturity of a "risk-free" bond.*** Treasury notes are fixed-income securities issued by the U.S. government that generate what is considered a "risk-free" rate, because of the negligible chance of the U.S. government defaulting on its debt obligations. In determining a "risk-free" return, the U.S. Treasury does not provide yields for every maturity; therefore, we use a yield-curve-fitting model to account for the missing maturities. This fitted "risk-free" curve provides duration-matched yields for any fixed income asset class we need to model.

- ***Yield spread***. Riskier bonds typically yield more than a risk-free rate due to credit and/or default risk. This additional yield is called the yield spread. The yield spread compensates investors for the risk of default by the corporation that issued the bond, i.e., the possibility that a bond's issuer will be unable to pay its obligations on time, or at all. The lower the issuer's credit rating, the higher the credit risk premium investors typically require for accepting the risk of owning the issuer's debt. In a perfect world, the investor would receive the entire stated yield over the life of the bond, but due to possible default loss and other losses (such as downgrades in the case of investment-grade bonds), some bonds may only earn around 50% of the observed yield spread.

- ***Roll-down return.*** Because investors typically invest in bond portfolios designed to maintain an average duration, we include this additional return. To maintain a target duration, bond managers must periodically rebalance the portfolio by selling bonds as they move closer to their maturity dates. As there is an inverse relationship between bond yields and prices, this process typically results in a gain for an upward-sloping yield curve (where longer-term bonds have higher yields than shorter-term bonds). Note that the opposite holds true if the yield curve is downward-sloping.

For **cash investments,** because they are very short-term in nature (typically not exceeding three months), we assume reinvestment at the end of each period over a 10-year horizon. The expected return from this constant reinvestment is referred to as the expected short rate, which we forecast using a term-structure model.

Why do you expect long-term returns to be lower than historical averages?

When planning for the future, relying solely on historical returns can create unrealistic expectations. When actual returns do not match expectations, it can have big financial consequences—such as a delayed retirement or difficulty paying for big expenses such as a college education. Rather than base our forecasts solely on history, the CMEs leverage forward-looking information, such as consensus-driven earnings estimates and macroeconomic forecast data, to create a more robust picture of future returns. Over the next decade, Schwab expects market returns to fall short of long-term historical averages due to deviations from historical interest rates, economic growth prospects, and equity valuations.

- ***Interest rates.*** While current and expected interest rates are notably higher than they were just a year ago, they are still much lower than they have been historically, especially compared to the high-interest-rate environment of the 1980s. Although our estimates account for this higher-rate environment, they are still not likely to be as high as what we have seen historically.

- ***Economic growth.*** Stubbornly high inflation has led central banks to aggressively tighten monetary policy, slowing near-term economic growth worldwide. Additionally, consensus forecasts over the long term have also declined. A robust economy is fundamental to achieving healthy returns from financial markets. According to consensus forecasts, economists expect real GDP growth to be 1.8% per year, on average, over the next 10 years. This outlook is notably lower than its historical average growth rate of 2.6% per year since 1970.

- ***Equity valuations***. Any potential attractiveness due to price declines in 2022 seemed to be counteracted by a more tepid earnings growth outlook. While expected earnings growth slowed somewhat in the near term, growth rates came down most notably in the medium term (three to five years). The end result is a return outlook similar to last year's, as these lower earnings expectations already appear to be reflected by the current price. As such, Schwab continues to expect stock returns to remain below historical levels.

Why do you expect international stocks to outperform U.S. stocks?

We project U.S. large-company stocks to return 6.1% annually over the next 10 years, compared with 7.6% for international large-company stocks. This is mainly due to differences in valuations between U.S. stocks (as measured by the S&P 500 index) and international stocks (as measured by MSCI EAFE index). International stocks are generally riskier than U.S. stocks and investors expect to be compensated for taking on this additional risk. While we recognize that historical returns for international stocks have lagged domestic stocks, the expected cash flows given the current price suggest they have a better chance of outperforming over the next 10 years. This is still the case even after accounting for the additional risk.

What can investors do now?

Due to the power of compound returns—the cumulative effect that gains or losses have on an original investment—even relatively small differences can result in large changes over time. Therefore, what investors do (or don't do) today can have a sizeable impact on the likelihood of achieving their long-term investment goals. By incorporating realistic return assumptions into the financial-planning process, investors are better able to plan for their long-term financial goals.

If you don't have a long-term financial plan, now is a good time to start putting one together. If you already have one, then consider revising it based on Schwab's updated CMEs. As always, keep in mind that it is impossible to predict with 100% certainty what will happen with any individual investment. As such, CMEs should not be used for timing the market; instead, these estimates should be used as a guide to set reasonable long-term expectations for financial goals and asset allocation plans.

Our seven investing principles can help you get started and stay on track, but here are a few things to consider now.

- Establish a financial plan based on your goals. Be realistic about your goals and be prepared to change your plan as your life circumstances change. Use our updated expected returns to help you be more realistic when creating your financial plan.

- This year our expected returns for bonds went up, but that doesn't mean you should correspondingly reduce the amount you save. Expected returns fluctuate from year-to-year and are far from a guarantee. The more you save, the more cushion you can have in case actual returns don't meet what we expect.

- Build a diversified portfolio based on your tolerance for risk. Various asset classes—such as stocks, bonds, or cash—behave differently in changing market environments, and it has been nearly impossible to predict which asset classes will perform best in a given year. Instead of chasing past performance, create an appropriately diversified portfolio that can help minimize the effects of market ups and downs.

Has The Realized Equity Premium Been Shrinking?

Jun. 4, 2014 7:20 AM ET | 23 comments | by: Larry Swedroe

Disclosure: I have no positions in any stocks mentioned, and no plans to initiate any positions within the next 72 hours. **(More...)**

Summary

- Claude Erb has done a series of papers in which he examines the various premiums — size, value, momentum, and beta.
- His most recent one focused specifically on the equity risk premium.
- While it's certainly possible that the equity risk premium could revert to its historical mean, mean reversion of valuations is far from a certainty.

Tying up our two-part series on premiums, today we'll explore the equity premium.

Claude Erb has done a series of papers in which he examines the various premiums - size, value, momentum, and beta - and found that there's a demonstrable trend in each case of the premiums shrinking in terms of realized returns. His April 2014 paper, "The Incredible Shrinking Realized Equity Risk Premium," focused specifically on the equity risk premium.

To create a trend line Erb used a three-step process:

Step 1: He linked the monthly excess returns into a "growth of $1" cumulative. The "market" excess return is the monthly total return minus the monthly Treasury-bill return from Ken French's website.

Step 2: On a monthly basis, he calculated the 10-year annualized rate of return. The first calculation covered the 10 years from June 1926 to June 1936, the second from July 1926 to July 1936, etc. Part of the reason for using the 10-year time horizon was that it is the same time horizon that Campbell and Shiller used in their early CAPE ratio research.

Step 3: He created a trend line using an Excel/PowerPoint function that regressed the rolling 10-year return on time (the x axis). He found that a 4.3 percent equity risk premium (the stock market total return in excess of the return of the t-bill) was the best fit of the relationship between 10-year excess return and time as of April 2014. Or given the way that 10-year equity excess returns have evolved over time, the relationship that best captures the downtrend in this measure suggests that the trend equity risk premium is currently 4.3 percent.

It's worth noting that Erb's 4.3 percent estimate is very similar to the current *real* expected return using Shiller's adjusted CAPE 10. The CAPE 10 is now at about 25.9. That produces an earnings yield of about 3.9 percent. However, we need to make an adjustment to arrive at the forecasted real return to stocks because the earnings figure from the CAPE 10 is on average a lag of 5 years. With real earnings growing about 1.5 percent a year, we need to multiply the 3.9 percent earnings yield by 1.075 percent (1.5 percent x 5 years). That produces a real expected return to stocks of about 4.2 percent.

Having estimated the equity risk premium at 4.3 percent, Erb noted that "the realized 'equity risk premium' has been in a downward trend since 1925. He explained that while a constant equity risk premium, and mean reversion, leads to the view that the probability rises over time that stocks will outperform high quality bonds, a declining equity risk premium, and mean reversion, leads to the view that the probability increases over time that safe assets will outperform stocks. He suggests that the declining equity risk premium has created a conundrum for many investors: Is it stocks for the long run, or bonds for the long run?

Erb also noted that a simple extrapolation of the declining trend in the equity risk premium results in a 0 premium by 2050. Logically (not that markets are always rational - see March 2000 when the earnings yield was below the yield on TIPS), that world shouldn't exist since no one would buy riskier stocks if there was no expectation of earning a risk premium. In other words, Stein's Law applies: If something cannot go on forever, it will stop (usually ending badly when it comes to stocks). However, it's certainly possible that instead of reverting to its historical mean (as many, such as Jeremy Grantham, are predicting) the equity risk premium could remain where it is, or even decline somewhat further. There are several possible/likely explanations for why the equity risk premium has been falling:

- When risk capital is scarce, it earns high "economic rents." As national wealth increases, the equity risk premium tends to fall as more capital is available to invest in risky assets. All else equal our rising national wealth should be expected to lead to a fall in the equity risk premium.
- Over time, the SEC's regulatory powers have increased, and accounting rules and regulations have been strengthened. The result is that investors have should have more confidence to invest in risky assets. Again, all else equal, this should lead to a smaller required equity risk premium.
- Implementation costs of equity strategies have fallen. Both commissions and bid/offer spreads have come way down over time. In addition, mutual fund expense ratios and loads are also much lower. And, the Internet has made trading much easier/more convenient. All else equal, lower implementation costs should lead to a lower equity risk premium. Lower trading costs can also help explain the falling small cap premium that Erb had found.
- Longer life expectancies can lead investors to have a stronger preference for equities as they provide the higher expected returns that may be needed to allow portfolios to last for longer horizons.

The bottom line is that while it's certainly possible that the equity risk premium could revert to its historical mean, mean reversion of valuations is far from a certainty. Thus, investors shouldn't draw the conclusion that the market is overvalued, nor that it's ripe for a fall.

Literature Review

THE EQUITY RISK PREMIUM: A CONTEXTUAL LITERATURE REVIEW

Laurence B. Siegel

CFA Institute Research Foundation

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ISBN 978-1-944960-31-5

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The Equity Risk Premium: A Contextual Literature Review

Laurence B. Siegel

Laurence B. Siegel is the Gary P. Brinson director of research at the CFA Institute Research Foundation, Charlottesville, Virginia.

The equity risk premium (ERP), or equity premium, is the difference in expected or realized return between an equity index and a reference asset,[1] where the latter is usually a bond or bill portfolio considered to be "riskless."[2] In the modern literature and in investment management practice, ERP usually means "*expected* ERP," and I will stick to that convention, reserving the phrase "realized ERP" for any backward-looking or historical measure.

The ERP is widely acknowledged as the most important variable in finance. It is useful

- for determining what returns to expect from each major asset class and from portfolios of securities or asset classes;
- in life-cycle and retirement planning (estimating how much to save and invest in the hope of achieving a given standard of living in retirement); and
- as a component of the opportunity cost of capital or required rate of return in corporate finance.

An estimate of the ERP is required for essentially all asset allocation models and is central to the practice of investment management and asset/liability management. ERP estimates thus strongly affect the asset allocation decisions of individual investors and institutional investors, including pensions, endowment funds, foundations, and insurance companies.

[1]Occasionally, the reference asset is "inflation"—that is, a hypothetical asset returning the rate of consumer price inflation as measured by some index.

[2]I would argue that no asset is completely riskless.

Approaches to Estimating the ERP

This review is organized by theme, roughly in the order in which the themes first appeared in the literature. Approaches to estimating the ERP fall into three broad categories:

1. Methods based on a dividend discount model (DDM), earnings discount model, or cash-flow-to-the-investor discount model: forward-looking methods with their roots in discounted cash flow (DCF) analysis, wherein the value of an asset is regarded as the present value of the cash flows the asset is expected to generate.
2. Methods based on extrapolating past trends, in particular the spread between realized stock and bond or cash returns, into the future: retrospective methods.
3. Methods based on a macroeconomic model of the way that investors require compensation for risk.

In past literature, these have been called, respectively, supply, equilibrium, and demand models.[3] The DDM is a supply model because it focuses on ways that companies generate cash with which to reward investors. The macroeconomic model is a demand model because it asks what excess return investors need to induce them to take equity risk. The retrospective method can be regarded as an equilibrium model because it relies on prices at which the market actually traded, reflecting the intersection of supply and demand curves.

Earliest Estimates. The earliest estimates of the ERP were derived by estimating the expected return on an equity portfolio using the DDM and then subtracting the expected return or yield on the riskless asset. This "DDM approach," which made a comeback at the end of the 20th century, is the method most widely used today.

Future Equals Past. The next step was taken by researchers who measured the realized ERP, asserting that the realized ERP was the best estimate of the expected ERP. In their view, neither the amount of risk in the market nor the "price of risk" (the return investors require and expect to receive for

[3] Roger G. Ibbotson, "The Equity Risk Premium," in *Rethinking the Equity Risk Premium*, edited by P. Brett Hammond, Jr., Martin L. Leibowitz, and Laurence B. Siegel (Charlottesville, VA: CFA Institute Research Foundation, 2011): https://www.cfapubs.org/doi/pdf/10.2470/rf.v2011.n4.8. This work describes the supply and demand models. In other works and in conversations, Roger Ibbotson has characterized the retrospective method as an equilibrium model.

taking a given amount of risk) changes much over time; that is, the return-generating process for equities (in excess of the riskless rate) is stable or stationary. This method is called the future-equals-past approach.

The future-equals-past approach suffers from the following flaw: The higher the market rises, the higher the estimate of future returns given by the method. This outcome is contrary to intuition, which would lead one to expect a low return (on any asset) if one pays a high going-in price for the asset. Consider, for example, a bond: If the past return is 10% per year because interest rates have fallen from, say, 5% at the beginning of the holding period to 1% at the end, is the expected return 10% or 1%? It is the latter.

In addition, the future-equals-past approach assumes that markets are fairly priced and does not allow for the possibility that they are not. This possibility became a primary focus of research once the future-equals-past method lost its preeminence.

The Macro Approach or "Equity Premium Puzzle." Starting around 1985, academics began to question why the realized ERP—and apparently also the expected ERP—was so large when certain aspects of macroeconomic theory suggested it should be much smaller. That is, other trade-offs between risk and reward in the economy implied that investors did not require nearly as large a risk premium as they had been getting.

This "equity premium puzzle" literature, while extensive and contentious, turned out to be something of a dead end because the ERP, while arguably smaller than it once was, is still much larger than the puzzle literature says it should be. I nevertheless take this literature seriously and document it in the "Equity Premium 'Puzzle'" section below.

The DDM Counterrevolution. A substantial innovation occurred in the 1980s when several researchers found the ERP to be *time varying*. This literature spawned a mountain of research on the time-series behavior of equity market valuation measures, particularly price-to-earnings ratios (P/Es).

The P/E-related research asks, among other questions, what the best definition of "earnings" is for forecasting future returns. The cyclically adjusted price-to-earnings ratio (CAPE), which smoothes earnings data by averaging them over long periods, typically 10 years, has become the most popular measure. (P/E and CAPE are relevant to ERP estimation because if the ERP is time varying, these statistics provide a way to get continuously updated measures of the expected return on equities; one can then subtract bond or bill yields to arrive at the ERP itself.) This thread, which is called "time-varying premia," continues today as the predominant trend in ERP research.

A branch of the time-varying ERP tree asks what, besides earnings, might accurately measure the desirability of an equity investment. The most important alternative is payout, or "cash flow to the investor"—that is, dividends plus other cash flows, such as those from share buybacks.

Other Works. While most of the work that has been done on the ERP relates to the United States, the underlying issues are the same everywhere. I review literature that extends this work to international markets.

Finally, I list and comment briefly on other literature reviews, compilations, and aggregative works.

First Stirrings

Edgar Smith, in 1924, seemed to intuit the equity risk premium.[4] He presented evidence that stocks had high returns, realized or expected (he did not make the distinction), relative to other, primarily fixed-income assets. In 1938, the Harvard professor John Burr Williams was the first to state that the value of a firm is the discounted present value of all of its future dividends.[5] He wrote, "Earnings are only a means to an end [dividends], and the means should not be mistaken for the end" (p. 47).

Williams's discounted cash flow formula, familiar to all business students, represents the origin of risk premium thinking because the discount rate, in order to be useful for valuing stocks, must be a risky discount rate that is higher than the riskless rate by an amount (the equity risk premium) that compensates the investor fairly, but not more than fairly, for the risk of the stock.

In 1956, Myron Gordon and Eli Shapiro, building on Williams's work, formalized the notion of a risky discount rate and equated the expected return on an equity with the "required rate of profit."[6] This principle is the foundation of corporate finance, which asserts that the market for an asset (say, an equity) is in equilibrium when the expected return on the asset equals the required return—that is, the return that investors demand as fair compensation for the asset's risk.

Future Equals Past

But these early works did not lead directly to estimates of the ERP that were practicable for asset allocation, capital budgeting, and other uses to which the

[4]Edgar Lawrence Smith, *Common Stocks as Long Term Investments* (New York: Macmillan, 1924; Eastford, CT: Martino Fine Books, 2012).

[5]John Burr Williams, *The Theory of Investment Value* (Cambridge, MA: Harvard University Press, 1938).

[6]Myron J. Gordon and Eli Shapiro, "Capital Equipment Analysis: The Required Rate of Profit," *Management Science*, vol. 3, no. 1 (1956): 102–110.

premium is now put. Ibbotson and Sinquefield (1976) made explicit estimates of the ERP by calculating, as far back in history as high-quality data allowed, the difference between the realized total returns on an equity index and the realized total returns on a bond or bill (cash) portfolio. The logic was that over time, investors conform their expectations to that which is actually realizable, so that the historical return (in excess of the riskless rate) is a fair or equilibrium estimate of the return (in excess of the riskless rate) that investors should expect going forward.

Ibbotson and Sinquefield decomposed historical returns on an equity index into a part attributable to the riskless rate and a part attributable to the equity premium. The arithmetic mean of the equity premium part is assumed to be stationary—that is, the same in the future as in the past. Thus, if equities had beaten riskless Treasury bills by an arithmetic mean margin of 7% a year over the historical measurement period (which was usually 1926 through the then-current time), then equities were forecast to beat bills by the same amount in the future.

The arithmetic mean expected total return on equities was then calculated as the sum of the forward-looking riskless rate (i.e., the yield on riskless bills or bonds) and the arithmetic mean expected ERP.

Reflecting on Ibbotson and Sinquefield's pioneering work, I wrote:

> Hadn't anyone before . . . Ibbotson and . . . Sinquefield . . . estimated the equity risk premium? Of course the thought had occurred to many, but the preexisting methodology—to use a kind of Dividend Discount Model (DDM) for the aggregate of all stocks in the market—gave forecasts, or estimates of the *ex ante* or expected risk premium, not backward looks at history. Hindsight showed that DDM-based forecasts had been much too low. A typical DDM estimate of the forward-looking, or expected, equity risk premium over bonds was in the range of 2 to 3 percent. In contrast, Ibbotson [and Sinquefield] showed that stocks had out-returned intermediate-term Treasury bonds by much more, 5.4 percent, using 1926 to 1979 as the measurement period. (p. xii)[7]

Ibbotson and Sinquefield's work was tremendously influential, led to the establishment of a firm (Ibbotson Associates) that would later be acquired by Morningstar, and was updated in yearbook form by Morningstar until 2015 and by Duff & Phelps thereafter (Ibbotson, Grabowski, Harrington, and Nunes 2017).[8] Their method is still the way that many finance professors,

[7]Laurence B. Siegel, foreword to *Frontiers of Modern Asset Allocation*, by Paul D. Kaplan (Hoboken, NJ: John Wiley & Sons, 2011).

[8]Starting about 2015, Morningstar discontinued "future-equals-past" estimates of the ERP in its updates of the Ibbotson yearbook, noting that DDM-type forecasts are more accurate and more theoretically justifiable.

investment management and sales executives, and others make their long-run forecasts. However, over roughly the last quarter century, other methods—principally based on a forward-looking discounted cash flow (DCF) model, such as the DDM—have become competitive and even dominant.

As noted, the future-equals-past method was the principal way of estimating the ERP for a long time after Ibbotson and Sinquefield's early studies. However, a 1984 paper, which was mostly ignored at the time but which would later become influential, called into question the relevance of this method's forecasts. Jeffrey Diermeier, who would later serve as president and CEO of CFA Institute, wrote the paper with Roger Ibbotson and myself.

We argued that (1) corporate earnings could not indefinitely grow faster than the overall economy, or there would eventually be nothing left for labor, government, and other claimants, and (2) P/E could not rise indefinitely either. As a result, the growth rate of the economy—that is, of GDP—is the hypothetical upper limit of the very-long-term rate of price return on equities. In addition to that return, the investor receives dividends. See Diermeier, Ibbotson, and Siegel (1984).

This argument asserts that a DDM is the right way to think about the ERP. While this idea remained dormant for some time, it would constitute the main thrust of ERP estimation in the 1990s and thereafter.

The Equity Premium "Puzzle"

In the 1980s, while practitioners were debating whether the ERP was low (3% or 4%, as suggested by DDM methods) or high (more than 5%, as obtained by extrapolating historical data), a group of academics were wondering why the ERP was not trivially more than zero. Mehra and Prescott (1985) described a "puzzle" whereby the ERP realized over the period 1889–1978 (or any other similarly long period, such as 1926 to the present) was too high, *by at least an order of magnitude,* to be explained by standard "general equilibrium" or "macroeconomic" asset-pricing models.

Using these models, such a high premium can be explained only by a very high coefficient of risk aversion, one in the range of 30 to 40. (The risk aversion parameter describes a given individual's trade-off between the amount of risk taken and the amount of additional return he or she requires as compensation for taking that risk.) Risk aversion parameters observed in other aspects of financial behavior are around 1. So, Mehra and Prescott argued, either the model used to describe investors' behavior is flawed or equity investors have received a much higher return than they expected.

The asset-pricing models referenced by Mehra and Prescott (1985) are called "macroeconomic" because they originated in that specialty but also, more importantly, to distinguish them from asset-pricing models commonly used in investment finance—such as the capital asset pricing model, the three-factor Fama–French model, and arbitrage pricing theory—that are silent on the absolute size of the risk premium (in fact, requiring it as an input) and that distinguish instead among the expected *relative* returns on specific securities or portfolios.

Research on the question of why the realized equity premium was so large can be divided into three broad categories: (1) studies alleging bias in the historical data, (2) studies suggesting improvements in the macroeconomic model, and (3) studies that raise behavioral finance, life-cycle, and other issues.

Biases in Historical Data. Potential biases in the historical data include survivorship bias, transaction and tax costs, and the mixing of expected and unexpected components of past returns.

- *Survival bias.* Brown, Goetzmann, and Ross (1995) argued that the historical equity premium calculated using US data is likely to overstate the true (expected) premium because the US stock market turned out to be the most successful in world history. However, Dimson, Marsh, and Staunton (2008) examined stock and bond returns using data from 1900 to 2005 for 17 countries and concluded that the historical equity premium obtained for the United States is comparable to that of other countries.

- *Transaction costs, regulations, and taxes.* McGrattan and Prescott (2001) suggested that the high historical equity premium is mainly due to a large run-up in the equity price caused by the sharp decline in the tax rate on dividends. In their article, they claimed that the equity premium is less than 1% after accounting for taxes, regulations, and costs. To this result, I would add that index funds were not available to investors over the long periods studied by historical researchers; thus, equity investors earned returns lower than those of the index by the amount of (1) the explicit transaction and holding costs involved in forming portfolios and (2) the implicit cost of not being diversified.

- *Unanticipated repricing of equities.* Bernstein (1997) suggested that because equities started the sample period (which begins in 1926) at a price-to-earnings ratio of about 10 and ended the period at a P/E of about 20, the actual return on equities was higher than investors expected or required. Thus, the historical return overstates the future expected return. This finding was bolstered by Fama and French (2002), who used the DDM to show that investors expected an equity risk premium of about 3%, on average, from 1926 to the present.

Improvements in the Theoretical Model. The second broad category of research on the equity risk premium is a large body of literature exploring a variety of improvements in the original Mehra and Prescott (1985) model.

□ *Rare events.* Rietz (1988) suggested that the ERP puzzle can be solved by incorporating a very small probability of a very large drop in consumption. If such a probability exists, the predicted equity premium would be large (to compensate investors for the small risk of a very bad outcome). Mehra and Prescott (1988) countered that, even if investors have a risk aversion parameter of 10, substantially larger than what they are generally believed to have, Rietz's model requires a 1 in 100 chance of a 25% decline in consumption, which they say has not happened in the United States. The largest aggregate consumption decline in the last 100 years, according to these authors, was only 8.8%.

I would remind these debaters that, according to Cooper and John, in the United States "from 1929 to 1933, real GDP decreased by 26.5 percent, while consumption decreased by 18.2 percent" (p. 1059).[9] Mehra and Prescott's (1988) 8.8% was the consumption decline in *just one year* of a multiyear decline.

Campbell, Lo, and MacKinlay pointed out in 1997 that "the difficulty with Rietz's argument is that it requires not only an economic catastrophe, but one which affects stock market investors more seriously than investors in short-term debt instruments" (p. 311).[10] Barro (2006) extended Rietz's model and argued that it does provide a plausible resolution of the equity premium puzzle.

□ *Borrowing constraints and life-cycle issues.* Constantinides, Donaldson, and Mehra (2002) introduced life-cycle and borrowing constraints into the debate. They argued that as the correlation of equities with personal income changes over the life of an investor, so too does the attractiveness of equities to that investor. The young, who should borrow to smooth consumption and to invest in equities, cannot do so. Therefore, equities are priced almost exclusively by middle-aged investors, who find them—or at one time found them—to be unattractive. Thus, equities are underpriced and bonds are overpriced, producing a higher ERP than the puzzle literature predicts.

□ *Behavioral concerns.* A large swath of behavioral finance literature argues that the combination of "myopic" loss aversion and narrow framing can help to resolve the equity premium puzzle. This category includes Benartzi

[9]Russell Cooper and Andrew John, *Theory and Applications of Economics* (v. 1.0): https://2012books.lardbucket.org/pdfs/theory-and-applications-of-economics.pdf.

[10]John Y. Campbell, Andrew W. Lo, and A. Craig MacKinlay, *The Econometrics of Financial Markets* (Princeton, NJ: Princeton University Press, 1997).

and Thaler (1995); Barberis, Huang, and Santos (2001); and Barberis and Huang (2007).

Time-Varying Premia and the DDM Counterrevolution

In one of the sharpest academic–practitioner divides in memory, some academics still consider the ERP puzzle literature relevant while almost no practitioners do. In addition, the future-equals-past method is rarely used by sophisticated practitioners and shows up mostly in the marketing literature of private wealth advisers who are trying to sell equities. So the DDM-based approach has been the only one with any real traction since the turn of the millennium.

While some practitioners had long used DDM-type estimates of the ERP, Campbell and Shiller, in the late 1980s, were really the first to reestablish the DDM as a respectable challenger to the then-dominant future-equals-past method. Their work spawned a vast literature that is exclusively forward looking; that is, it focuses on the expected rather than the realized ERP. This literature asserts that, like most DDM estimates, the ERP is time varying and countercyclical: The ERP is high when the market is low, and vice versa.

As noted earlier, the future-equals-past method, in contrast, is procyclical: It paradoxically gives higher forecasts after each market move upward and lower forecasts after each move downward. (An interesting contrast of investors' procyclical views with the DDM's countercyclical forecasts is presented in Greenwood and Shleifer [2014].)

This procyclicality proved to be the method's undoing. As of 1999, it was forecasting a greater than 12% annual return—an absurdity given the already bubble-like level of the market. So, around that time, the popularity of the future-equals-past method waned and acceptance of the DDM and allied approaches grew. Because the DDM had also been the preeminent method before Ibbotson and Sinquefield, I refer to this shift in thinking as the DDM counterrevolution.[11]

Valuation Levels and Subsequent Stock Returns. Campbell and Shiller (1988) "found that valuation ratios are positively correlated with subsequent returns and that the implied predictability of returns is substantial at longer horizons" (Campbell 2007, p. 1). So much for perfectly efficient

[11]To Ibbotson's credit, he has coauthored several papers that embrace—or, in the case of Diermeier, Ibbotson, and Siegel (1984), foreshadow—the DDM counterrevolution, in a sense overturning his own prior work with Sinquefield. See Roger G. Ibbotson and Peng Chen, "Long-Run Stock Returns: Participating in the Real Economy," *Financial Analysts Journal*, vol. 59, no. 1 (January/February 2003): 88–98; and Straehl and Ibbotson (2017).

markets! If returns can be predicted from valuation levels, then return expectations are not, or should not be, constant; thus (holding the riskless rate constant), the ERP is not constant either. There is information in valuation levels, then, that is potentially useful for timing the market and almost certainly useful for making periodic adjustments to the ERP assumption used in asset allocation and long-range planning.

Around that time, Fama and French (1988) came to a similar conclusion. They found that dividend yields were positively related to expected stock returns. This is the same as saying that high valuations (low dividend yields—that is, high price-to-dividend ratios) portend low stock returns and vice versa.

Once Jeremy Siegel (1994) and Peter Bernstein (1997), both best-selling authors with strong academic credentials, jumped decisively on the DDM bandwagon (see the discussion of Bernstein's work above), other works pursuing the same theme came in a flood. They include Campbell and Shiller (1998); Arnott and Bernstein (2002); Shiller (2000); Asness (2000, 2003); and Fama and French (2002; mentioned earlier in the puzzle discussion). As the field matured, other, more integrative works were produced, including Cochrane (2011) and Ilmanen (2011).

Two Influential Books. Among practitioners, the most influential of these works were Siegel's and Shiller's books, respectively titled *Stocks for the Long Run* (1994) and *Irrational Exuberance* (2000). Sometimes portrayed as rivals, the two authors are actually close personal friends who have vacationed together with their families and who enjoy debating the fine points of their views on markets.

□ *CAPE method.* Shiller's book, in particular, has spawned a literature on the valuation method it espouses, called CAPE (cyclically adjusted price-to-earnings ratio). The CAPE literature is relevant to ERP estimation because CAPE is just an "improved" P/E—which, under carefully constrained conditions, is the inverse of the real expected return on a stock or stock portfolio.

Thus, if the CAPE or P/E of a portfolio (say, an index) is 25, the real expected return is 1/25 = 4%, and one can then subtract the real riskless rate (say, 1%, which is roughly the rate as of this writing) to arrive at the ERP (in this example, 3%). Jeremy Siegel (2016) set forth a constructive critique of the CAPE method, noting that researchers should emphasize more recent data, rather than the entire history, because accounting for the goodwill component of corporate earnings became more conservative around 1990. Adjusting for the accounting change raises the equity premium forecast.

☐ *Market timing.* As suggested above, if the ERP is time varying, then of course one could use that information to time the market. For obvious reasons, the literature on market timing intersects with the literature on estimating the value of the ERP at a given time. Ilmanen (2016) focused on the time-varying aspect of the ERP and other risk premia. While market timing per se is outside the scope of this review, his study also deals with long-term expectations, so it is included here.

Cash Flow to the Investor

The "payout" or "cash flow to the investor" literature relies on Miller and Modigliani,[12] whose work implies that, in the words of Straehl and Ibbotson (2017), "investors should be indifferent about whether they receive distributions via dividends or buybacks as well as how they participate in a buyback—that is, by receiving cash from tendering their shares or by receiving an increased proportion in the company" (p. 2). If this is the case, then explicit (cash) dividends are irrelevant and only total cash payout to the investor, including buybacks as well as dividends, is relevant for equity valuation. Diermeier, Ibbotson, and Siegel (1984) rely on this principle, as do Grinold and Kroner (2002) and Grinold, Kroner, and Siegel (2011).

Grinold's studies adjust dividends for "net new issues"—that is, the number of shares issued by companies in secondary public offerings *minus* the number of shares retired through buybacks and other corporate actions. This method brings together (1) the payout literature and (2) the dilution analysis performed by Bernstein and Arnott (2003), wherein the authors find that in order to achieve the earnings growth that has been observed, shareholders have had to suffer dilution amounting to a large 2% per year—with "dilution" referring to a decrease in the ownership percentage of a company represented by a given number of shares. This dilution, if continued in the future, will reduce the ERP.

But Straehl and Ibbotson (2017) were the first to really complete the payout analysis. They show that total payouts—in their formulation, dividends plus buybacks, not dividends alone—explain long-run stock market returns.[13] They proposed a new valuation measure, CATY (cyclically adjusted total yield), analogous to CAPE but constructed from "total yield" (payouts) rather than earnings, that "predicts changes in expected returns at least as well as the . . . CAPE" (p. 32). (The analysis is still not quite complete because total

[12]Merton H. Miller and Franco Modigliani, "Dividend Policy, Growth, and the Valuation of Shares," *Journal of Business*, vol. 34, no. 4 (October 1961): 411–433.

[13]In an article in progress, I argue that cash takeovers are a form of buyback and should be added to the total payout calculation.

yield should include cash takeovers as well as dividends and buybacks, but the authors did not have data for cash takeovers.)

As with the CAPE literature, the payout or CATY literature ties back to the ERP because the ERP can be calculated simply by subtracting the bond or bill yield from whatever expected total return on the stock market is implied by the CAPE or CATY analysis. Estimating the ERP and estimating the expected stock market return are essentially the same problem, because the two estimates differ by an observable constant (the riskless rate of return).

Yet the payout literature is contentious because that analysis relies on a satisfactory disentangling of earnings, earnings per share, number of shares, new issues, dilution, dividends, retained earnings, buybacks, and takeovers. These concepts, governed by accounting identities, seem easy until one tries to interpret them for the purpose of estimating expected returns and the ERP. Then they become difficult. While analysts perform this intricate analysis for individual companies with DCF models (by constructing measures such as EBITDA), such an approach may be daunting in the aggregate. In an inversion of the classic framework, where dividends are easy to forecast and capital gains hard, the payout literature shows that even the income part of the return, of which dividends are a key element, is subject to interpretation and controversy.

Why the increased interest in payout? Brav, Graham, Harvey, and Michaely (2005) reported that a 1982 change in SEC rules reduced the legal risk of repurchases. Since that time, dividend yields have fallen and buybacks have soared. In particular, "managers behave as if there is a significant capital market penalty associated with cutting dividends, but not with reducing repurchases. Accordingly, dividends are set conservatively and repurchases are used to absorb variation in total payout."[14] The resulting increase in buybacks makes it important to measure them as part of total payout rather than relying, as analysts in the last century generally did, on dividends.

Other Methods

This review of ERP estimation methods is not exhaustive. Duarte and Rosa (2015), making one-year rather than long-term forecasts, catalogued 20 models and found "that an optimal weighted average of all models places the one-year-ahead ERP in June 2012 at 12.2 percent, close to levels reached in the mid- and late 1970s, when the ERP was highest in the study sample."[15] This

[14]Bradford Cornell, Robert D. Arnott, and Max Moroz, "The Equity Premium Revisited" (1 February 2009): 4–5 (https://ssrn.com/abstract=1651196).

[15]From the authors' published abstract.

forecast was roughly correct over the subsequent five years, but it is way too high as a long-term expectation. This result suggests that Duarte and Rosa's method might be used for making the medium-term forecasts needed for dynamic or tactical asset allocation (timing) decisions.

An alternative approach to estimating the ERP is to look at credit markets. Equities per se don't have observable expected returns, but equity-like risky bonds do; the expected return is the yield minus an allowance for defaults. (The default allowance must necessarily be an estimate or forecast.) Extrapolating the risk–return relationship for credit bonds up to the risk or beta of equities can lead to a usable ERP number.

The literature on this question is well represented by Berg and Kaserer (2013), who used credit default swap (CDS) spreads instead of bond yields because of their greater accuracy. The authors' results for the US ERP range from 5.16% in 2004 to 7.18% in 2005; they note that, while the forecasts are high, these are upper limits, not midpoint estimates.

International Issues

The first efforts at measuring long-run equity returns in global markets were by Ibbotson, Siegel, and Love (1985) and Brinson, Diermeier, and Schlarbaum (1986). But neither of these studies explicitly estimated an ERP (although they made such estimation possible using a future-equals-past method). It took until the turn of the millennium for academics to focus their attention on the global equity market and its risk premium in a meaningful way.

Jorion and Goetzmann (1999) tested the concept of survival bias, which asserts that ERP estimates taken from successful countries, such as the United States and the United Kingdom, are upwardly biased because one could not know at the beginning of the period studied which countries' markets would survive and which would fail, or almost fail, due to war, nationalization, or other factors. This potential bias is a key issue in the estimation of any variable from observed historical data.

The authors

> collect a database of capital appreciation indexes for 39 markets going back into the 1920s. Over 1921 to 1996, the U.S. had the highest real return of all countries, at 4.3%, versus a median of 0.8% for other countries. The high equity premium obtained for the U.S. therefore seems to be the exception rather than the rule. (from the published abstract)

Dimson, Marsh, and Staunton (2002, 2017) have a slightly different take on survival bias. They documented, for a large assortment of countries, the annual returns on equities, bonds, and bills over a very long period: 1900 to the present. They also documented exchange rates and inflation rates so that real returns can be compared across countries. Like Jorion and Goetzmann (1999), they showed that survival bias is a significant factor in interpreting historical equity returns: An index composed of countries that survived the 20th century, with its wars and nationalizations, outperformed an unbiased index composed of countries that had markets in 1900.

However, the United States—one of the highest-returning markets—outperformed other surviving markets by only a modest margin. Equities, representing aggressive bets on the future, had the best returns in every country, representing the "triumph of the optimists" over pessimists who sought, through fixed-income investing, to defend their wealth positions against unforeseen disasters. Thus, survival bias is not as large a factor as one might naively guess.

Jeremy Siegel (1994) also weighed in on survival bias, noting that stocks beat bonds even in countries where markets were almost extinguished by war and inflation. In Germany and Japan, for example, stocks survived but bonds were ruined entirely.

Literature Reviews, Compilations, and Other Aggregative Works

CFA Institute Efforts. In 2002, the Association for Investment Management and Research (now CFA Institute) convened a group of academic and practitioner experts on the equity risk premium and published the ensuing discussion (AIMR 2002, online only). The discussion participants' estimates of the ERP ranged from 0.0% to 5.0%, excluding the results of a survey of finance professors who were asked what ERP estimate they used in their class materials; those estimates ranged as high as 7%. The average of the estimates made by the discussion participants was 3.7%.

Hammond, Leibowitz, and Siegel (2011) documented a reconvening of the AIMR (2002) group, this time by the CFA Institute Research Foundation, with some additions and deletions of participants. Several of the individual articles in the 2011 publication are referenced separately in this review. Remarkably, in the decade since the previous convocation, the experts' ERP estimates had converged tightly to 4%, plus or minus a small amount.

Additional Contributions. Additional elements of the ERP literature include Goetzmann and Ibbotson (2006); Campbell (2007); DeLong and Magin (2009); Cochrane (2011); Damodaran (2016); and Song (2007). Goetzmann and Ibbotson's book, *The Equity Risk Premium*, is an indispensable collection of the two Yale professors' works, with many coauthors, over more than 40 years. Several of the articles collected there are referenced separately in the bibliography below. Song (2007), the predecessor to this review, emphasizes the puzzle more than I have and is a valuable reference for readers interested in covering that literature in greater detail.

Conclusion

It is important to study and estimate the equity risk premium because it underpins some of the most significant financial and investment decisions a person or organization can make. Because the ERP cannot be observed directly, it must be estimated using one of a number of indirect approaches or models.

ERP models have gone through a number of fashions, sometimes called *regimes*, since the idea of estimating the ERP first came to prominence almost a half century ago. Initially, estimates of the equity risk premium, arrived at casually, tended to be low. Then, in the 1970s, Ibbotson and Sinquefield launched a period in which the ERP was expected to be high. This period lasted between a decade and a quarter century, depending on when one considers the DDM counterrevolution to have become fully established. Since the counterrevolution, the DDM approach seems to have prevailed and low to moderate estimates of the ERP have predominated.

What will happen in the future? While no one knows for certain, a low-return environment, sustained for a long enough time, creates the conditions for a high-return environment. But those conditions have not emerged yet. Market prices and valuation ratios suggest that low to moderate expected equity risk premia will prevail for some time.

I wish to thank P. Brett Hammond, research leader at Capital Group (Los Angeles), for his top-level editorial assistance and suggestions. Zhiyi Song, CFA, PhD, allowed me to recycle some of the ideas and language in The Equity Risk Premium: An Annotated Bibliography *(CFA Institute Research Foundation, 2007), which is the predecessor to this review; the section on the equity premium puzzle is mostly his (although I have shortened it), as are many of the annotations. I also thank various anonymous interviewees, including some whose work is cited herein.*

Bibliography

AIMR. 2002. *Equity Risk Premium Forum*. Charlottesville, VA: Association for Investment Management and Research.

This online resource consists of the proceedings of a high-level discussion group convened by AIMR (now CFA Institute) in 2001. Contributors include, in alphabetical order, Robert Arnott, Clifford Asness, Bradford Cornell, Campbell Harvey, Martin Leibowitz, Rajnish Mehra, Robert Shiller, Jeremy Siegel, and Richard Thaler.

Arnott, Robert D., and Peter L. Bernstein. 2002. "What Risk Premium Is 'Normal'?" *Financial Analysts Journal*, vol. 58, no. 2 (March/April): 64–85.

The expected equity return equals the dividend yield plus dividend growth plus the expected change in valuation, if any. As of year-end 1925, investors expected about 5.1% (about 1.4% more than the bond yield). The subsequent positive surprise was the result of four historical accidents: (1) Bonds had unanticipated losses; (2) valuations quadrupled, as measured by the price-to-dividend ratio (P/D); (3) the market survived; and (4) accelerated growth in real dividends and earnings occurred because of regulatory reform. These observations are used to construct a framework for estimating the equity risk premium at each point in time, including the present. The "normal" equity risk premium, or historical average of what investors were actually expecting, is 2.4%, and the current (2002) equity risk premium is around zero.

Asness, Clifford S. 2000. "Stocks versus Bonds: Explaining the Equity Risk Premium." *Financial Analysts Journal*, vol. 56, no. 2 (March/April): 96–113.

Changes in the expected equity risk premium are explained by changes in the relative volatilities of the two assets (stocks and bonds). The low ERP at the time of this study is consistent with low volatility in the stock market and high volatility in the bond market. The author writes, "This model fits 1871–1998 data extremely well" (p. 96). Interestingly, this finding holds over periods (before modern times) when volatility was not widely measured or understood to be a factor in asset returns.

Asness, Clifford S. 2003. "Fight the Fed Model." *Journal of Portfolio Management*, vol. 30, no. 1 (Fall): 11–24.

The “Fed model,” so called because the US Federal Reserve has sometimes used it to assess market valuation levels, compares the earnings yield (E/P, the reciprocal of P/E) on a stock market index to the yield on Treasury bonds. Asness argues that the model is incorrect because it mixes real and nominal quantities. Corporate earnings are “real,” varying with inflation, and bonds are nominal. Thus, the proper comparison is between earnings yields and *real* interest rates.

Barberis, Nicholas, and Ming Huang. 2007. “The Loss Aversion/Narrow Framing Approach to the Equity Premium Puzzle.” In *Handbook of the Equity Risk Premium*. Edited by Rajnish Mehra. Amsterdam: Elsevier.

The authors review the behavioral approach to understanding the ERP puzzle. The key elements of this approach are loss aversion and narrow framing, two well-known features of decision making under risk in experimental settings. By incorporating these features into traditional utility functions, Barberis and Huang show that a large equity premium and a low and stable risk-free rate can be generated simultaneously, even when consumption growth is smooth and only weakly correlated with the stock market.

Barberis, Nicholas, Ming Huang, and Tano Santos. 2001. “Prospect Theory and Asset Prices.” *Quarterly Journal of Economics*, vol. 116, no. 1 (February): 1–53.

This article proposes a new approach for pricing assets by incorporating two psychological ideas into the traditional consumption-based model. Investors are assumed to be more sensitive to losses than to gains, and their risk aversion changes over time depending on their prior investment outcomes. The authors show that this framework can help explain the high historical equity risk premium.

Barro, Robert. 2006. “Rare Disasters and Asset Markets in the Twentieth Century.” *Quarterly Journal of Economics*, vol. 121, no. 3 (August): 823–866.

This article extends the analysis of Rietz (1988) and argues that it does provide a plausible resolution of the ERP puzzle. Barro suggests that the rare-disasters framework (i.e., the allowance for low-probability disasters proposed by Rietz) can explain the ERP puzzle while “maintaining the tractable framework of a representative agent, time-additive and iso-elastic preferences, and complete markets” (p. 823). These technical terms refer to assumptions that are embedded in Mehra and Prescott (1985) and that are considered standard in general equilibrium or macroeconomic models.

Benartzi, Shlomo, and Richard H. Thaler. 1995. "Myopic Loss Aversion and the Equity Premium Puzzle." *Quarterly Journal of Economics*, vol. 110, no. 1 (February): 73–92.

This article proposes an explanation for the equity premium based on two concepts from the psychology of decision making. The first concept is "loss aversion," the tendency for investors to be more sensitive to losses than to gains. The second concept is "mental accounting," whereby investors mentally separate their portfolios into subportfolios for which they may have quite different utility functions or risk aversion parameters. For example, investors may have one set of portfolios that they never evaluate and another set that they evaluate every day. Benartzi and Thaler show that the size of the historical equity premium can be explained if investors evaluate their portfolios at least annually.

Berg, Tobias, and Christoph Kaserer. 2013. "Extracting the Equity Premium from CDS Spreads." *Journal of Derivatives*, vol. 21, no. 1 (Fall): 8–26.

Credit default swap spreads can be used to estimate the ERP because they are the directly observable market price of corporate performance risk, while equity expected returns are not directly observable and must be inferred. The authors' estimates of the ERP are high, ranging from 5% to over 7%, but they caution that because of their assumptions, these should be regarded as upper limits, not best estimates.

Bernstein, Peter L. 1997. "What Rate of Return Can You Reasonably Expect . . . or What Can the Long Run Tell Us about the Short Run?" *Financial Analysts Journal*, vol. 53, no. 2 (March/April): 20–28.

By studying historical intervals when stock valuation (price/dividends or price/earnings) was the same at the end of the interval as at the beginning, one can avoid incorporating unexpected valuation changes into long-term rate of return studies. The analysis gives an equity risk premium of 3%, although the more interesting finding is that equity returns are mean reverting whereas bond returns have no mean to which to revert. Thus, in the very long run and in real terms, stocks are safer than bonds.

Bernstein, William J., and Robert D. Arnott. 2003. "Earnings Growth: The Two Percent Dilution." *Financial Analysts Journal*, vol. 59, no. 5 (September/October): 47–55.

This essential paper is best described in the authors' abstract: "Two important concepts played a key role in the bull market of the 1990s. . . . First, many investors believed that earnings could grow faster than the macroeconomy.

In fact, earnings must grow slower than GDP because the growth of existing enterprises contributes only part of GDP growth; the role of entrepreneurial capitalism, the creation of new enterprises, is a key driver of GDP growth, and it does not contribute to the growth in earnings and dividends of existing enterprises. During the 20th century, growth in stock prices and dividends [not per share but in absolute magnitude] was 2 percent [per year] less than underlying macroeconomic growth. Second, many investors believed that stock buybacks would permit earnings to grow faster than GDP. The important metric [for evaluating the impact of share buybacks on earnings per share] is not the volume of buybacks, however, but net buybacks—stock buybacks less new share issuance. . . . We demonstrate . . . that during the 20th century, new share issuance in many nations almost always exceeded stock buybacks by an average of 2 percent or more a year" (p. 47).

Brav, Alon, John R. Graham, Campbell R. Harvey, and Roni Michaely. 2005. "Payout Policy in the 21st Century." *Journal of Financial Economics*, vol. 77, no. 3 (September): 483–527.

The authors trace the recent boom in share buybacks, as opposed to cash dividends, to a change in SEC rules in 1982 and find that dividends are managed conservatively (because there is a financial market penalty for cutting them) while buybacks are managed discretionarily (because there does not seem to be any such penalty for reducing buybacks).

Brinson, Gary P., Jeffrey J. Diermeier, and Gary G. Schlarbaum. 1986. "A Composite Portfolio Benchmark for Pension Plans." *Financial Analysts Journal*, vol. 42, no. 2 (March/April): 15–24.

The authors calculate returns on a global multi-asset portfolio, using fixed weights, and recommend it as a benchmark for pension plans. This study is one of the first attempts to measure the return on world wealth, although the use of fixed weights means that the portfolio manager would have to transact in order to rebalance to these weights, instead of pursuing a buy-and-hold strategy. The use of fixed weights avoids the need to monitor the portfolio for excessive risk caused by one asset class becoming dominant over time.

Brown, Stephen J., William N. Goetzmann, and Stephen A. Ross. 1995. "Survival." *Journal of Finance*, vol. 50, no. 3 (July): 853–873.

This article suggests that survival bias could induce a substantial spurious equity premium and at least partially explain the equity premium puzzle documented by Mehra and Prescott (1985)—that is, explain it away, because the returns used to frame the puzzle were neither expected nor achieved by many investors.

Campbell, John Y. 2007. "Estimating the Equity Premium." NBER Working Paper 13423 (http://www.nber.org/papers/w13423.pdf).

In this extended literature review and personal essay, Campbell finds that "the world geometric average equity premium was almost 4% at the end of March 2007, implying a world arithmetic average equity premium somewhat above 5%. Both valuation ratios and the cross-section of stock prices imply that the equity premium fell considerably in the late 20th Century, but has risen modestly in the early years of the 21st Century" (published abstract).

Campbell, John H., and Robert J. Shiller. 1988. "Stock Prices, Earnings, and Expected Dividends." *Journal of Finance*, vol. 43, no. 3 (July): 661–676.

In what is almost certainly the first "CAPE" paper, the authors write that "a long moving average of real earnings helps to forecast future real dividends. The ratio of this earnings variable to the current stock price is a powerful predictor of the return on stock, particularly . . . over several years" (p. 675). Thus, contrary to the efficient market hypothesis, which prevailed in academia at the time this paper was written, stock prices are at least somewhat predictable and countercyclical; that is, expected returns are high when prices (relative to earnings and dividends) are low and low when prices are high.

Campbell, John Y., and Robert J. Shiller. 1998. "Valuation Ratios and the Long-Run Stock Market Outlook." *Journal of Portfolio Management*, vol. 24, no. 2 (Winter): 11–26.

According to the efficient market hypothesis, the dividend-to-price ratio (D/P) can forecast changes in dividends or changes in price or both. Empirically, it forecasts only changes in price. At the then-current (1998) D/P, the forecast was extraordinarily bearish: The stock market was expected to lose about two-thirds of its real value. The forecast becomes less drastically bearish (although still quite bearish) when one uses total cash payout (i.e., dividends plus share buybacks), earnings, the 10-year moving average of earnings in constant dollars, or other variables instead of dividends in the denominator. Real stock returns close to zero over the next 10 years were forecast. A number of statistical weaknesses in the analysis are acknowledged: The historical observations are not independent, and the analysis depends on valuation ratios regressing to their historical means, whereas the actual means are not known and could conceivably lie outside the historical range.

Cochrane, John H. 2011. "Presidential Address: Discount Rates." *Journal of Finance*, vol. 66, no. 4 (August): 1047–1108.

This presidential address to the American Finance Association focuses on changing beliefs in the field of finance. Cochrane indicates that discount-rate variation, including variation in the ERP, "is the central organizing question of current asset-pricing research." He describes the impact of incorporating discount-rate variation on "portfolio theory, accounting, cost of capital, capital structure, compensation, and macroeconomics" (p. 1047).

Constantinides, George M., John B. Donaldson, and Rajnish Mehra. 2002. "Junior Can't Borrow: A New Perspective on the Equity Premium Puzzle." *Quarterly Journal of Economics*, vol. 117, no. 1 (February): 269–296.

As the correlation of equities with personal income changes over the life of an investor, so does the attractiveness of equities to that investor. The young, who should borrow to smooth consumption and to invest in equities, cannot do so. Therefore, equities are priced almost exclusively by middle-aged investors, who find equities to be unattractive. The result is a decreased demand for equities and an increased demand for bonds relative to what would be the case in a perfectly competitive market.

Damodaran, Aswath. 2016. "Equity Risk Premiums (ERP): Determinants, Estimation and Implications—The 2016 Edition" (5 March): https://ssrn.com/abstract=2742186.

In an annually updated comprehensive review, Damodaran catalogues the various methods available for estimating the ERP, including "economic determinants of equity risk premiums," the standard historical approach, the survey approach, and "the implied approach, where a forward-looking estimate of the premium is estimated using either current equity prices or risk premiums in non-equity markets." Damodaran also looks at "the relationship between the equity risk premium and risk premiums in the bond market . . . and in real estate . . . and how that relationship can be mined to [generate] expected equity risk premiums" (p. 2).

DeLong, J. Bradford, and Konstantin Magin. 2009. "The U.S. Equity Return Premium: Past, Present, and Future." *Journal of Economic Perspectives*, vol. 23, no. 1 (Winter): 193–208.

In this sophisticated literature review and general discussion, the authors state reasons why others have found a puzzle or macroeconomic paradox in the high expected returns of equity markets and present accumulated evidence that equity returns have been and will continue to be high relative to riskless assets such as Treasury bills.

Diermeier, Jeffrey J., Roger G. Ibbotson, and Laurence B. Siegel. 1984. "The Supply of Capital Market Returns." *Financial Analysts Journal*, vol. 40, no. 2 (March/April): 74–80.

Stock total returns must equal dividend yields plus the growth rate of dividends, which cannot, in the long run, exceed the growth rate of the economy. If infinite-run expected dividend growth exceeded infinite-run expected economic growth, then dividends would crowd out all other economic claims. Net new issues, representing new capital (transferred from the labor market) that is needed so the corporate sector can grow, may cause the dividend growth rate to be lower than the GDP growth rate. Thus, the equity risk premium equals the dividend yield (minus new issues net of share buybacks) plus the GDP growth rate minus the riskless rate.

The "supply side" or "supply model" thread begins with this work, which was written when so-called supply-side economics was popular; the authors strove to apply supply-oriented thinking to investment questions.

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

The authors document the annual returns on equities, bonds, bills, currencies, and inflation over the 20th century for all major markets (the United States, the United Kingdom, Japan, France, Germany, Canada, Italy, Spain, Switzerland, Australia, the Netherlands, Sweden, Belgium, Ireland, Denmark, and South Africa). Later editions include more countries. The authors show that survival bias is a significant factor in estimating future returns because past returns reflect only those countries that have been successful. In a speech, Dimson summarized his and his coauthors' work as follows: "Although equities gave the highest return in every country, they were also risky, and we demonstrate the importance of diversifying globally as well as across asset classes" (p. 1).[16]

[16]Elroy Dimson, "Triumph of the Optimists," Arrowstreet Capital (October 2003): http://csinvesting.org/wp-content/uploads/2015/03/2781_triumph_of_the_optimists.pdf.

Dimson, Elroy, Paul Marsh, and Mike Staunton. 2008. "The Worldwide Equity Premium: A Smaller Puzzle." In *Handbook of the Equity Risk Premium*. Edited by Rajnish Mehra. Amsterdam: Elsevier.

Using 1900–2005 data for 17 countries, the authors show that the annualized equity premium for the rest of the world was 4.2%, not too much below the US equity premium of 5.5% over the same period.

The historical equity premium is decomposed into dividend growth, multiple expansion, the dividend yield, and changes in the real exchange rate. Assuming zero change in the real exchange rate, no multiple expansion, and a dividend yield 0.5%–1% lower than the historical mean of 4.49%, the authors forecast an equity premium on the world index of about 3%–3.5% on a geometric mean basis and 4.5%–5% on an arithmetic mean basis.

Dimson, Elroy, Paul Marsh, and Mike Staunton. 2011. "Equity Premiums around the World." In *Rethinking the Equity Risk Premium*. Edited by P. Brett Hammond, Jr., Martin L. Leibowitz, and Laurence B. Siegel. Charlottesville, VA: CFA Institute Research Foundation.

While the authors document geometric mean realized equity risk premia ranging from 2.7% in Denmark to 6.7% in Australia over 1900–2009, they project lower returns going forward. Their estimate of the global ERP at the time of their writing was "3.4 percent for the average country and . . . 4.0 percent for the World index" (p. 47).

Dimson, Elroy, Paul Marsh, and Mike Staunton. 2017. *Credit Suisse Global Investment Returns Yearbook 2017: Summary Edition*. Zurich: Credit Suisse (https://publications.credit-suisse.com/tasks/render/file/?fileID=B8FDD84D-A4CD-D983-12840F52F61BA0B4).

This yearbook annually updates the data and analysis presented in Dimson, Marsh, and Staunton (2002).

Duarte, Fernando, and Carlo Rosa. 2015. "The Equity Risk Premium: A Review of Models." *Economic Policy Review*, vol. 21, no. 2 (December): 39–57 (https://ssrn.com/abstract=2886334).

These two Federal Reserve economists "categoriz[e] the [available] models into five classes: trailing historical mean, dividend discount, cross-sectional estimation, regression analysis using valuation ratios or macroeconomic variables, and surveys" (published abstract). They make a one-year-ahead ERP forecast (as of June 2012) of 12.2%.

Fama, Eugene F., and Kenneth R. French. 1988. "Dividend Yields and Expected Stock Returns." *Journal of Financial Economics*, vol. 22, no. 1 (October): 3–25.

Dividend yields predict intermediate- and long-horizon equity market returns much better than they do short-horizon returns. While regressions of returns on dividend yields typically explain less than 5% of monthly or quarterly return variances, the percentage explained rises to 25%–40% for a three- to five-year horizon. This result sharply contradicts the theory of efficient markets and suggests that investors should buy when dividend yields are high and sell when they are low.

Fama, Eugene F., and Kenneth R. French. 2002. "The Equity Premium." *Journal of Finance*, vol. 57, no. 2 (April): 637–659.

This article compares alternative estimates of the unconditional expected stock return between 1872 and 2000 and explains the low expected return estimates derived from fundamentals, such as dividends and earnings, for the 1951–2000 period. The authors conclude that the decline in discount rates largely caused the unexplained capital gain of the last half century.

Goetzmann, William N., and Roger G. Ibbotson. 2006. *The Equity Risk Premium: Essays and Explorations*. Oxford, UK: Oxford University Press.

This comprehensive volume includes the authors' works, with many coauthors, from the 1970s to the early 2000s. Because the authors produced much of the literature discussed in this review, this collection of Goetzmann and Ibbotson's works is indispensable for serious scholars of the equity risk premium and related issues.

Greenwood, Robin, and Andrei Shleifer. 2014. "Expectations of Returns and Expected Returns." *Review of Financial Studies*, vol. 27, no. 3 (March): 714–746 (https://scholar.harvard.edu/files/shleifer/files/expectations_of_returns_public._feb_2014_print.pdf).

Survey-based measures of the returns that investors expect are procyclical (they rise after markets have risen), while model-based estimates of expected returns are countercyclical (they fall after markets have risen). Thus, the returns that investors say they expect are negatively correlated with the returns they would expect if they followed the (mostly DDM-based) models.

Grinold, Richard C., and Kenneth F. Kroner. 2002. "The Equity Risk Premium: Analyzing the Long-Run Prospects for the Stock Market." *Investment Insights*, vol. 5, no. 3 (July).

This is the predecessor article to Grinold, Kroner, and Siegel (2011) and provides some detail on the input estimation methods not included in the later article.

Grinold, Richard C., Kenneth F. Kroner, and Laurence B. Siegel. 2011. "A Supply Model of the Equity Premium." In *Rethinking the Equity Risk Premium*. Edited by P. Brett Hammond, Jr., Martin L. Leibowitz, and Laurence B. Siegel. Charlottesville, VA: CFA Institute Research Foundation.

The authors examine separately the four components of the expected equity risk premium (income return, expected real earnings growth, expected inflation, and expected repricing) and suggest a then-current risk premium of about 3.6% over 10-year Treasury bonds. The authors also forcefully attack the "puzzle" literature, saying that they have never understood how one can seriously assert that the theory is right and the data are wrong.

Hammond, P. Brett, Jr., Martin L. Leibowitz, and Laurence B. Siegel, eds. 2011. *Rethinking the Equity Risk Premium*. Charlottesville, VA: CFA Institute Research Foundation.

In 2011, the CFA Institute Research Foundation reconvened the equity risk premium discussion group in AIMR (2002), with some changes to the participant list. Rather than a transcript of proceedings, this volume is a collection of articles submitted by the presenters after the meeting. The included contributors, in alphabetical order by lead author, are Andrew Ang and Xiaoyan Zhang; Robert D. Arnott; Clifford Asness; Peng Chen; Elroy Dimson, Paul Marsh, and Mike Staunton; Richard C. Grinold, Kenneth F. Kroner, and Laurence B. Siegel; P. Brett Hammond, Jr., and Martin L. Leibowitz; Roger G. Ibbotson; Antti Ilmanen; Rajnish Mehra; and Jeremy J. Siegel. Some of the individual articles are referenced separately in this review.

Ibbotson, Roger G., Roger J. Grabowski, James P. Harrington, and Carla Nunes. 2017. *2017 Stocks, Bonds, Bills, and Inflation (SBBI) Yearbook*. Hoboken, NJ: John Wiley & Sons.

This yearbook annually updates the data and analysis presented in Ibbotson and Sinquefield (1976).

Ibbotson, Roger G., Laurence B. Siegel, and Kathryn S. Love. 1985. "World Wealth: Market Values and Returns." *Journal of Portfolio Management*, vol. 12, no. 1 (Fall): 4–23.

The authors present annual return and market-capitalization data on global equities, global fixed income, commodity metals, and US real estate over 1960–1984. Cap-weighting the individual asset-class returns, they present a composite return series for the world market wealth portfolio. They note that what is omitted (human capital, non-US real estate, private businesses) is probably larger than what is included.

Ibbotson, Roger G., and Rex A. Sinquefield. 1976. "Stocks, Bonds, Bills, and Inflation: Year-by-Year Historical Returns (1926–1974)." *Journal of Business*, vol. 49, no. 1 (January): 11–47 (http://epge.fgv.br/we/MFEE/FinancasCorporativas/2011?action=AttachFile&do=get&target=Ibbotson.pdf).

Total equity returns consist of a stationary part (the equity risk premium) and a nonstationary part (the interest rate component, which consists of a real interest rate plus compensation for expected inflation). The estimator of the future arithmetic mean equity risk premium is the past arithmetic mean premium, which was about 7% when the authors wrote the article. To this is added the then-current interest rate, 4.8% (on 20-year Treasury bonds). The sum of these, about 12%, was the arithmetic mean expected total return on equities. The historical equity risk premium reflects equilibrium at all times and forms the proper estimator of the future equity risk premium. (Later updates discuss other methods rather than supporting a doctrinaire "future-equals-past" interpretation of historical data.)

Ilmanen, Antti. 2011. *Expected Returns: An Investor's Guide to Harvesting Market Rewards*. Hoboken, NJ: John Wiley & Sons.

The author takes a "cubic" approach to understanding expected returns. On one face of the cube are conventional asset classes: stocks, government bonds, credits, and alternatives. A second face represents trading strategies: value, "carry" (roughly speaking, yield), trend, and volatility. The third face is for underlying macroeconomic factors: growth, inflation, illiquidity, and tail risks. The treatment is encyclopedic and covers many aspects of return estimation, alpha generation, and beta-focused investing.

Ilmanen, Antti. 2016. "A Historical Perspective on Time-Varying Expected Returns." In *Financial Market History: Reflections on the Past for Investors*

Today. Edited by David Chambers and Elroy Dimson. Charlottesville, VA: CFA Institute Research Foundation.

The author focuses on the difficulty of timing the market using time-varying valuation or risk premium approaches but also engages in a very high-quality discussion of ERP issues in general.

Jorion, Philippe, and William N. Goetzmann. 1999. "Global Stock Markets in the Twentieth Century." *Journal of Finance*, vol. 54, no. 3: 953–980.

The authors compare real stock returns over 1921–1996 in the United States with real stock returns in 38 other countries over the same period and find that the US returns were much higher. Thus, survival bias is a significant factor in evaluating historical returns and the historical ERP. Simply projecting past returns forward into the future results in forecasts that are much too high.

McGrattan, Ellen R., and Edward C. Prescott. 2001. "Taxes, Regulations, and Asset Prices." NBER Working Paper 8623 (December): http://www.nber.org/papers/w8623.pdf.

The large run-up in equity value relative to GDP between 1962 and 2000 was mainly caused by (1) large reductions in individual tax rates, (2) increased opportunities to hold equity in nontaxed pension plans, and (3) increases in intangible and foreign capital. The authors argue that the high equity risk premium documented by Mehra and Prescott (1985) is not puzzling after these three factors are accounted for. However, in the future, one should expect no further gains from tax policy; the currently expected real return on equities is about 4%, down from 8% in the early postwar period.

Mehra, Rajnish. 2003. "The Equity Premium: Why Is It a Puzzle?" *Financial Analysts Journal*, vol. 59, no. 1 (January/February): 54–69.

The ERP puzzle literature is easily misunderstood because of its difficulty. Here, the puzzle is stated in language that is accessible to most finance practitioners. First, empirical facts regarding the returns and risks of major asset classes are presented. Then, the theory responsible for the puzzle is summarized. Modern asset-pricing theory assumes that economic agents pursue and, on average, get fair deals. When one follows this line of reasoning to its conclusion, using the tools of classic growth and real business cycle theory, an equity risk premium of at most 1% emerges. An extensive discussion reveals why this is the case and addresses various attempts made by other authors to resolve the puzzle.

Mehra, Rajnish, and Edward C. Prescott. 1985. "The Equity Premium: A Puzzle." *Journal of Monetary Economics*, vol. 15, no. 2 (March): 145–161.

In this respected work, Mehra and Prescott first document the "equity premium puzzle" using a consumption-based asset-pricing model in which the quantity of risk is defined as the covariance of excess stock return with consumption growth and the price of risk is the coefficient of relative risk aversion. Because of the low risk resulting from the smooth historical growth of consumption, the 6% ERP in the 1889–1978 period can be explained only by a very high coefficient of risk aversion in the magnitude of 30 to 40. Risk aversion parameters observed in other aspects of financial behavior are around 1. Such a risk aversion parameter is consistent with at most a 1% equity risk premium and possibly one as small as 0.25%.

Note that Mehra and Prescott assumed that consumption was equal to aggregate dividends. Because consumption is very smooth and dividends are not as smooth, this comparison may be troublesome.

Mehra, Rajnish, and Edward C. Prescott. 1988. "The Equity Premium: A Solution?" *Journal of Monetary Economics*, vol. 22, no. 1 (July): 133–136.

This article is a response to Rietz (1988).

Rietz, Thomas A. 1988. "The Equity Risk Premium: A Solution." *Journal of Monetary Economics*, vol. 22, no. 1 (July): 117–131.

Rietz suggests that the ERP puzzle can be solved by incorporating a very small probability of a very large drop in consumption. In such a scenario, the risk-free rate is much lower than the equity return. In an article published in the same issue of the *Journal of Monetary Economics*, Mehra and Prescott (1988) argue that, in Rietz's model, "with a 1-in-100 chance of a 25 percent decline in consumption, the required risk aversion parameter is 10" (p. 135). However, these authors say, the largest consumption decline in the last 100 years was only 8.8%.

But during the Great Depression, the stock market fell by 86% from peak to trough and dividends fell by about half; aggregate consumption in the economy, not just by stockholders, fell by about 18%. Mehra and Prescott's 8.8% is the largest one-year decline in a multiyear consumption decline.

Shiller, Robert J. 2000. *Irrational Exuberance*. Princeton, NJ: Princeton University Press.

Irrational Exuberance, the title taken from an Alan Greenspan speech, presents basic concepts of behavioral finance and argues that markets become overextended, so that returns can be above normal and then below normal for extended periods.

Shiller introduces (to a mass audience) the concept of the cyclically adjusted price-to-earnings ratio, or CAPE, which modifies the traditional P/E by using the average of 10 years' trailing real earnings in place of (trailing or forecast) current-year earnings. This method achieves a compromise, using a period longer than one year (to stabilize the earnings measure) but not too long (to exclude old, irrelevant data). The ability of the CAPE to make market return forecasts is documented.

Siegel, Jeremy J. 1994. *Stocks for the Long Run*. New York: McGraw-Hill.

This immensely influential book documents "Siegel's constant": The author argues that real (inflation-adjusted) returns on stocks have been close to a constant over very long time periods. "Note the extraordinary stability of the real return on stocks," the author writes, "over all major subperiods: 7.0 percent per year from 1802 through 1870, 6.6 percent from 1871 through 1925, and 7.2 percent per year since 1926" (p. 11). Even in countries where stock markets were almost destroyed by war, such as Germany and Japan, stocks beat bonds, which were entirely ruined in those countries.

Siegel, Jeremy J. 2016. "The Shiller CAPE Ratio: A New Look." *Financial Analysts Journal*, vol. 72, no. 3 (May/June): 41–50.

While generally supportive of Shiller's (2000) CAPE approach to market valuation, Siegel notes that accounting standards have become more conservative, especially with respect to depreciation requirements for goodwill. Thus, CAPE ratios from before these changes are not necessarily relevant for assessing the current valuation of the market. When more contemporary data are used, the market appears less overvalued.

The author also recommends using national income and product accounts (NIPA) profits as a check on S&P 500 or other corporate earnings series, because the earnings series reported by Standard & Poor's do not "observe consistent and uniform conventions across time" (p. 49).

Song, Zhiyi. 2007. *The Equity Risk Premium: An Annotated Bibliography*. Charlottesville, VA: CFA Institute Research Foundation.

This is the predecessor to the current review. Song covers most of the same issues I do, but from the vantage point of a decade earlier and with greater emphasis on the "puzzle" literature associated with Mehra and Prescott (1985).

Straehl, Philip U., and Roger G. Ibbotson. 2017. "The Long-Run Drivers of Stock Returns: Total Payouts and the Real Economy." *Financial Analysts Journal*, vol. 73, no. 3 (Third Quarter): 32–52.

The authors present evidence, over a 143-year period in the United States, that total payouts (dividends plus buybacks), not dividends alone or earnings, are "the key drivers of long-run stock market returns" (p. 32). They show that aggregate (not per share) total payouts have grown at the same rate as GDP on average over time. The authors also introduce the cyclically adjusted total yield—that is, yield based on 10 years' average real total payout—and show its ability to predict returns.

This article resolves a number of issues raised by Diermeier, Ibbotson, and Siegel (1984) and reconciles the DDM/DCF literature with the work of Miller and Modigliani,[17] who showed that investors should be indifferent between cash dividends and other forms of cash payout.

[17]See Note 12.

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The CFA Institute Research Foundation acknowledges with sincere gratitude the generous contributions of the Named Endowment participants listed below.

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