

## The Past, the Future, and Modern Portfolio Theory

A common refrain in investment industry disclosure, “past performance is no guarantee of future results,” warns prospective investors about the often erratic nature of the securities markets. The catchphrase advises that – when we use historical returns to help evaluate an investment product’s appeal – we must remember that streaks end, that trends change, that patterns can and do shift over time. And lest we forget, the “past performance” disclaimer is seemingly everywhere: it’s printed on prospectuses and other marketing materials as reliably as the surgeon general’s warning is stamped on packs of cigarettes.

Caveats regarding past performance and future results are less prevalent, however, when it comes to modern portfolio theory (MPT), a set of ideas adopted by many investors today. In fact, a few key underpinnings of MPT actually hinge on the assumption that the past is a reliable indicator of how future events will unfold.

In this article, we start with a brief review of the origins of modern portfolio theory. Next, we examine three MPT ideas that lean heavily on the past as a guide to the future – and we use real market data to put these ideas to the test. Our findings highlight areas where the relationship between the past and the future is shaky – and suggest that, as a result, some key elements of modern portfolio theory may not stand on stable ground.

### MEET HARRY MARKOWITZ

One day in the early 1950s, a young graduate student at the University of Chicago sat outside his professor’s office, waiting to discuss the topic of his doctoral dissertation. The student’s name was Harry Markowitz, and his studies focused on linear programming, a field that employs mathematical models to maximize output for a given level of cost, or to minimize cost for a given level of output. For example, linear programming could be used by an auto manufacturer when figuring out how to build as many cars as possible with limited amounts of materials and man-hours.

While waiting, Markowitz struck up a conversation with a stockbroker who happened to be outside the office with him. After hearing about Markowitz’s line of study, the broker suggested he apply linear programming to the problems faced by investors in the stock market. Markowitz – at that time, an investment novice – ended up running with the idea, and eventually presented his findings in a 1952 *Journal of Finance* submission titled “Portfolio Selection.”<sup>1</sup>

<sup>1</sup>The story behind “Portfolio Selection” is adapted from Peter Bernstein’s account in 1996’s *Against the Gods* (page 250).

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How did Markowitz connect linear programming and investing? His approach centered on the belief that the desired “output” from an investor’s portfolio is a high return, while the “cost” to be minimized is the volatility of that return. Markowitz theorized that a properly diversified portfolio would provide maximum return for a given level of volatility – or minimum volatility for a given level of return. He also outlined a model that showed how this “efficient” portfolio could be constructed.

Markowitz’s insights were nothing short of groundbreaking. His 1952 paper laid the foundation for the development of modern portfolio theory, a range of new ways of thinking about investing. His ideas also contributed to many practical applications widely used by investors today. In 1990, the innovation and far-reaching influence of “Portfolio Selection” earned Markowitz a Nobel Prize.

### THE PAST, THE FUTURE, AND MPT

Markowitz’s ideas have generated controversy as well as acclaim. One criticism, for example, involves the use of volatility as the “cost” to be minimized. Many MPT detractors argue that *risk* is the true price of higher returns – and that risk is not adequately represented by volatility.

Another contention is that the portfolio-building approach outlined in “Portfolio Selection” is dependent on forecasts that too often rely on the assumption that the future will look like the past. To construct a properly diversified portfolio, Markowitz’s model requires three types of data: the expected *return* of each potential component of the portfolio, the expected *volatility* of each component’s return, and the expected *correlation* of each component with every other component. If all three types of data are provided, the model then identifies the blends of components that it anticipates will yield the best trade-offs between return and volatility for the portfolio overall.

How does one determine these expected returns, expected volatilities, and expected correlations? “One suggestion,” Markowitz wrote, “is to use the observed [values] for some period of the past.” After sharing this suggestion, Markowitz was quick to note that he hoped better methods “which take into account more information” would be uncovered in subsequent work.<sup>2</sup> But he offered no practical alternatives, and today – 50 years after “Portfolio Selection” – historical numbers remain a chief source of guidance for many investors using MPT-driven portfolio construction models.<sup>3</sup>

<sup>2</sup>Harry Markowitz, “Portfolio Selection,” *Journal of Finance* 7.1 (March 1952): page 91.

<sup>3</sup>For example, New York University’s Stern School of Business professor Robert Engle was recently named a co-recipient of the Nobel Prize for Economics for his 1980s work on autoregressive conditional heteroskedasticity, a technique which attempts to estimate the future volatility of a portfolio or an asset based on a weighted average of its volatility in the past.

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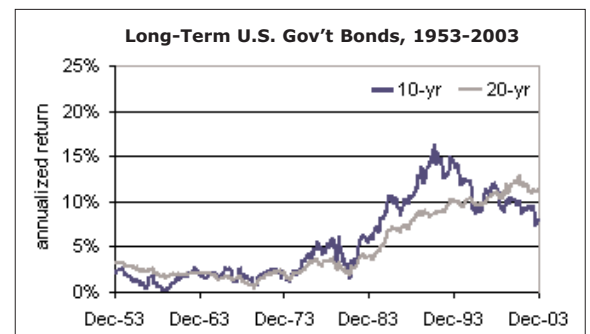
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To shed light on the potential hazards of this reliance on the past, we next review the historical stability of return, volatility, and correlation data for two basic asset classes: stocks and bonds. In addition, we create simple “60/40” portfolios and examine how their *expected* performance compares with their *actual* performance over time. Throughout our analysis, we are guided by a simple question: how well do past values predict future results?

### A BASIC BALANCING ACT: STOCKS VS. BONDS

As a simple example of portfolio-building the Markowitz way, consider an investor who seeks to construct a portfolio consisting of just two assets: the S&P 500 Index and long-term U.S. government bonds. To derive the recommended blend, the investor needs estimates of expected returns and expected volatilities for both assets, as well as an estimate of the expected correlation between them.

How well does history help predict expected return? The charts below track the last 50 years of annualized 10- and 20-year returns for the S&P 500 and for long-term U.S. government bonds.<sup>4</sup> For both assets, returns have fluctuated widely over time. Take the S&P 500, for example. The difference in the Index’s returns for adjacent 10-year periods – such as 1953-1963 and 1963-1973 – averages an annualized 4.9% over the half-century examined below. In other words, from one decade to the next, the typical swing in *per year* performance was nearly 500 basis points.



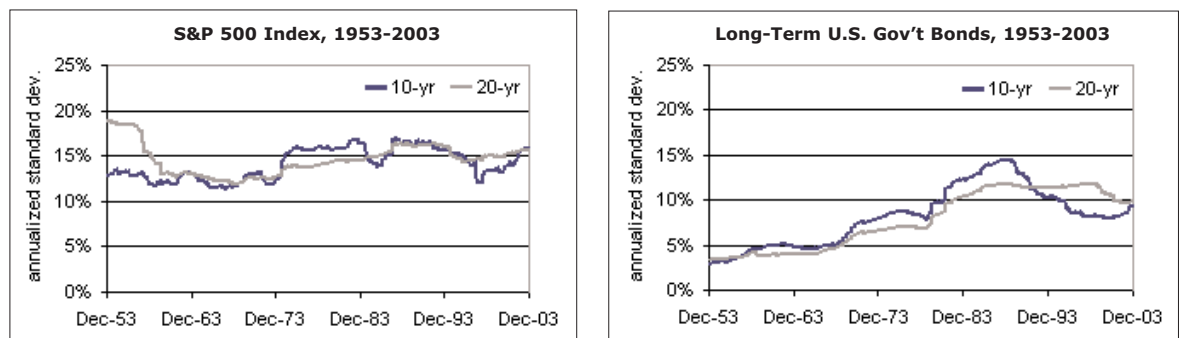
Source: Ibbotson Associates, Inc. and The Brandes Institute.

<sup>4</sup>While today's S&P 500 was introduced in 1957, Ibbotson has worked backward to recreate it from 1926.

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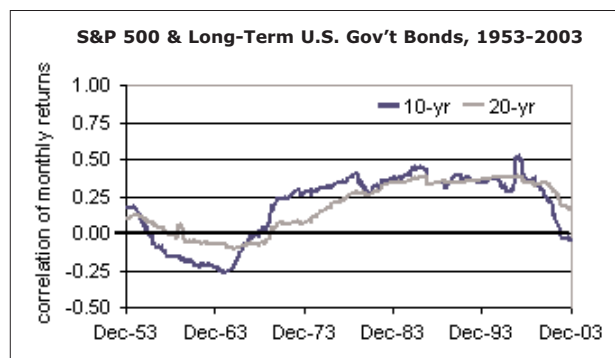
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As shown in the charts below, the volatilities of these two assets also have varied over time - particularly in the case of long-term U.S. government bonds. The S&P 500's standard deviation has tended to drift between 12% and 16% over the last 5 decades. For bonds, changes in volatility have been more pronounced, with 10- and 20-year standard deviations ranging from less than 5% to well over 10% in select periods.



Source: Ibbotson Associates, Inc. and The Brandes Institute.

When it comes to expected correlation, the third statistic required by Markowitz's portfolio model, historical numbers for the S&P 500 and long-term U.S. government bonds also appear to offer limited predictive value. The chart below plots the correlation of the assets' monthly returns over 10- and 20-year intervals from 1953 to 2003. Like return and volatility, correlation seems to change considerably over time. For instance, 10-year correlation averaged 0.18 during the 50-year time frame, but its value in individual decades dipped as low as -0.25 and reached as high as 0.5.



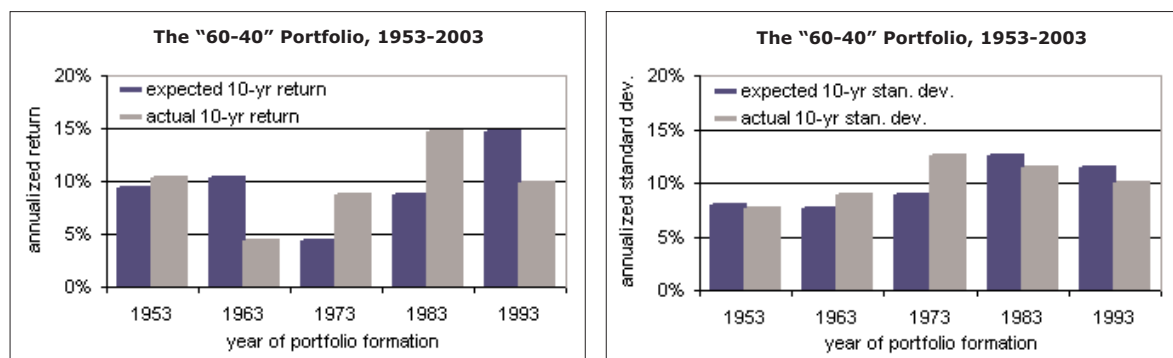
Source: Ibbotson Associates, Inc. and The Brandes Institute.

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Finally, we examine the performance of five hypothetical “60/40” portfolios – with initial allocations of 60% to the S&P 500 Index and 40% to long-term U.S. government bonds – formed at 10-year intervals between 1953 and 1993. Specifically, we compare the *expected* results of these portfolios (based on the assets’ previous 10 years of returns, standard deviations, and correlation) with the portfolios’ *actual* results over the subsequent decade.

As the charts below show, actual results often diverge from expectations – especially when it comes to returns. In four of the five 60/40 portfolios we study, for example, expected 10-year returns and actual 10-year returns differed by close to 5% *per year*. While expected standard deviation and actual standard deviation tended to be more closely aligned, we believe the overall results for these 60/40 portfolios demonstrate that investors who expect the future to behave like the past could be in for a surprise.



Source: Ibbotson Associates, Inc., Style Advisor (Zephyr Associates, Inc.), and The Brandes Institute.

### IF NOT THE PAST – WHAT?

We believe the exhibits above draw attention to the instability surrounding the statistics that drive MPT-style portfolio-building models. In our experience, numbers such as returns, volatilities, and correlations tend to vary substantially over time – for the S&P 500, for long-term U.S. government bonds, and for many of the other assets available to investors today. Accordingly, we think historical data has limited value as a guide to what lies ahead. Indeed, as the all-too-familiar warning advises, past performance is no guarantee of future results.

But if history isn't the answer, what is? At the Brandes Institute, we're not sure that returns, volatilities, and correlations can be predicted with the precision required by the Markowitz approach.

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In fact, we hesitate to embrace modern portfolio theory, and its reliance on forecasts of developments that we consider unpredictable is no small part of our skepticism. At the same time, we recognize the widespread acceptance of MPT – and we hope that this discussion gives the theory’s practitioners new insight into the variability of the data items involved.

In 1952, Harry Markowitz wrote that the key to forecasting might be found in a mixture of “statistical techniques” and “the judgment of practical men.” After mathematically deriving tentative return, volatility, and covariance estimates – whether from historical data or somewhere else – investors could adjust these estimates “on the basis of factors or nuances not taken into account by the formal computations.” In essence, Markowitz acknowledged that anticipating the future could be as much an art as a science.<sup>5</sup>

Perhaps this helps explain the common tendency to rely on the past as a guide, despite its limitations. After all, in the absence of other tangible information, historical numbers might not be much, but they are *something*.

In *Against The Gods*, a chronicle of the evolution of man’s struggles with uncertainty, economic consultant and historian Peter Bernstein shares an anecdote that captures this quandary neatly. Bernstein recounts a story from Kenneth Arrow, a Nobel laureate statistician who had served as an Air Force weather forecaster during World War II:

Some officers had been assigned the task of forecasting the weather a month ahead, but Arrow and his statisticians found that their long-range forecasts were no better than numbers pulled out of a hat. The forecasters agreed and asked their superiors to be relieved of this duty. The reply was: “The Commanding General is well aware that the forecasts are no good. However, he needs them for planning purposes.”<sup>6</sup>

<sup>5</sup>“Portfolio Selection,” page 91.

<sup>6</sup> Page 203.

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