



Feature Interview:

Harry M. Markowitz,
Nobel Laureate

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Today, the concept of investment diversification to optimize reward while minimizing risk is so ubiquitous that it seems preposterous to think there was a time when investors didn't know about it. But there was.

In 1950, a seemingly normal day at the library for Harry M. Markowitz turned out to be a day that changed the world of economics. While researching for his dissertation in economics at the University of Chicago, Markowitz posed a few key questions to himself about investors and risk. What came of that internal discussion and subsequent research is modern portfolio theory, for which Markowitz won the 1990 Nobel Memorial Prize in Economic Sciences (sharing it equally with William Sharpe and Merton Miller for their later work). While sitting in the library that fateful day, Markowitz had no idea his work would form the foundation of an entirely new area of economics and that his theories would

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be used unknowingly by millions of average Americans.

Markowitz showed in the 1952 essay “Portfolio Selection” that investors should be as equally concerned about an asset’s risk as its expected return, and if an investor is to be concerned with risk, it must be measurable. As a result, he was the first to decipher how to measure the risk of assets: Use variance (a range of possible return outcomes based on the past variability of returns).

With the ability to quantify risk, Markowitz then looked at determining optimal portfolios—the best mix of assets to glean the desired reward with the least risk. Markowitz’s research found that the risk of a diversified portfolio depends not only on the risk of each asset, but also on the opposite movement of all assets. When one asset class goes up, another usually goes down. The opposite movement results in a higher return than if all of the assets move together.

This led to the question of how to mathematically determine an optimal portfolio. So with George Dantzig’s insights into optimization techniques, Markowitz developed the critical line algorithm. A portfolio that lies on this line, or the efficient frontier (later named the Markowitz frontier), is characterized as gaining no further expected return without increasing its risk.

In 1955, he earned a doctorate degree from the University of Chicago with a thesis on portfolio theory. The topic was so novel that while Markowitz was defending his dissertation, Dr. Milton Friedman jokingly argued that portfolio theory was not economics.

Then Markowitz went on to spend a year conducting more research at the Cowles Foundation, which turned into the book *Portfolio Selection: Efficient Diversification* published in 1959. Although his initial work on portfolio selection dealt exclusively with a selection of stocks, the theory works for any liquid asset, as well as a combination of assets. So it is to Markowitz that we owe a great deal of the development and growth of the mutual fund and ETF industry.

RW Sr.: When you first developed modern portfolio theory, you came at the subject from the point of view of an investor, which was new at the time.

HM: Yes. My work looks at what one individual should do. Bill Sharpe’s capital asset pricing model analyzes what an economy would be like if everyone used portfolio theory. Bill always says that he received a Nobel Prize because he followed me using portfolio theory, and I said that I got a Nobel Prize because he transformed the field from business administration to economics. Otherwise, I would not have gotten a prize in economics.

RW Sr.: How did you get involved in economics in the first place? As I understand it, you were originally interested in philosophy.

HM: When I was in high school, I read David Hume and different philosophers. I loved Hume. He said that even though he released a ball a hundred times and each time it went down, that is no proof it will drop the 101st time. I was very interested in questions like, what do we know, and how do we know it? When I finished the survey courses at the University of Chicago and it came time to choose a department, I recalled how much I liked the little bit of math and a little bit of this and that of economics. It took me about 10 minutes to decide—OK, I’m going into economics. It wasn’t a big goal of mine to save the world, and I had no idea that the University of Chicago’s economics department was one of the greatest in the world.

RW Sr.: How did you come up with modern portfolio theory?

HM: Generally, I was interested in the economics of uncertainty, particularly the Von Neumann and Morgenstern theory of games and later Leonard J. Savage’s analysis of how you should act under uncertainty and so on. When it came time to pick a dissertation topic, I went to professor Marschak, my thesis advisor and former head of the Cowles Commission, to ask about suggestions for a dissertation.

While I was waiting for him in the lobby, I started talking to a broker who was also waiting. He said, “Why don’t you do a dissertation on the stock market?” So I said to

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Marschak, “The guy out there says I should do a dissertation on the stock market.” He responded, “Alfred Cowles [founder of the Cowles Commission] had hoped someone would do that.” It also fit my interest of economics of uncertainty.

So, I’m in the business school library one afternoon in 1950 reading John Burr Williams’ *Theory of Investment Value*. Williams says that the value of a stock is the present value of future dividends. Of course, the world is uncertain and so he means the expected value of future dividends. I was sitting there thinking, “If all you’re interested in concerning stocks is the expected value, then you must be only interested in the expected value of your portfolio. And if you are only interested in the expected value or average value of your portfolio, the way you maximize that is to put all your money in whichever stock has the highest expected value.”

Now, look, everybody knows that you’re not supposed to put all your eggs in one basket. And I had been looking at Wisenberger’s *Investing in Companies and Their Portfolios*. So I thought to myself, clearly investors want an expected return, but they don’t want too much variability of the return. That’s why there is diversification—to reduce variability. And the natural measure of variability that statisticians use is standard deviation or variance.

I thought of the returns on stocks as random variables, and the return on the portfolio as a weighted sum of these random variables, where the investor gets to choose weights. I knew what the expected value of the weighted sum was, but I didn’t know what the variance of the weighted sum was. I got Uspensky’s *Introduction to Probability* from the library shelf and found the formula for the variance of weighted sum of random

variables. Not only did it contain the variances of each of the variables, the formula also contained something called covariances. In other words, the volatility of the portfolio depends not only on the volatility of the constituents but on whether they go up or down together. So I had two things: risk and return. I’m an economist, so I drew a graph, putting risk on one axis and return on the other, plot a curve, which is now called the efficient frontier. I was taking a course with Koopmans on something called activity analysis (later he won a Nobel prize for that), and he distinguished between efficient and inefficient allocations in resources. I clearly had efficient and inefficient portfolios. Then I had to figure out how to compute these things; I had a lot of work to do. But the basic ideas were there.

RW Jr.: All in just one afternoon?

HM: One afternoon.

RW Sr.: That’s pretty incredible.

HM: All in one brilliant flash, starting with the words of the theorists of the day and the thought that that’s not right.

Now, let me tell you about my dissertation defense. At the time, I wasn’t happy about this situation, but I’ve had so much fun retelling it. I left Chicago for RAND Corporation with everything done but my dissertation. After finishing it, I traveled from Santa Monica to Chicago to defend it. When I landed, I thought, “I know this subject cold. Not even Dr. Milton Friedman can give me a hard time.”

About five minutes into my defense, Friedman said, “Harry, I’ve read your dissertation.

I don't find any mistakes in the math, but this isn't a dissertation in economics. We can't give you a Ph.D. in economics for a dissertation that's not economics." Most of the next hour and a half was spent with Friedman telling me that they weren't going to give me a Ph.D. in economics.

He said, "Harry, you have a problem: It's not economics; it's not business administration; it's not mathematics." Professor Marschak said, "It's not literature." Then they sent me out to the hall to await their decision. About five minutes later, Marschak comes out and says, "Congratulations, Dr. Markowitz."

RW Sr.: In both your writings and comments, you've mentioned that there might not have been as much attention drawn to your work and it may not have resulted in a Nobel Prize had it not been for William Sharpe.

HM: I said individual investors should worry about risk and return; they should put things together in a way that is efficient in the sense that they minimize risk and maximize return. Sharpe said, "If everybody does that, and everybody has the same beliefs, and everybody can borrow all they want at the risk-free rate, then you don't have to do the hard job of estimating expected returns. It is much easier to estimate betas—the regression of security returns against the market. If all those assumptions I [Bill Sharpe] made are true, then the expected returns are a simple linear function of their betas. Also, you don't have to worry about computing efficient portfolios because the market portfolio is a mean variance, efficient portfolio. In fact, the market (plus borrowing or lending) is the only efficient portfolio."

For the first decade after my book, nobody noticed until Sharpe started promoting his and my work. Bill was more social than I was. He was more willing to go to meetings than I was or am. Not only did he do research on how well your portfolio would do if you had just used the one-factor model versus the covariance matrix, but he also made available a program that would allow you to do one-factor portfolio selection. Suddenly, everybody who's trying to get a Ph.D. is using

one-factor model code. Then the capital asset pricing model comes out in 1964, and finally economists are all excited about it. In the '60s everybody in academia was jumping on board. In the 1970s, the institutional investors were jumping on board, and in 1990, we got a Nobel Prize.

RW Sr.: After the crash of 1929 and the subsequent Investment Company Act of 1940, the process of developing and creating investment funds—mutual funds—really died; it diminished rather quickly. And it wasn't regained for a very long time. I think when you wrote your paper in 1952, the market was still one-fifth the size it was in '29.

HM: I wouldn't be surprised if it took a long time to recover back to the '29 level. It certainly was true that the market, the economy, didn't get very far through 1939 and went into limbo until after World War II. Then came the 1950s. Not only were there the Nifty 50 [stocks], but the '50s were nifty, too. There was never a decade like it, at least during my lifetime.

RW Sr.: It really was your work and William Sharpe's work that legitimized mutual fund-type investments—or, at least, it gave them a better reason to exist—and increased participation.

HM: Peter Bernstein says that Markowitz 1952 came at just the right time—when interest in the stock market was reviving. At a meeting last weekend, Peter said that before Markowitz 1952, the investment business was different. There were a lot of hot tips. Everything was one stock at a time. People who were not there in 1952 cannot believe how different the thought process was.

RW Sr.: We are faced with some pretty interesting problems right now. In the late 1970s, I created a series of commodity indexes based on the futures market price on the front month, weighted on open interest and indexed to 1977 being 100. If you look at those indexes since 1977 (until about two years ago), average prices had only risen 12 per-

cent. So I believe a lot of what we are seeing today—that we are calling inflation—is really market catch-up. It's my opinion that starting back in the later years of Volcker through the entire Greenspan period, the Federal Reserve's intervention actually prevented normal price action for commodities. The commodity prices were very easy to control simply by raising inventory costs—the cost of carry. And so, for example, if you were to raise interest rates, then you would immediately take the speculation away from the market because nobody would be willing to pay the carrying charges.

HM: The motto of the old Fed was as follows: The job of the Federal Reserve is to take the punch bowl away when the party is getting good. Yet, the motto of the new Fed is that if you're running out of booze; that's OK, we'll get more. To paraphrase George Bernard Shaw in *Pygmalion*, the function of the current Federal Reserve seems to be, never mind what the market is doing, just facilitate the market so it can continue doing whatever it is it is doing.

I'm with Milton Friedman when he said that you don't need a Federal Reserve. What you should do is inflate 3 percent per year, every year. Anybody who tries to get 4 percent (without productivity gain) will find himself out of a job, and anyone who asks for 2 percent instead of 3 percent is foolish.

RW Sr.: So your point is that the Federal Reserve is actually having to feed inflation because its tool for combating it has been taken away due to the Fed's attempt at protecting the banking system.

HM: It is proper for the Federal Reserve to provide temporary liquidity to the banking system in the face of a liquidity crisis. But the current crisis is not a liquidity crisis, it is an information crisis: Nobody knows who has the bad paper. The Fed inflated; prices shot up, but the banking crisis remained.

RW Sr.: So we are in an interesting situation. What did the investment banks do wrong that put them in this dilemma from your perspective?

HM: I heard a lecture yesterday in which the speaker asserted that the mortgage industry problem started from how the industry was structured with three different groups. The first group was paid by how many underwritings they could sell. So they had an incentive to make it easier for people to get mortgages. No documentation, no money down.

The next group is the rating services. House prices were going up—because house prices usually go up, and there's a big demand for housing from mortgages with no money down. So house prices went up. Rating services looked at the pieces of paper already issued and found that nobody defaulted. They concluded that these pieces of paper were great investments. And the third party in this story, investors, concluded that these were safe investments with clearly high returns and high credit ratings.

The mortgage industry reached the point where "everybody" who wanted a loan, had one. And then what happened? You know the story about the guy whose broker calls and says, "Buy Fly By Night Software; it's going up." And the guy says, "OK." Then the broker says, "It's going up more; buy some more." And this keeps happening until finally the guy says, "You know, I think I should sell some." And the broker says, "To whom?"

Everybody was making money; whose job was it to say, "This paper stinks"? Well, Moody's and Standard and Poor's. There's a difference between forward-looking and backward-looking analysis. When you do portfolio selection/analysis, you should use forward-looking estimates. So Moody's and S&P were not forward looking. They assumed that what did happen, will happen.

RW Jr.: Today portfolios are not all based on stocks, they're not all based on bonds. So, can you apply portfolio theory to any asset class?

HM: Yes, but the theory assumes that these are liquid assets. For example, on Thursdays I go to an outfit called Guided Choice, which is a 401(k) advisory service. Instead of just

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investing in the market, like CAPM says, we generate an efficient frontier of asset classes. We also figure out what combinations of investable securities permitted by each 401(k) plan best track various asset class efficient portfolios.

RW Jr.: What do you feel are the best components to add or combine with stocks and bonds with the opportunity of maximizing your efficient frontier?

HM: At Guided Choice, we don't have commodities available because most 401(k) plans don't have commodities. But Roger Gibson in his book *Asset Allocation: Balancing Financial Risk* considers four asset classes: bonds, domestic equities, international equities and commodities [hard assets]. He looked back at the returns: One-fourth of the time, commodities were doing best, one-fourth of the time domestic equities did best, one-fourth international stocks and one-fourth bonds. But he finds that, overall, an equally weighted portfolio of the four does the best by far.

RW SR.: How can Joe Average in Omaha invest sensibly?

HM: Buy shares in a broadly diversified exchange-traded or mutual fund. But he's got to do a little work. It's important for the average investor to be able to see where returns fall in the historical scheme. So, Joe Average should understand that 2000 and 2001 were terrible years, but they weren't the worst years ever—they are not more than two standard deviations away from the mean. And those years in the late 1990s, they were great, but they aren't the best years ever, and they, too, were not more than two standard deviations from the average.

So Joe Average should have a mix of the broad equity portfolio and cash or good bonds so that if there is a two standard deviation move downward of equities, he will say, “Well, that's what I was told was going to happen. And it happened, so let's get on with important things like baseball.”

Now if he wants to be a little bit more adventurous, he should consider the breakdown of large-cap versus small-cap stocks. Smaller caps have done better in the long run but with greater volatility. Small caps are 15 percent of the market and large-caps are about 85 percent, but the investor who is not too risk averse really could put 25 percent of a portfolio in small-caps and 75 percent in large-caps, and get a portfolio more suited to his or her risk-return preferences.

RW SR.: Who is currently doing the best work with your work?

HM: The important answer is many, many people. Let me tell you the types of persons. One is Bill Sharpe and people who are in the business of helping 401(k) plans develop portfolios. Then there are people who help financial planners and large institutional investors—not banks that slice and dice and sell these collateralized debt obligations and the like—but the guys who take a point off the efficient frontier; people who didn't try to beat the system, who weren't too smart for their own good.

RW SR.: Thank you.

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