



# The Limits of Theory



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Modern Portfolio Theory (MPT) is a remarkable body of work. It has given us key insights into the concept of risk, and has led to improved understanding of the way that markets function. At the same time, it has led to an ever increasing level of abstraction in the way that many asset owners and asset managers think about investing. Stocks are viewed not as businesses, but as collections of factor exposures. The higher return that equities have earned over time is viewed not as a simple reflection of the fact that companies have been able to earn returns on their invested capital higher than their cost of capital, but as the result of a hypothetical “equity risk premium.” And the idea that a market index is an optimal portfolio, rather than simply a broad measure of the market, has led people to believe that it is a positive good to make no effort to judge whether a business is worth owning.

In addition, the use of indices as benchmarks has had unintended consequences for the behavior of both asset owners and asset managers. In the end, though, MPT is only a model of reality; a useful model, but still a model. It is not reality itself. We need to remember that in reality individual stocks rise and fall because of the success or failure of the underlying businesses; that the market as a whole rises or falls because of the ability of the average business to generate a premium over its cost of capital; and that not every publicly traded company is a business worth owning.

Investing is not a theoretical exercise; it’s about understanding what makes one business succeed while another one fails. Ultimately, there are limits to what MPT can do to help us be successful investors.

One day in April of 1974, the *New York Times* reviewed an exhibition of realist art taking place at Yale University. The reviewer, Hilton Kramer, made this observation: “Realism does not lack its partisans, but it does rather conspicuously lack a persuasive theory. And given the nature of our intellectual commerce with works of art, to lack a persuasive theory is to lack something crucial—the means by which our experience of individual works is joined to our understanding of the values they signify.”

The writer Tom Wolfe, reading this, was, by his own description, “jerked alert.” Wolfe understood Kramer to be saying, in Wolfe’s words, “In short: frankly, these days, without a theory to go with it, I can’t see a painting.”

That statement comes from Wolfe’s 1975 book *The Painted Word*, in which he expanded his initial reaction into a history of how, in his view, art in modern times had transformed from a visual medium into a literary medium (hence the book’s title). Artists, Wolfe believed, were no longer creating works of art to express ideas about beauty or history or various other subjects. Rather, they were creating art primarily to illustrate theories about art itself, understandable only to other artists or critics steeped in the same theories. By the time Wolfe was writing the book, some works of art consisted of nothing more than words on a page or a canvas.

Wolfe summarized his thesis in the book’s opening pages: “All these years, in short, I had assumed that in art, if nowhere else, seeing is believing. Well—how very shortsighted! Now, at last, on April 28, 1974, I could see. I had gotten it backward all along. Not ‘seeing is believing,’ you ninny, but ‘believing is seeing,’ for *Modern Art has become completely literary: the paintings and other works exist only to illustrate the text.*” [emphasis in original text]

About now you are probably wondering whether this paper has anything to do with investing, or whether we have simply decided to indulge ourselves by writing about a different subject. Or perhaps you too see the analogy that we see: in finance as in art, the 50-year ascendancy of theory has been the main story.

We are all so steeped in Modern Portfolio Theory (MPT) that we do not really appreciate how differently an investor in 1968 would have answered certain basic questions, such as:

- *What is a stock?*
- *Why have stocks historically generated higher returns than Treasury bills (and bonds in general)?*
- *What does a stock index represent?*

Thinking about how MPT has changed the way many people answer these questions can be quite revealing. We believe that MPT has been a positive development in helping people to better understand investing. But like any theory, MPT is only a model of the way the real world works; it is not the real world itself. It is our contention that over the last 50 years, some investors have become so enamored of the theory that they have lost sight of the real world underlying the theory. Let’s consider these questions in turn, to illustrate what we mean.

## **What is a stock?**

Our hypothetical 1968 investor, faced with the question “what is a stock?” would probably have looked askance at the interviewer for asking a question with such an obvious answer, said something along the lines of “a stock is an ownership stake in a business,” and left it at that.

MPT does not so much dispute that answer as it simply views it as woefully incomplete. In the early days of MPT, a proponent would have said that a stock represents a combination of “systematic” risk and “idiosyncratic,” company-specific risk. What’s more, the MPT proponent would tell you that the market does not reward investors for taking on

idiosyncratic risk, because they can diversify that risk away. The only risk that the market rewards is the undiversifiable, systematic risk that comes with owning equities, and different stocks contain different levels of exposure to that risk. The two things that matter most about a stock are its level of systematic risk (which MPT labeled “beta”) and the correlation of its returns with those of other stocks. In the MPT world, a stock is really not of much interest on its own; it is of interest mainly for how it interacts with other stocks in a portfolio, and how it will affect a portfolio’s mean return and the volatility of those returns (which MPT uses as the definition of “risk.”)

*But stocks are more than a collection of statistics . . . they are actual businesses. Their success or failure as businesses . . . ultimately drives their stock price higher or lower. That is, company stock price movements drive factor returns; factor returns don’t drive company stock price movements.*

In more recent years, the theorists have expanded their answer. Today, a person who wants to appear *au courant* would tell you that a stock is a collection of multiple factor exposures. In this view, a stock does not carry exposure to just one form of systematic market risk; it has exposure to a whole gamut of risk factors. Depending on what model you are using to define and measure these various risks, the factors might go by names like size, volatility, financial leverage, growth, quality, or value.

Risk models measure factor exposures in “normalized” terms—i.e., how many standard deviations above or below average a stock’s exposure is. At the end of a given time period, an analyst versed in MPT will take the returns that various stocks have experienced, regress them against the “factor exposures” of the stocks at the start of the period, and produce a set of “factor returns”—i.e., the return associated with a one standard deviation level of exposure to each factor in the risk model. But many investment practitioners have become so enamored of this theoretical framework that they reverse cause and effect in the way they think about the world. They seem to think that a stock did well because it had exposure to certain factors that did well, as if the factor returns have an independent existence of their own out in the cosmic ether, apart from the success or failure of the underlying companies.

But stocks are more than a collection of statistics such as mean return, variance, or a set of factor exposures. As the 1968 investor understood well, they are actual businesses. Their success or failure *as businesses*, which is dependent on their ability to meet the needs of customers and to allocate their cash flow sensibly, ultimately drives their stock price higher or lower. And it is the success or failure of actual businesses in the real world that creates the theoretical factor returns through the resulting stock price movements. That is, company stock price movements drive factor returns; factor returns don’t drive company stock price movements. Or to put it yet another way, markets don’t reward or punish abstract *factors*; they reward or punish *companies* because of how well or poorly their business is doing, and that in turn creates what we end up measuring as “factor returns.” But we should never lose sight of the fact that those factor returns are a *derivative*. They are not the starting point.

Yes, at any given point in time you can compare one company to another based on a whole host of interesting characteristics, whether it be size or leverage or price/book ratios, and you can create factor exposure scores for each stock on all of those characteristics. And when, inevitably, one company’s stock performs better than the other’s over some subsequent time period, a regression analysis will tell you that the factor exposures associated with the more successful stock generated positive returns. But what really happened here? Was the market rewarding one set of factors and punishing another, or was it simply reacting to changes in expectations about each company’s business?

Let’s make this more concrete. Consider what happens when a company reports disappointing profits and lowers its outlook for the future, and the company’s stock falls. After the fact, this fall in the stock price, when combined with the factor exposures that the stock had just before its decline, will clearly affect the calculation of the factor returns for that time period. But if a company with, for example, low financial leverage and high momentum disappoints the market and the stock falls, the market is not punishing low financial leverage and high momentum *per se*: it is punishing a specific company because its outlook for future cash flows deteriorated.

Now, an MPT advocate might respond to the preceding section by saying that yes, of course individual company stock prices react to changes in the outlook for each company's future cash flows. But almost invariably, some companies are experiencing upward changes in expectations while others are experiencing downward changes. So to continue the example we just gave, there would likely have been some other company with low financial leverage and high momentum that was simultaneously reporting better than expected profits and was raising its future outlook, and whose stock rose in response. In that case, these company-specific pieces of information would essentially cancel each other out, and the calculation of the return to low financial leverage and high momentum would not be affected by either company's "idiosyncratic" risk.

This is what MPT means when it says that the market does not reward idiosyncratic risk, because by holding many stocks you can eliminate that risk; and why should you get paid for risk you don't need to take? You should only get paid for taking "systematic" risks—i.e., risks that are inherent in the system, and which you cannot eliminate through diversification. In the early days, MPT measured that systematic risk on a single dimension: "beta." Today, the theory views systematic risk as a multi-dimensional phenomenon, with various factors representing those multiple dimensions. And while company-specific news clearly has an impact on individual companies' stock prices, that impact nets out to zero over time when you combine the good news at some companies with the bad news at others, so that in the long term it is only the systematic risks that investors get paid for.

This is certainly an intellectually elegant model, and one that makes for interesting analysis of portfolio behavior. But the key word in that last sentence is "model." Step back for a moment and think about what a stock price is in the real world. As our 1968 investor could have told you, the value of a company is equal to the present value of its future cash flows. When a stock's price rises or falls, it is because of changes in investors' expectations about either those future cash flows themselves, or about the appropriate interest rate at which they should be discounted.

It's not immediately obvious how this uncontroversial view fits together with the factor model of the world. Even if we stipulate that the idiosyncratic good news at one company is often offset by idiosyncratic bad news at another, the MPT factor-based view of "systematic" risk doesn't really offer a satisfying explanation of why the value of the market as a whole has tended to rise over time. That is, where does the "systematic return" in the MPT model come from? Or in real world terms, why has the present value of the cash flows of all the companies in the stock market put together risen over time, even as some individual companies have succeeded and others have failed? The obvious top-down answer is that the total cash flows themselves have grown in real terms because the economy has expanded. In other words, the value of the market has risen because businesses as a group have succeeded. It seems hard to turn that growth into a bottom-up phenomenon, i.e., some sort of aggregation of returns to a group of factors like "size" or "quality" or "momentum," independent of what has been going on at the level of the real economy. This dilemma brings us to our second question.

### **Why have stocks historically generated higher returns than Treasury bills (and bonds in general)?**

So where *does* that systematic market return come from? In the world of theory, the answer is straightforward: systematic return is the reward for taking systematic risk. Stock returns are more variable than Treasury bill returns, and as variability is the very definition of risk in MPT, investors must be paid higher returns on stocks in order to induce them to take on that risk (or, looking backward, you could phrase it as "to compensate them for the added risk they have taken on"). Investment practitioners today often call this gap between stock market returns and the return on Treasury bills (also known as the "risk-free rate") the "equity risk premium," and view it as the reward that investors get for taking on the undiversifiable, systematic risk of owning equities.

Analysts spend a lot of time trying to figure out just what the size of the equity risk premium is at any given time, and the reports often read as if the analysts are scientists trying to measure a natural phenomenon like the speed of light or the force of gravity. Consider this passage from the start of a Federal Reserve Bank of New York Staff Report written in 2015, titled “The Equity Risk Premium: A Review of Models:”

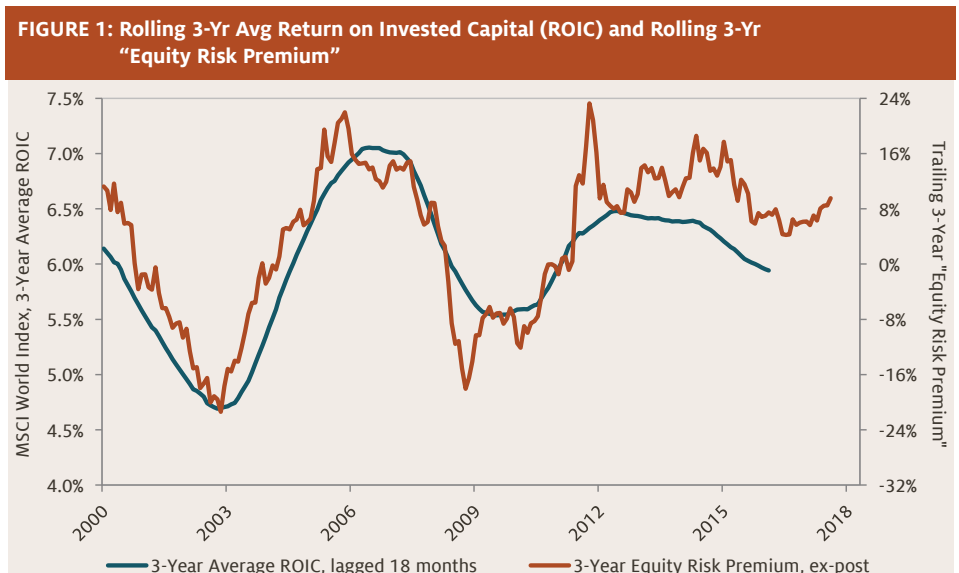
*The equity risk premium—the expected return on stocks in excess of the risk-free rate—is a fundamental quantity in all of asset pricing, both for theoretical and practical reasons. It is a key measure of aggregate risk-aversion and an important determinant of the cost of capital for corporations, savings decisions of individuals and budgeting plans for governments. Recently, the equity risk premium (ERP) has also returned to the forefront as a leading indicator of the evolution of the economy, a potential explanation for jobless recoveries and a gauge of financial stability. In this article, we estimate the ERP by combining information from twenty prominent models used by practitioners and featured in the academic literature.*

Source: [https://www.newyorkfed.org/medialibrary/media/research/staff\\_reports/sr714.pdf](https://www.newyorkfed.org/medialibrary/media/research/staff_reports/sr714.pdf)

Economists who work at Federal Reserve banks are very smart people, and to be fair, the paper is thorough and well done, given what it sets out to do. But with all due respect, we would suggest that the logic here is misguided. Just as factor returns do not have an independent existence that drives stock returns, neither does the equity risk premium. The equity risk premium is not some sort of force of nature, driving stocks to produce better returns than risk-free assets. It is an after-the-fact derivative. And what is the “fact” that the equity risk premium derives from?

Well, go back to the previous section, where we asked, what is a stock? As we discussed, stocks represent ownership of businesses. And what is it that businesses do? Regardless of what industry a company is in, management in every firm is trying to do the same thing: take capital that costs X% and earn a return *higher* than X%. That is the definition of how a business creates value for its owners, just as it is how individuals increase or decrease their personal wealth. When companies earn higher returns on their invested capital relative to their cost of capital, they create more value for the owners of that capital, and stock prices

*When markets anticipate high ROIC, stock prices rise; when they anticipate poor ROIC, prices fall.*



Source: Bloomberg, Factset

rise at a faster rate. After the fact, we observe that as a higher equity risk premium. This is the view that our investor from 1968 would likely hold.

As evidence for our view, we present **Figure 1**. In this chart we show a rolling three-year average Return on Invested Capital (ROIC) for the MSCI World Index, as well as a rolling three-year “equity risk premium,” calculated as the difference between the return on that same World Index and the return on one-month U.S. Treasury bills. We have lagged the ROIC figures by 18 months, because stock markets, as we alluded to, are essentially forward looking discounting machines. That is, stock markets move in response to changes in expectations about the future, so it makes sense to line up market movements with what actually happened in the real economy at some subsequent time.

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Figure 1 makes it quite plain that stock prices have correctly anticipated when businesses would have periods of high ROIC and periods of low ROIC. When markets anticipate high ROIC, stock prices rise; when they anticipate poor ROIC, prices fall. Keep in mind that simply having a positive ROIC is not enough to justify a rise in stock prices. As we mentioned above, the “C” in “ROIC”—i.e., the capital—is never free; there is always a cost of capital. The fact that the equity risk premium has been negative even when ROIC has been in the 4% to 6% range is due to the fact that when ROIC is that low, companies are likely earning less than their cost of capital, and are hence destroying value for the owners of that capital. (In the same way, if you borrow money at a 6% interest rate and invest it in something that earns 4%, you are destroying your own wealth. If there was a stock price attached to your personal wealth, it would fall, even though you were generating a 4% ROIC.)

The point is, there is really no mystery behind the “equity risk premium.” It is simply an outcome of the fact that businesses, as a group, are more often than not able to take a dollar of capital and, net of the cost of that capital, turn it into something more than a dollar. And in theory, the upside to that transformation is unlimited. Maybe not literally—as the saying goes, trees don’t grow to the sky, and no company can grow to an infinite value. Perhaps a better word would be “unbounded,” because there is no limit specified in advance. In actual practice, the upside for the growth in the value of a successful business is astonishingly high. To take some extreme examples: a dollar invested in Apple stock at the end of 1992 was worth over \$91 at the end of 2017, twenty-five years later (assuming you reinvested all your dividends back into the stock). A dollar invested in Microsoft was worth \$48 at the end of those same twenty-five years. Obviously, these are outliers. But even if you had simply invested in an S&P 500 index fund, which gave you exposure to a mix of companies with high ROIC and companies with low ROIC, your dollar would have turned into a little over \$10.

On the other hand, a Treasury bill, or even a corporate bond for that matter, is a fundamentally different instrument. They are called “fixed income” securities for a reason—they offer fixed payments, with no opportunity for your money to grow in an unbounded way. A dollar invested in one-month Treasury bills for the last twenty-five years (rolling over every month) would only have grown to about \$1.78. If you had invested in a broad bond market index fund (tracking the Barclays US Aggregate Index), you would have done better, but even so, your dollar would still only have grown to be worth about \$3.80.

Stocks have been able to generate the returns they have because on average, businesses are able to earn a return on invested capital that is higher than their cost of capital. By definition, that is how they increase the value of the business. Fixed income securities, also by definition, do not provide any avenue for that kind of growth; they simply return the original investment (if all goes well), and provide interest along the way. So the fact that equities have performed better than fixed income is simply due to the fact that businesses have been able to earn a premium over their cost of capital. After the fact, we call that higher return the “equity risk premium.” But this means that trying to predict the equity risk premium in advance, as many analysts do, simply means trying to predict how well businesses are going to do. It’s not really some sort of exercise in advanced theory, like trying to prove the existence of the Higgs boson.

Yes, stock market returns are more variable than Treasury bill returns or bond market returns. That's because the nature of your claim as an equity holder in a business is such that there is inherently a wider range of outcomes, in terms of what the payoff will be, than is the case with the claim of a bondholder. What MPT did was the following: 1) observed the parameters of these two fundamental characteristics—return, which we like, and variability, which we don't—across various types of investments, 2) noticed that broadly speaking, the investments with higher returns have tended to be the ones with the higher variability, and 3) posited a model in which the former is a payment for the latter, and claimed to be able to quantify the relationship in a formal way. This link between risk and return is intuitively appealing.

But the study of economics is full of situations in which something desirable (in this case, return) is associated with something undesirable (like variability of return). Cities with higher levels of economic activity are usually more congested. Faster economic growth generally means more pollution. We normally refer to these situations as “tradeoffs;” we don't normally build models saying that the positive outcome is a form of payment for the negative features that come with it, and quantifying the relationship.

None of this is intended to imply that MPT is all wrong, or should be ignored. MPT is indeed very useful, and helps us think more clearly about risk. Our point is simply that we all need to remind ourselves occasionally that in the end, MPT is a mental model, not a description of a physical reality. We should not lose sight of the fact that in the real world, the equity risk premium is not some sort of abstract “fundamental quantity,” as the New York Fed paper described it, but simply the result of companies successfully earning high—but by their nature variable—returns on the capital they invest in their businesses.

## What does a stock index represent?

In the previous section, we noted the growth in the value of a dollar invested in an S&P 500 index fund over the last twenty-five years. An investor in 1968 would have said, “What is an index fund?”

To investors of that era, an index was simply a measure of how the overall market was doing. It would not have occurred to them that the index represented a portfolio that they would want to hold, much less one that was, in theory, the *best* portfolio for them to hold.

But that is in fact the conclusion that MPT proposes: every investor should hold the entire market, in miniature. We discussed the MPT argument for the market as the “optimal portfolio” at length in our 2015 white paper “The Case for Active Management,” and will not go through the reasoning again here. Rather, we will simply note that the idea that there is one optimal portfolio that we would all want to hold (which, logically, would have to be a miniature version of the whole market, since that is the only portfolio we could all hold simultaneously) is predicated on the assumption that we all agree on how to define and measure risk, and that we all perceive the riskiness of each asset and each portfolio in the same way. As we mentioned earlier, MPT uses the variance of an asset's returns as the definition of risk. The work of behavioral economists has made it clear that this assumption about risk is invalid, so it is simply not the case that there is one portfolio that every investor would agree is optimal.

MPT was largely promulgated in the 1960s. Behavioral finance grew out of work by psychologists studying decision making in the 1970s, and did not become widely known within the field of finance until the 1990s. In that period between when MPT caught on and when behavioral economists came along to demonstrate why its assumptions were so questionable, MPT had established enough of a foothold to create a significant real world consequence: the birth of the index fund. We are fond of noting that everything in life has unintended consequences, so what have been the unintended consequences of the spread of index funds? We would argue that the most significant one is that the availability of indexing has distorted the way people think about investing.

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Think about the logic of holding an index fund. Essentially, you are surrendering your ability to render any judgment about which companies to invest in. If a company chooses to go public, you are obligated to buy it, because it is now part of the market portfolio. So the choice as to whether that company ends up in your portfolio is being made not by you, but by the board of directors of the company when it decides to go public. Is it a good business —i.e., one that earns a premium over its cost of capital? You're not even bothering to check. If the company is public, you buy it.

Two recent research papers highlight why this might not be a good idea. The first is titled "Eclipse of the public corporation or eclipse of the public markets?"<sup>1</sup> The paper reviews the steady decline in the number of publicly held companies in the U.S. over the last twenty years, and hypothesizes that the explanation lies in the declining importance of tangible assets (think steel mills and big factories) and the rising importance of intangible assets (such as software or media platforms). A company with mostly intangible assets does not need as much capital in its early stages, and hence does not need to tap the public markets in order to grow. In addition, it is harder to value intangible assets, particularly given the way that GAAP accounting rules effectively penalize research and development expenses relative to capital spending on physical plant and equipment. The newer breed of companies prefers to deal with a smaller group of specialized private investors, who are in a position to understand and properly value their business.

But what is of particular interest to our discussion here is what this tells us about the reasons why companies eventually *do* go public these days. As the authors note in the abstract of their paper, "We argue that the importance of intangible investment has grown but that public markets are not well-suited for young, R&D-intensive companies. Since there is abundant capital available to such firms without going public, they have little incentive to do so until they reach the point in their lifecycle where they focus more on payouts than on raising capital." In other words, companies defer going public until they are more concerned about enabling the earlier owners to cash out. Does that give you confidence that you should be buying every company that goes public? If you believe that the market portfolio is optimal, that's what you should be doing.

A second paper, "Do Banks Have an Edge?"<sup>2</sup>, takes a look at the U.S. banking industry since 1960. The authors note that "... most banking activities are built around the maturity transformation activity, whereby short-to-medium-term interest rate sensitive assets are funded largely with very short-term debt. To do this, banks issue credit to consumers and small businesses, and fund these positions using deposits. Banks perform these activities because they are viewed to have an edge in each." The authors point out that this "maturity transformation" can be executed passively in the capital markets, and they compare the results of such a strategy to the actual performance of bank assets over time.

Their conclusion? "The empirical analysis suggests that the aggregate U.S. banking sector has been relatively inefficient over the period 1960 to 2015, earning less on its assets than maturity-matched U.S. Treasury bills and paying more to operate its deposit franchise than it benefited from reduced interest payments ... Since 1960, banks appear inefficient in that they have not covered their opportunity cost of capital."

Now, this is not to say that there are no individual banks that have done well. There are. But the industry as a whole has essentially failed to earn more than its cost of capital. If you were thinking like a 1968 investor, you would say to yourself, "I guess I should probably be a very selective investor in this industry." But if you have become an MPT advocate, you ignore the fact that a majority of banks do not earn back their cost of capital, and you buy them all. Does that really make sense?

Consider the logic of indexing in the context of the bond market. Why would it not be equally optimal to hold a market portfolio of fixed income securities? Suppose that a country that is already heavily indebted, such as Japan, needs to continue to issue more debt every year to fund its social welfare programs, and due to its demographic profile has



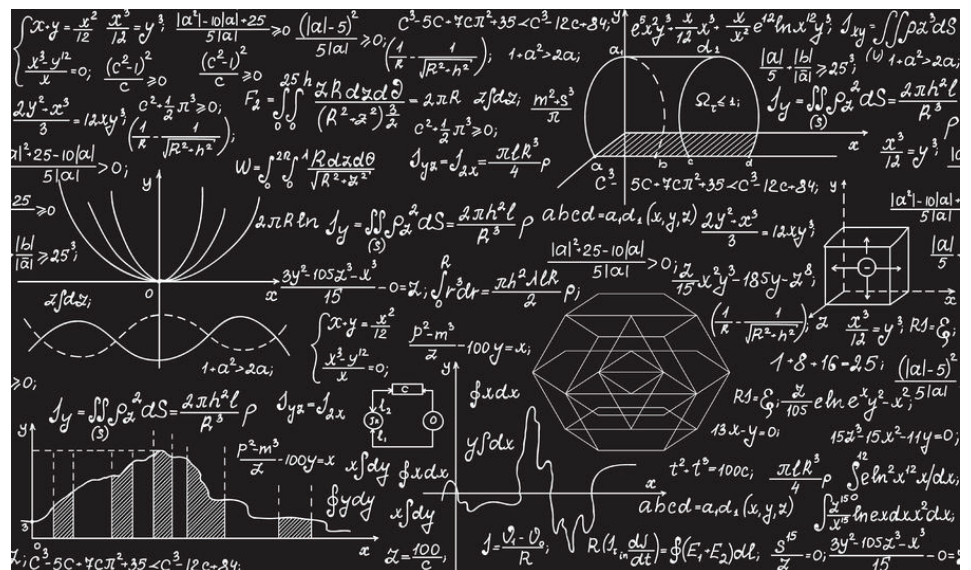
little prospect of ever generating enough tax revenue to start paying down that debt. As the country keeps issuing more and more debt, in the process making its debt less and less creditworthy, are you obligated to keep buying more of that debt, simply because it makes up a larger share of the debt market? Shouldn't you exercise some discretion about the creditworthiness of what you are buying? And if so, shouldn't you similarly try to exercise some discretion about which companies' equities you will own?

We acknowledge that professional active equity managers have complicated this situation through their inability to consistently generate better returns than index funds, which has convinced many people that index funds are a better way to invest. We believe that to a large extent, this too is a case of unintended consequences, because the focus on indexes has altered the way that both clients and managers think and behave.

Managers today generally do not focus on identifying attractive businesses (ones that can earn sustained premiums over their cost of capital over time); they focus instead on trying to figure out which stocks are going to outperform the index over some short to medium term. These are different objectives, and they lead to different analytical methods. Managers worried mainly about relative performance tend to look at things like P/E ratios, or earnings growth, or PEG (P/E to growth) ratios, because they can compare themselves to the index and say to clients "Our stocks are cheaper than the index" or "Our stocks have better earnings growth than the index." But none of these measures tell us anything about what kind of ROIC a company is earning, or how effectively its management allocates capital. In other words, too many managers are following investment processes that we have little reason to believe will lead them to the most attractive businesses.

The client focus on indexes has played a role as well, because managers know that many clients will not retain them if their performance falls behind that of their benchmark over a three-year period. The fact that clients compare managers to an index leads managers to think of risk in terms of tracking error, rather than in terms of some broader measures of overall risk. In most cases, clients have many managers, each managing just a small portion of their overall portfolio, and what matters to the clients in the end is how their overall portfolio performs. Yet because clients compare each manager to an index, the managers focus on managing their tracking error relative to that index, even though for the client, these individual tracking errors may not matter much at all to the behavior of the total portfolio. Clients might be better served by giving individual managers freer rein, so that the managers would worry less about the index and more about only investing in good businesses.

In short, the unintended consequence of MPT's focus on indexing is that active management has come to be less about identifying businesses that add value and more



about positioning yourself relative to an index. And in the process, managers have adopted methods that have made it less likely that in the long run they will generate returns that are better than an index.

## Conclusion

As we said earlier, our objective in this paper is not to somehow “disprove” MPT or to advise people to ignore it. Far from it; we agree that MPT provides a very useful framework to think about investing, and gives us many tools that help us manage risk and understand the drivers of return in an insightful way. Our goal has been to remind readers that MPT is in the end an economic model—intellectually fascinating, and helpful in understanding the real world, but not equivalent to, for example, Newtonian physics. The latter enables us to make very precise and accurate predictions about the physical world (at least at some scales). MPT involves finance, which in the end is an inescapably human activity, subject to all the vagaries and unpredictability of anything that involves people interacting with each other. It does not allow us to make precise and accurate predictions. We should never get so caught up in a model that we lose sight of what investing is really all about in the real world. Successful investing in equities is about identifying companies that create value for their owners by earning high returns on the capital that they take from those owners and invest in their business. The fact that companies on average have been able to do that successfully is what has driven the value of the stock market up over time.



We began this paper with a digression into the art world; to close it, we will talk briefly about baseball as another way to illustrate both the usefulness and the limits of quantitative models applied to a human activity. In any given year, after the end of the season, you can take the number of wins that each team accumulated and build a powerful model that explains much of the variation in win totals across teams with just two independent variables: the team batting averages (a measure of how often batters get a hit) and the team ERA, or earned run average (a measure of how many runs a team’s pitchers give up per nine innings, without counting runs that were caused by fielding errors). In recent decades, a whole science of baseball statistics has arisen, known as “Sabermetrics” (named after the Society for American Baseball Research—SABR—founded in 1971). For many years, batting average and ERA were the standard measures of hitting and pitching, but Sabermetrics looks down on them as being too imprecise. Even so, a regression of team wins against these two old standbys—team batting averages and team ERAs—still produces a model with very high explanatory power.

For the 2017 season, for example, such a regression generates an R-squared of 83%, meaning that 83% of the variability in the number of wins across the thirty teams can be explained by differences in their team batting averages and team ERAs. It will not surprise you to learn that higher win totals are associated with higher batting averages and with lower ERAs, and both variables are extremely statistically significant.

So this simple two-variable model for predicting how many wins a team had is simultaneously powerful (look at that 83% R-squared!) and useless. Why useless? Well, because this model simply states the obvious—to win more games, you have to get more hits and have your pitchers give up fewer runs. A team’s general manager doesn’t learn anything from this model; what he needs to know is how to figure out which hitters and which pitchers will be able to deliver the good numbers, and get them on his team.

The man that Wikipedia calls the “public face” of Sabermetrics, Bill James, recently appeared on the Econ Talk podcast, hosted by economist Russ Roberts. James became famous in the 1980s with his annual *Bill James Baseball Abstract* books, in which he popularized many new statistical measures. It was his influence that led to the rise of the “moneyball” phenomenon chronicled in the 2003 book of the same name by Michael Lewis. That same year, the Boston Red Sox hired James as an advisor; the next year the Red Sox won their first World Series in 86 years, followed by another championship three years after that and a third one in 2013.

You might think that James would be eager to say that it was his quantitative analytical techniques that led to the end of Boston's long World Series drought. And it would be hard to gainsay him if he did. Yet here is how James responded to a question about what he has learned from his years with the Red Sox:

**Russ Roberts:**

*You went from being the crazy guy in the basement who had this self-published thing called the Bill James Baseball Abstract . . . And now, you are a consultant to the Red Sox . . . What most surprised you in that move from outsider to insider about what baseball is actually like, once you got on the inside?*

**Bill James:**

*The most surprising thing was an understanding of how many people contribute to a championship. And it literally is impossible to explain to an outsider how many people it requires doing how many different jobs at a high level in order for a baseball team to win a World Championship. And, the number of streams—the number of little streams that feed into that river, is—it's almost incalculable. You'd have to—if you take a single player—let's say, Dustin Pedroia—you have to look at everybody who had a big influence on Dustin Pedroia, which may include your Minor League managers, your Minor League coaches; it may include the scouts—the first scout who focused on him and the other scouts who focused on him. But it also includes, you know, his father, and his high school coaches. And, all of those people had some impact on the Red Sox eventually winning World Championships in 2007 and 2013.<sup>3</sup>*

Yes, you can compare Dustin Pedroia's batting and fielding statistics to other players in ever more sophisticated ways, but what the statistics will never be able to tell you is why Dustin Pedroia has the ability that he does. And what James is saying is that ultimately it's not the statistics alone that win a World Series—it's the "why" behind each player as well.

Investing is no different. As helpful as it is to have all of the insights that MPT offers—and it offers many—an investor still has to understand the "why" behind a successful business.

**Sources:**

1 Craig Doidge, Kathleen M. Kahle, G. Andrew Korolyi, and Rene M. Stulz, "Eclipse of the public corporation or eclipse of the public markets?," ECGI Working Paper Series in Finance, Working Paper No. 547/2018, January 2018

2 Julie Begenau and Erik Stafford, "Do Banks Have an Edge?," working paper, January 2018

3 [http://www.econtalk.org/archives/2018/01/bill\\_james\\_on\\_b.html](http://www.econtalk.org/archives/2018/01/bill_james_on_b.html)

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