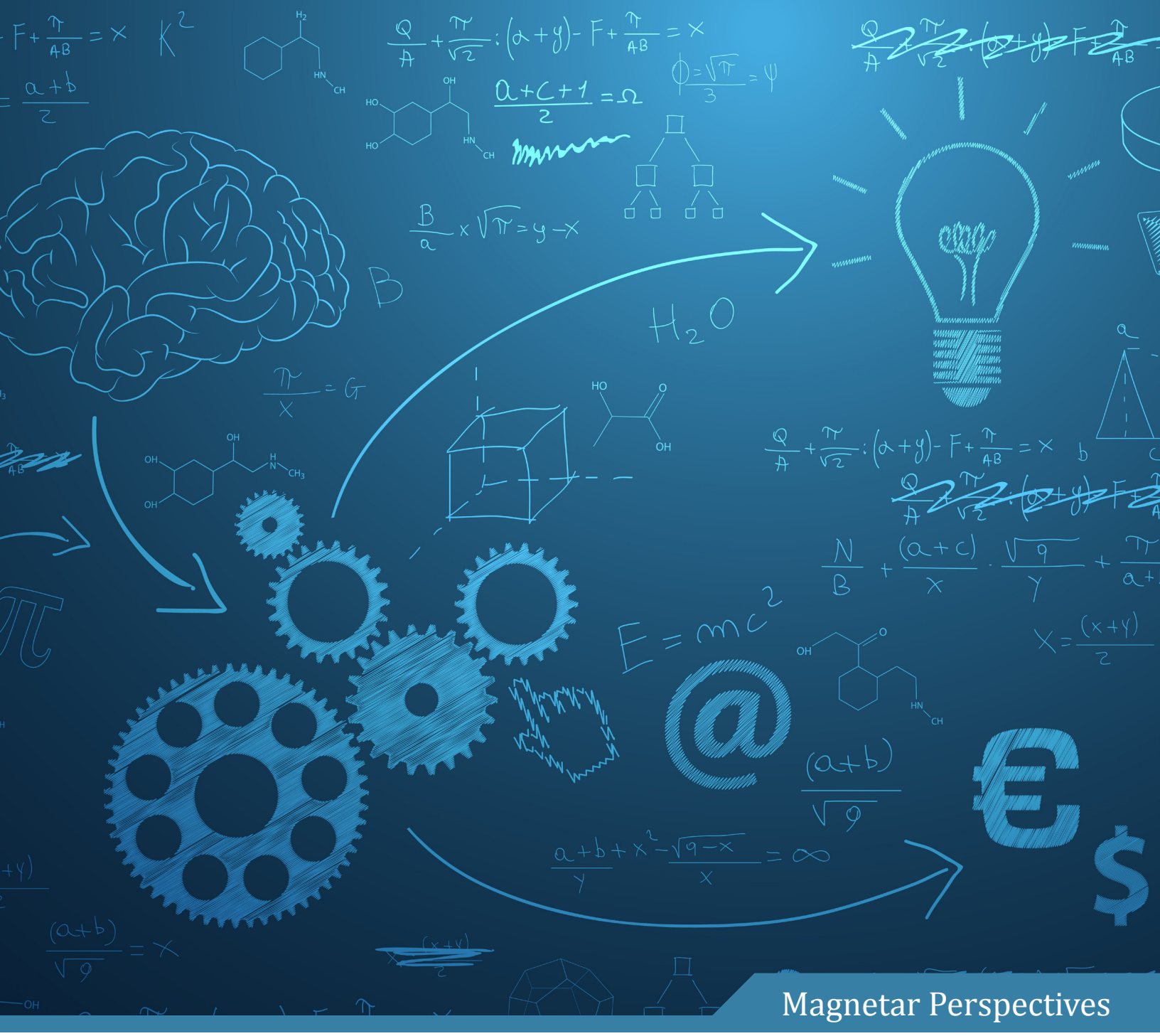


Magnetar Perspectives

THE ART AND SCIENCE OF KNOWING WHAT YOU OWN

By Alec Litowitz, Founder and CEO, and Brian Portnoy, CFA, PhD, former Director of Education

MAGNETAR CAPITAL

ABSTRACT

In this perspective on articulating, extracting, and assembling investment risk, we explore the modern history of this fundamental question: *Do you truly know the underlying risks of what you own?* We contend that investors benefit from risks that are accessible, transparent, affordable, and measurably useful. This wish list might seem straightforward, but achieving it is not. There are linguistic, analytic, and other obstacles that get in our way. We observe that the evolution of investment risk occurs through cycles of innovation. The interplay between investor preferences, investment products, and academic models illuminates how markets and investors adapt over time. As innovation cycles systematically disrupt the money management industry, investors benefit from investment products that become more accessible and cheaper. In turn, money managers are compelled to adapt or face irrelevance. In detailing the modern history of marketable risk, including fertile areas of research in alternative risk premia, we believe that investors in our current era are empowered to meet their financial objectives with products and analytic tools in unprecedented ways.

> "The revolutionary idea that defines the boundary between modern times and the past is the mastery of risk: the notion that the future is more than a whim of the gods and that men and women are not passive before nature."
>
> – Peter Bernstein, *Against the Gods (1996)*

INTRODUCTION

In investing, acquiring a true understanding of the risks we take is a surprisingly persistent and peculiar problem.

As capital markets have evolved over the centuries, "risk" is rarely well-defined or stable in its manifestation. Nor are the preferences and aspirations of those who are taking it, making for an evergreen challenge that sits at the heart of finance. As historian Peter Bernstein reminds us, the long history of articulating risk with increasing sophistication is one of the great tales of progress in modern society (Bernstein 1992, 1996, 2007).

The thing is, we're never quite finished figuring it out. The problem is never solved, even in an era of supercomputers and machine learning. In fact, and perhaps paradoxically, more data and more computing power can aggravate the problem by amplifying complexity. Thus, it remains true for investors of all stripes that even a full and transparent rendering of one's portfolio is unlikely to reveal its true underlying drivers of returns and risk.

Knowing what you own is hard. Not knowing what you own is dangerous.

* * *

In this first of several Magnetar perspectives on articulating, extracting, and assembling investment risk, we explore the modern history of this fundamental question: Do you truly know what you own? (Further papers will explore in more technical depth investors' ability to build portfolios with differentiated and alternative risks.)

In this paper, we make three main points:

- *Investors benefit from risks that are accessible, transparent, affordable, and measurably useful.* This wish list might seem straightforward, but achieving it is not. There are obstacles that get in our way.

- *The evolution of investment risk occurs through cycles of innovation.* The interplay between investor preferences, investment products, and academic models is a fruitful way to understand how markets and investors adapt over time.

- *Innovation and disruption benefit investors.* As cycles systematically disrupt the money management industry, investment products can become cheaper, more accessible, and more plentiful. Money managers are compelled to adapt or face irrelevance.

Our perspective is organized as follows. First, we note three impediments to acquiring a sharper understanding of the risks we take. Second, we offer a simple model of financial innovation. Third, we walk through the modern history of marketable risk, including fertile areas of research in alternative risk premia.

Overall, we believe that investors in our current era are empowered in a way they never have been before. The accessibility and affordability of useful products and user-friendly tools to make sense of them has ushered in an era where investors are increasingly well-positioned to achieve their financial goals.

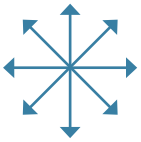
WHAT ARE WE UP AGAINST?

Three persistent frictions impede our ability to get to the nub of what investment risks we are taking:

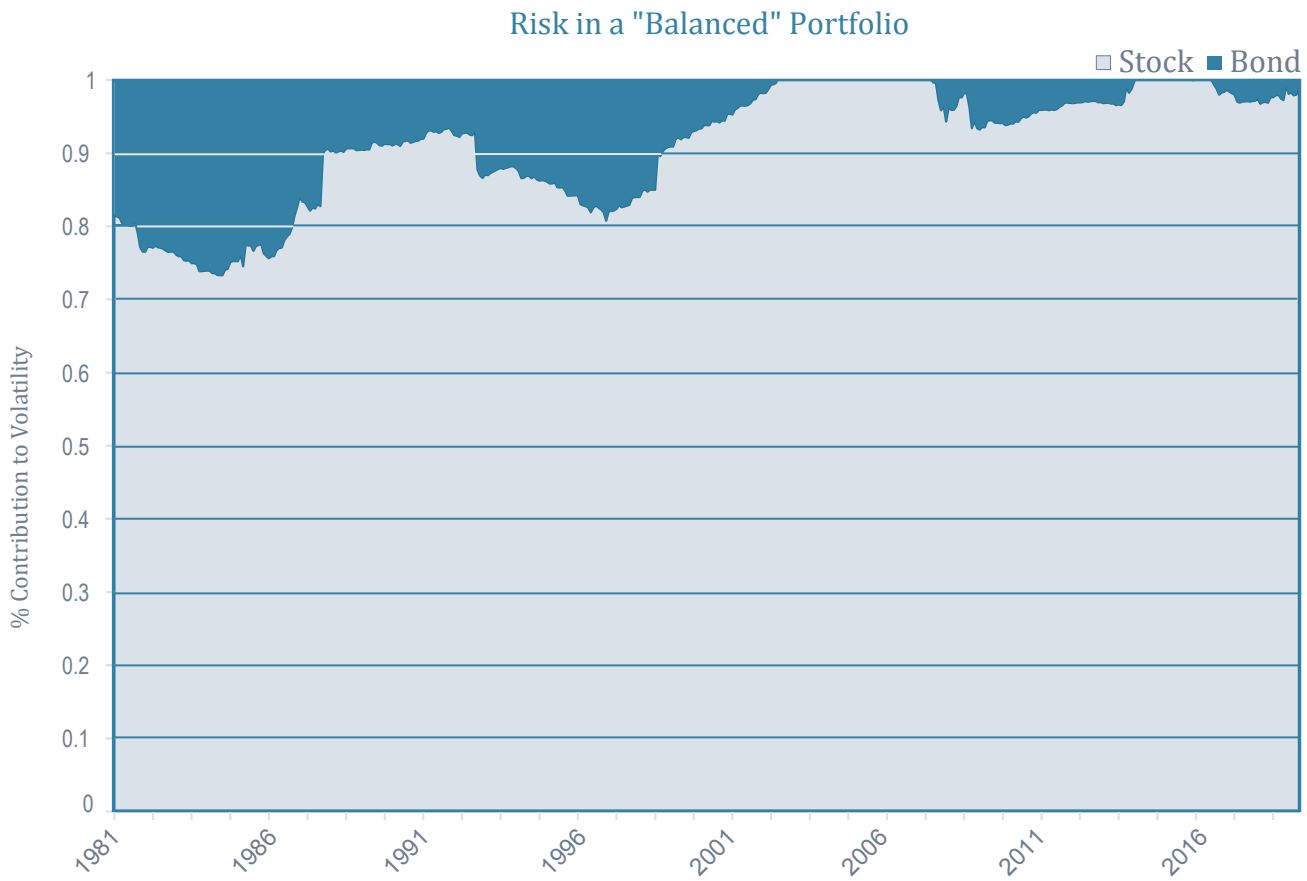
1. *Language*. A linguistic puzzle sits at the center of smart investing. What is something and what do we call it? As the physicist Richard Feynman put it, "Knowing the name of something is not the same as knowing something."[1] In that spirit, finance – with its apparent precision and rigor – is a linguistic minefield, filled with esoteric jargon, where shared understandings are elusive. Answering the question of "*What is this?*" has motivated decades of investigation among the most serious finance scholars and investment practitioners.

2. *Analytics*. Next, there is a necessary exercise in the "decomposition" of risk and return that is mathematically and statistically complex. In an effort to simplify and clarify, investors have engaged in what some call "dimensional reduction," or the process of identifying and articulating the "true" sources of an investment's return and risk. Over time, investors and academics have built increasingly sophisticated tools to both decompose and assemble risks.

3. *Dynamics*. Markets are complex adaptive systems in which change is constant (Lo 2014). Thus, risk isn't fixed, either in its supply or demand. It can change in both magnitude and type. And perception matters: An all-stock portfolio will be perceived by a 30-year old much differently than an 80-year old retiree, for example. The constancy of change and complexity keeps the bar high for understanding what we own.



Let's walk through a simple example of what we're up against: Understanding the risk and return drivers of a "balanced" portfolio of stocks and bonds. This approach remains by far the most conventional method for organizing one's portfolio. The following data reflect the standard starting point of a portfolio with a 60% allocation to equities and 40% allocation to bonds. What's driving the volatility of the portfolio? Even though there's roughly an even split between stocks and bonds, we immediately see that a vast majority—sometimes all—of the risk in a "balanced" portfolio comes from stocks and very little—or none—from bonds.



Data as of January 1981 to June 2019. Stocks are represented by the S&P Total Return Index and bonds by the Bloomberg Barclays U.S. Aggregate Bond Total Return Index. Risk contribution is calculated as marginal risk contribution based on a 60/40 portfolio and a five-year rolling covariance matrix using monthly simple returns between stocks and bonds.

Over this time series, on average 91.6% of the balanced portfolio's volatility was explained by stock market exposure and just 8.4% by its bond exposure. Further, the risk of a balanced portfolio is unstable. From 1981 to 2019, the amount of risk attributable to equities has grown while that of bonds has shrunk to nearly zero.

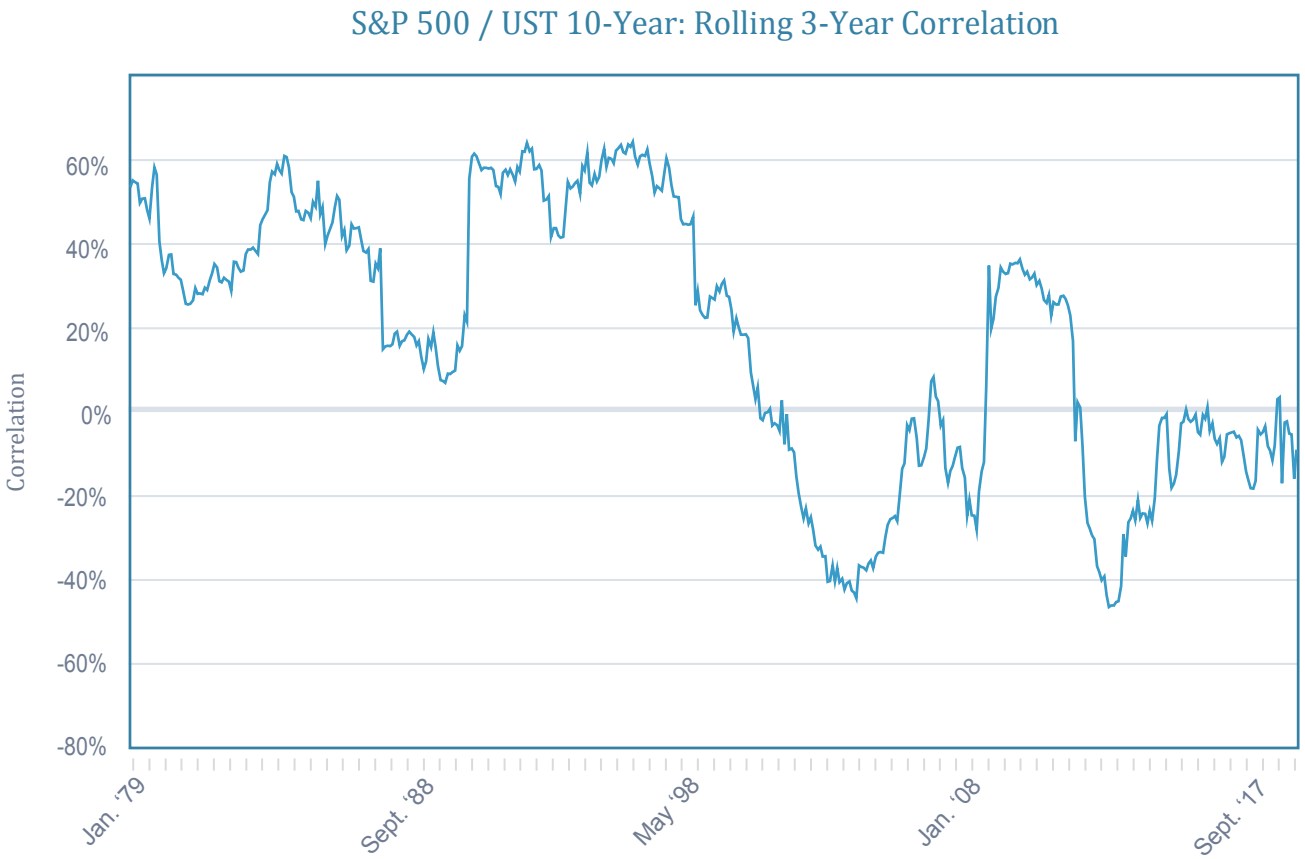
	Asset Allocation		Risk Attribution	
	Stock	Bond	Stock	Bond
1981*	60%	40%	80.9%	19.1%
1991			93.1%	6.9%
2001			95.4%	4.6%
2011			96.3%	3.7%
2019**			98.0%	2.0%

* Data pulled on Jan. 31 of stated year
** Data pulled on Mar. 31 of stated year

Data as of January 1981 to June 2019. Stocks are represented by the S&P Total Return Index and bonds by the Bloomberg Barclays U.S. Aggregate Bond Total Return Index. Risk contribution is calculated as marginal risk contribution based on a 60/40 portfolio and a five-year rolling covariance matrix using monthly simple returns between stocks and bonds.

This basic exercise offers some important lessons. First, what investors casually refer to as "diversified" often is not. A portfolio might have many holdings, distributed across different categories such as asset classes, sectors, and countries. Yet this may provide only the illusion of diversification. What drives the performance of the widely-held "balanced" portfolio? It's almost entirely composed of equities.

Second, while the math behind the return decomposition above is uncomplicated, it reveals that there is more than meets the naked eye. One critical element in this example is that, despite conventional wisdom, stocks and bonds aren't necessarily uncorrelated. From the 1960s through late 1990s, the S&P 500 Index and the 10-year U.S. Treasury Bond were positively, though variably, correlated. A regime shift took place around the turn of the century and lately correlations have been generally negative (though highly variable).



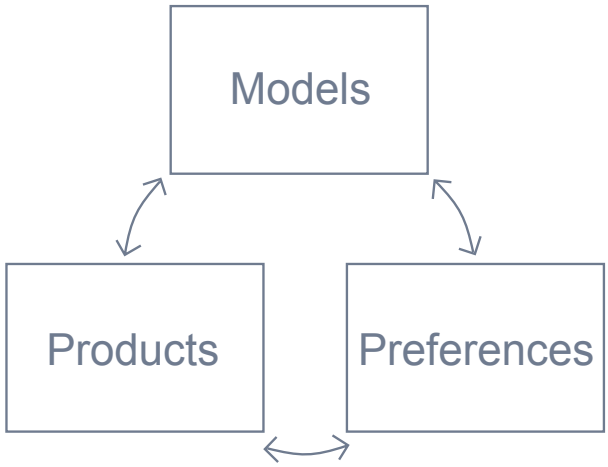
Data as of January 1979 to June 2019. Stocks are represented by the S&P Total Return Index and bonds by the Bloomberg Barclays U.S. Aggregate Bond Total Return Index. Correlation is calculated using trailing 36-month monthly simple returns.

Finally, labels are often deceiving. In this case, the allocation is based on the basic language of "asset classes." Most fundamentally, and a topic we will explore in a separate paper, the idea of "bond" risk is deceiving. That label, as popular as it is, masks distinct underlying risks, especially credit and duration, themselves subject to further decomposition. As Richard Feynman suggested, knowing the name of something doesn't imply an understanding of it.

These three obstacles – language, analytics, and dynamics – are a permanent part of the terrain we must navigate to figure out what we own. Nonetheless, over the past century, investors still have been able to make large strides in building better portfolios. In fact, investors should be encouraged that the opportunity for innovation is always present and, if channeled smartly, provides hope that we will continue to discover effective sources of return and diversification. Let's now shed light on why that is so.

HOW INVESTMENT RISK EVOLVES

Here's a basic mental model for making sense of the innovation cycle that drives the buying and selling of investment risk.



Three variables are in play:

- *Products* package tradable market risks which are accessible to and consumed by investors. Like any product, they go in and out of favor for any number of reasons. They are created and distributed by asset managers.

- *Models* create a useful abstraction of a complex reality. As the saying goes, the map is not the territory. As Nobel Laureate Myron Scholes put it, "We make models to abstract reality. But there is a meta-model beyond the model that assures us that the model will eventually fail. Models fail because they fail to incorporate the relationships that exist in the real world" (quoted in Bernstein 2007). Indeed, all of our maps are snapshots in time and subject to revision.

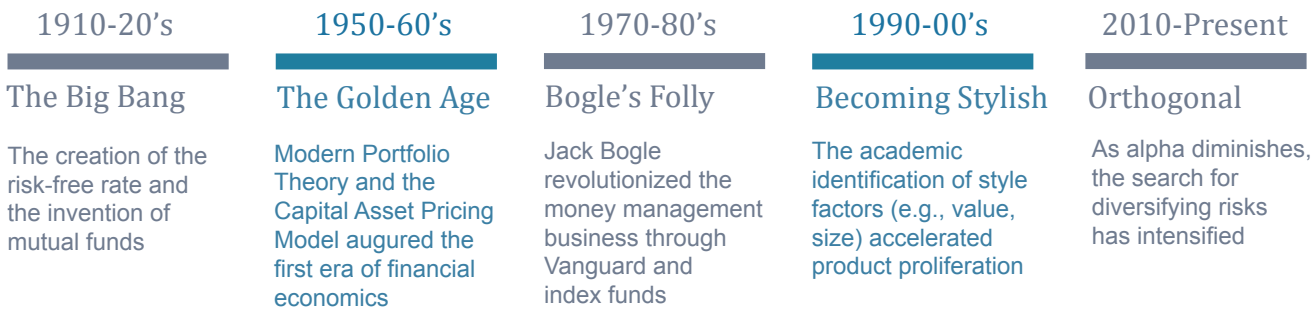
- *Preferences* are what the client – in this case, the investor – wants. There is a complex ecosystem of individuals, advisors, and institutions all with particular wants and needs. The most powerful assumption about all investors is that they are loss averse, meaning that losses are more psychologically painful than gains are pleasurable (Kahneman and Tversky 1979). (Unpacking differing investor utility functions is far beyond the scope of this paper.)

How does the cycle work? The answer, like the history of innovation generally, is circumstantial. The model is not unidirectional but recursive, meaning that there is an ongoing but unpredictable interplay between products, models, and preferences. It does not prescribe directionality or causality, let alone timing.[2]

In the history that follows, we'll see examples from every which way. The government might issue securities for its own purposes, and investor demand for models that clarify the risks at hand come later. The same dynamic holds when money managers build a new "product" and hope, a la "Field of Dreams," that investors will come. Likewise, mutual funds existed decades before there was a theory behind how they worked or their widespread adoption. In other cases, financial models can be "an engine, not a camera," as the sociologist Donald MacKenzie (2006) memorably put in his study of how academic theory shaped financial markets. Legendary scholars like Bill Sharpe, Eugene Fama, and Kenneth French built engines, not cameras, of financial markets and products. Finally, unmet investor demand for particular opportunities can drive product and model creation.

The unifying idea is that these three forces combine to drive cycles of innovation, which in turn empower investors to discover and employ useful investment risks. History tends to bear this out.

CYCLES OF INNOVATION IN INVESTMENT RISK



The "Big Bang"

While the history of humanity's quest to quantify and harness risk stretches back millennia – encompassing everything from hunting mammoths, to gambling, to the invention of probability theory, to the creation of the insurance industry – the modern era of investment risk started on April 24, 1917.

On that day, the U.S. government issued its first Liberty Bond, a war bond sold to finance American participation in World War I. Its significance is due to the means by which the government sold them: The bonds were directly marketed to ordinary households, not just the wealthy. Liberty Bonds were the first important mass marketable security of the modern era.

This innovation marked the invention of the "investor class." Prior to then, relatively few households had any access to marketable investments. Now, for the first time, the government invited every household to participate. This "mass" appeal was fueled by a broad publicity campaign, including celebrity promotions (e.g., Al Jolson, Douglas Fairbanks, Charlie Chaplin) and colorful advertisements, which 100 years later have become pricey collectibles.

Liberty Bonds marked the genesis of liquid access to a "risk-free" source of return for everyday investors, with broad ramifications for the development of modern capital markets. It established a transparent baseline for distinguishing between "risky" and "riskless" assets.

The "risk-free rate" anchors the logic of all modern investing. It's hard to overstate its importance. No rational investor would buy securities that have an expected return less than the risk-free rate. If short-term U.S. Treasuries yield 2% (and assuming there is no chance that the U.S. government would default on its short-term debt), then any risk-seeking investor would "demand" a return greater than 2%. Hence the modern invention of the "risk premium": an expected return an investor would insist upon to compensate for the possibility of taking a loss. Without a risk-free rate, a systematic approach to investing would prove difficult, if not impossible.

This baseline raises another, thornier issue. How do we assess whether taking additional risk to achieve a higher return is worth taking? Say we can potentially earn 8% in public equities, but what is the probability of hitting that bogey relative to the 100% chance we can make 2%? What risks – precisely – need we take to achieve that higher return? And how does this calculation map to other fundamental issues, especially the relevant time frame of the outcome (months? years? decades?) and our psychological capacity to take investment risk? These questions sit at the center of modern investing.

The accessible risk-free rate was the first of two key early innovations in creating the investor class. The second was the mutual fund. It had been possible for centuries, of course, to buy an individual stock on an exchange, but it was never possible for the general public to easily purchase a portfolio of securities, especially one assembled and managed by an investment professional.

In 1924, Massachusetts Investor Trust (now known as MFS) launched the first open-end investment fund, but it hardly triggered a deluge of new offerings. The massive growth in mutual funds would not take place for decades.

There was no predicting this growth trend – a theme common to many stories of innovation. Mutual funds provided investors market access. But what exactly did that mean? At the time, it was hard to say as investors lacked an incisive framework to answer two basic questions:

1. *What do I own?* What risk exactly am I taking? What are the underlying drivers of my investment's return? Have I made a "good" or a "bad" decision?

2. *How do I use it?* Where does this investment fit into a portfolio, if at all? Is this risk diversifying? Does it increase the likelihood I will achieve my financial objectives?

It would be a full quarter century until investors began to receive fulsome answers.

The Golden Age

The modern risk innovation cycle was jumpstarted in the years following World War II. Devastated by the Depression and distracted by World War II, the inchoate investor class would wait a couple decades after the "big bang" for the first new insights to help power the selection of better investments and construction of better portfolios. This was the era when folklore transformed into theory (Bernstein 1996).

Two primary innovations of this era were the invention of modern portfolio theory (MPT) and the capital asset pricing model (CAPM).[3] This history is relatively well-known and has been written about extensively (cf. Bernstein 1992), but there are still some salient points worth emphasizing.

Until Harry Markowitz's 1952 article "Portfolio Selection" and 1959 book *Portfolio Selection: Efficient Diversification of Investments*, there had never been a systematic treatment of portfolio diversification. Markowitz was hardly the first person to consider the benefits of diversification. In reflecting on his career, Markowitz points out that Shakespeare himself well understood the concept in the 1590s.

> "My ventures are not in one bottom trusted,
> Nor to one place; nor is my whole estate
> Upon the fortune of this present year;
> Therefore, my merchandise makes me not sad."
>
> - *Merchant of Venice* Act I, Scene 1

Nonetheless, Markowitz's thinking transcended centuries of "don't put all your eggs in one basket" wisdom to create a *theory* – a clarifying model – to show how the whole can be greater than the sum of the parts. He saw portfolio risk as a function of the *covariance* of the underlying investments, meaning that the risk of each individual piece is less important in selecting the right portfolio than how they interact with each other. Two extremely "risky" (highly volatile) investments, if sufficiently uncorrelated with one another, may form a better portfolio than the combination of two "safe" assets. That such thinking is now conventional wisdom, even common sense, makes it easy to overlook Markowitz's original contribution.

But which assets should we own in this quest for a diversified portfolio? This is where Markowitz's student, William Sharpe, picked up the ball, along with John Lintner (1965), Jack Treynor, and Jan Mossin (1966). They introduced the Capital Asset Pricing Model (CAPM), arguably even more important to the science of knowing what you own. Sharpe knew that the map was not the terrain but drawing one was still essential for coherence and progress: "An asset class factor model can help make order of the chaos that often attends the investment process" (Sharpe 1992).

CAPM suggested that the expected return of any stock was driven by the risk-free rate, the equity market risk premium, and the stock's sensitivity (beta) to the market:

$$Expected\ Return = Risk\text{-}Free\ Rate + (Beta \times Equity\ Risk\ Premium) + Alpha$$

Beta measures the volatility, or systematic risk, of an individual asset in comparison to the entire market. CAPM contains a single risk premium. It is the return of the market in excess of a risk-free asset. Investors are compensated for systematic risk that they cannot diversify. Because in the original CAPM formulation the market is defined so broadly, there is no unexplained risk (what came to be known as alpha). Eugene Fama and Ken French later wrote that, "The attraction of the CAPM is that it offers powerful and intuitively pleasing predictions about how to measure risk and the expected relation between expected return and risk"; they called the contribution a "theoretical tour de force" (Fama and French 2004: 25, 44).

CAPM immediately enabled a savvier evaluation of stock picking skill, of whether a mutual fund was "good" or "bad." It became an innovation for investors wanting to benchmark their mutual fund manager against what types of returns the manager should have generated given the fund's level of market beta.

In other words, CAPM reflected the start of risk decomposition in earnest. It began to systematically explain what risks someone owned.

Bogle's Folly

With the vantage point of history, MPT and CAPM were monumental creations in understanding risk and return, at both the portfolio and security level. In practice, however, they were trees falling in an unmanned forest, effectively heard by no one. For as much as the pioneers of modern financial economics wrote about the "market portfolio," there was actually no practical way to invest in it.

John C. "Jack" Bogle changed all that. Bogle's big idea was that active management, by definition, is unable to beat the market because it is, in aggregate, the market. The high costs of mutual funds would subtract value over passive market replication. In fact, the early studies by scholars using the CAPM framework found disappointing results. For example, in an analysis of actively managed funds from 1955 to 1964, Jensen (1968: 415) found "very little evidence that any individual fund was able to do significantly better than that which we expect from mere random chance."

Influenced by these findings, including the writing of Paul Samuelson and Charley Ellis, Bogle heeded the call.[4] He founded Vanguard in 1975 and one year later launched the first true index fund, the Vanguard First Index Investment Trust (later named the Vanguard 500 Index Fund). Dismissing the benefits of skill and emphasizing the harm of high fees, Bogle's vision was to provide cheap, diversified exposure to the broad market.

Because we know how the story ends, Bogle's moxie sounds great. Yet at the time his idea landed with a thud. In 1976, principal underwriters targeted a $150 million initial offering for the fund; it attracted a mere $11.3 million (Schlesinger 2019). The effort was assailed as "Bogle's Folly," a clever but fruitless attempt to convince investors that "passive" investing was in their best interest. Bogle and index funds were deemed "un-American" by some onlookers – especially rival asset managers – by suggesting that indexing accepted an "average" result, contrary to the spirit of capitalist competition. Real Americans weren't passive.

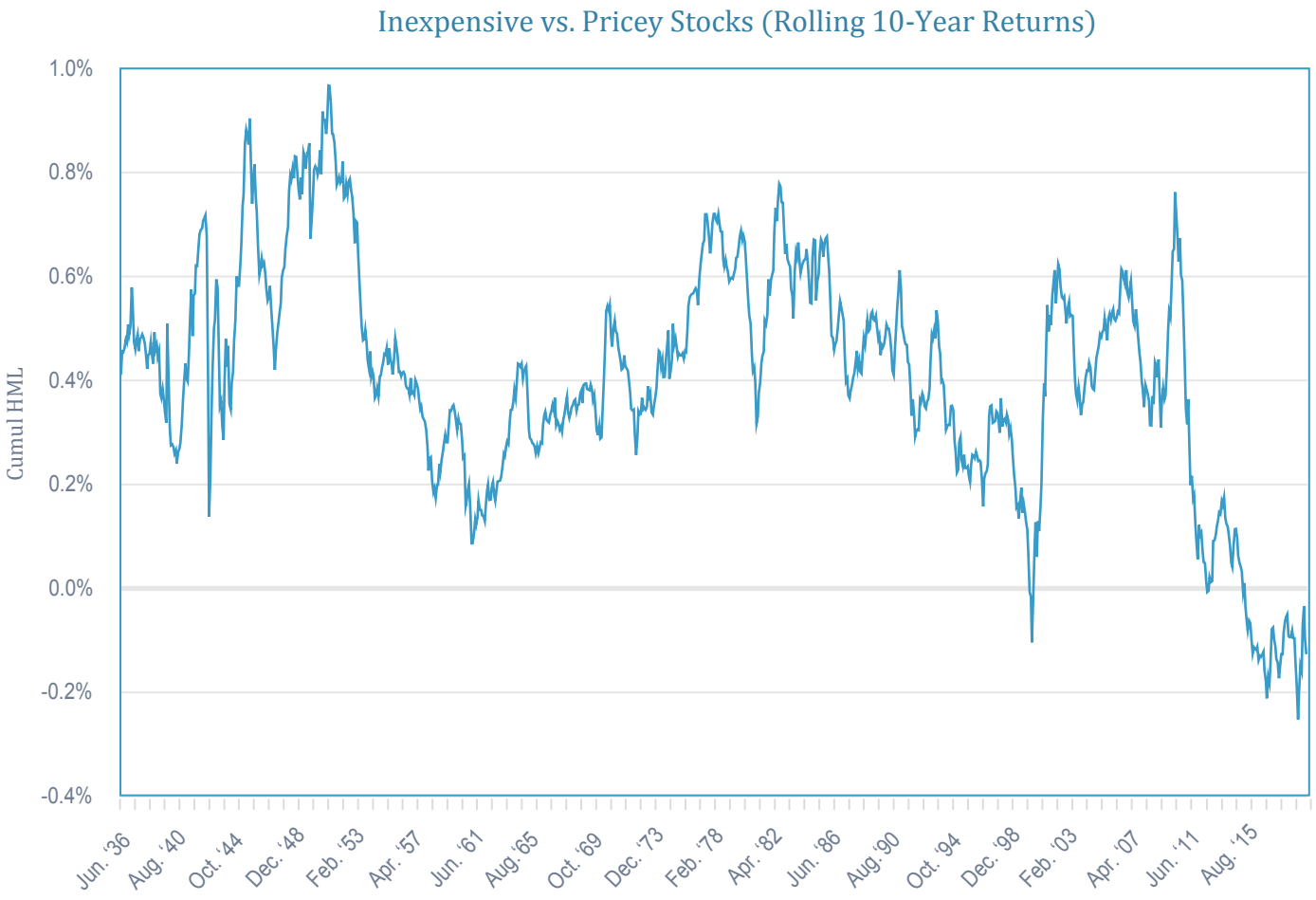
By the end of 2018, Vanguard managed $3.85 trillion in passive assets (and Blackrock, the other modern king of passive investing managed $4.15 trillion) (Williamson 2019). This was in retrospect what Clayton Christensen (2019: 11) calls a "revolutionary" or "market creating" innovation, which "transform complex and expensive products and services into simple and more affordable products." These become accessible to new consumers and, in effect, create consumers where there was no prior demand. Indeed, aside from some academic debate in the 1960s and 1970s, widespread clamoring for an "index" fund failed to materialize.

Becoming Stylish

The creation of widely available and cheap equity markets accelerated academic interrogation into the nature of investment risk. It was the CAPM that sat squarely in their crosshairs. The original CAPM would predict that the highest beta stocks would be compensated with higher returns. In other words, more risk produced more return. Was this empirically true? No.

Eugene Fama and Kenneth French's seminal contribution was the discovery of *systematic* risks beyond the impact of the broad market factor (Fama and French 1992; Fama and French 2004; Ang 2004). Specifically, they identified stocks' *value* and *market capitalization* characteristics as systematic risk (or "style") factors.

Take value, for example. It's not difficult to create a portfolio of stocks ranked by valuation, from cheap to expensive on various metrics (e.g., price-to-book, price-to-earnings, etc.). While bulk equity beta would predict higher returns for higher betas, Fama and French observed that cheaper stocks (in their case, ranked by book value) systematically outperformed pricier ones, as evidenced in the several decades leading up to their seminal 1990s studies. In the graphic below, positive rankings reflect the outperformance of inexpensive (based on price-to-book) stocks versus pricey ones. More recently, the value factor has struggled.

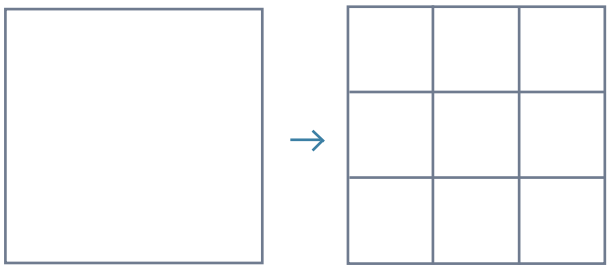


Fama-French data library, Magnetar. Data as of June 1931 to April 2019. Performance of inexpensive vs. pricey stocks is measured by rolling 10-year average of monthly HML factor.

Fama and French made another important observation about the systematic impact of company size: Generally, small-cap stocks tended to outperform larger-cap ones. Meanwhile, a third prominent factor "discovered" before the turn of the century was *momentum*: Stocks that have recently had the highest positive performance tended to outperform stocks that have recently underperformed. (Jegadeesh, Narasimhan and Titman 1993; Carhart 1997).

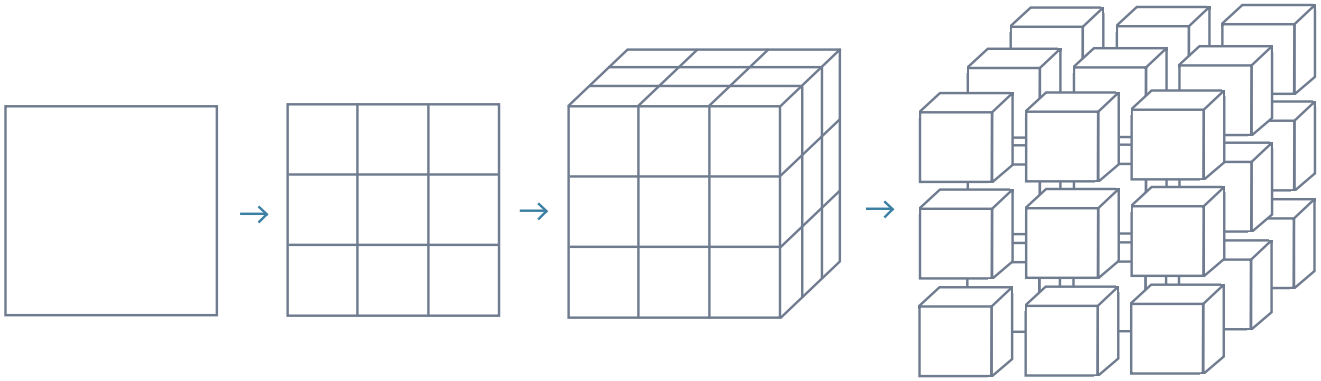
These style-based insights were institutionalized by Morningstar, an upstart investment research firm launched in the mid-1980s, and had massive knock-on effects for the next generation of product creation. Prior to 1992, Morningstar (as did other research services such as Lipper) evaluated all equity funds in a CAPM-influenced manner, meaning that the broad equity market beta was the relevant benchmark for all mutual funds, regardless of whether they tilted toward big or small caps, value or growth companies.

When the model changed, the language did, too. In sync with the Fama-French 3-factor model, Morningstar created the "Style Box" which generated 9 different investment categories: Size on one axis (large-, mid-, and small-cap), value on the other (value, core, and growth).



Per our innovation model, when the academic insights and language changed, so did the products. The early 1990s marked the onset of a new wave of "style"-based funds (e.g., mid-cap growth, large-cap value). When combined with the raging bull market of the 1990s, this innovation helped fuel a golden age for the traditional mutual fund industry. In addition to Vanguard's rise, large supermarket-style firms like Fidelity and T. Rowe Price grew sharply, as did style-focused shops Dimensional Fund Advisors and AQR, both run by former students of Fama at the University of Chicago.

This research launched a torrent of activity in return decomposition. Beyond equity beta, value, size, and momentum, scholars searched for as-yet undiscovered factors in order to find new sources of return and additional means of portfolio diversification. Recent research by Harvey, Liu, and Zhu (2016) (cf. Arnott et al., 2019) point to 314 factors published in top academic journals alone (which doesn't include proprietary or unpublished factors), creating what some observers call the "factor zoo."[5]



As such, the quest for useful investment risks has created countless potential dimensions. This growth has been additionally spurred by a newer packaging of risk, the exchange-traded fund (ETF). According to Morningstar, "Strategic Beta" ETFs (those focused on specific risk factors, not including broad market indexes) grew from zero assets in 2000 to $705.1 billion across 693 offerings at the end of 2018, making up more than 20% of the market for exchanged-traded products. A majority (77.6%) of these offerings focus on "simpler" style products with value, growth, or dividend-oriented tilts (Morningstar 2019b).

What About Alpha?

A remarkable feature of the evolution of investment risk, from bulk asset classes to thinly sliced factors, is the incremental *devolution* of alpha. By definition, alpha is the unexplained portion of a return stream. It is considered valuable because it is uncorrelated with other risks, which empowers investors to build better portfolios. This supposedly idiosyncratic risk is then labeled as "skill." As such, alpha has always commanded a premium price.

However, at each evolutionary step, what's perceived as idiosyncratic risk is often transformed into systematic risk.

The Interplay of Models and Products

	Stage	Description	Label	Accessibility/ Transparency	Cost
Alpha ↓	Unexplained	Technically, variation that is unexplained by existing risk factors. Colloquially known as "skill"	Alpha	Very difficult to access and by definition opaque	Very Expensive
↓	Identified & extracted	Identifiable risk factor but hard to extract and scale	Alternative risk premia, Smart beta, Exotic beta, Strategic beta	Complex, difficult to understand, difficult to create product	Expensive
↓	Scaled	Refinements of systematic extraction, creating more access and lowering costs		Less complex, still difficult to understand, amenable to scalable products (i.e. funds, ETFs)	Moderate
Beta	Commoditized	Products with effectively no barriers to entry	Beta	Very transparent	Cheap

As Crowell et al. (2012) and others have noted, alpha is often just beta waiting to be discovered. The most notable example stemmed from the discovery and integration of value and size factors. In the Morningstar context, until the early 1990s, "equity" mutual funds were analyzed as one cohort. In practical terms this meant we could observe at times alpha in a comparatively large number of funds.

Style-based benchmarking and peer-to-peer comparisons caused much of this observed alpha to disappear. It was no longer as appropriate to applaud smaller-cap or value-oriented managers for "outperforming" – adding alpha – when in fact all or most of what they were doing was merely providing beneficial factor exposure. This is not the same as (or as valuable as) stock picking prowess. (The *reductio ad absurdum* logic here is that because no two funds are perfectly identical, then we can end up with countless categories of just one. Thus, the problem of language and categories rears its ugly head once more.)

Fast forward to today, a quick glance at recent data on U.S. equity mutual fund performance speaks to the near disappearance of alpha in the largest, most liquid capital markets. Over the past five, ten, and 15 years, very few professional stock pickers beat their broad index.

% of U.S. Equity Funds Outperformed by Style Benchmarks

	5-year (%)			10-year (%)			15-year (%)		
	Value	Core	Growth	Value	Core	Growth	Value	Core	Growth
Large	79	92	88	82	93	84	79	92	95
Mid	94	89	69	88	90	87	92	95	91
Small	94	95	88	87	93	86	94	97	98
All Domestic Funds		88			84			89	

Source: Soe, Liu, and Preston (2019)

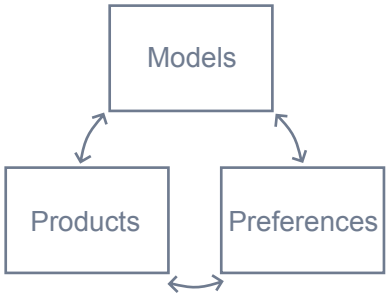
Based on these data, it's no surprise that the long-only world of mutual funds has been upended by cheap index funds. In 2018, for example, Vanguard and Blackrock's iShares collected combined net assets of $297 billion, but the long-term net flows for the entire mutual fund/ETF industry were just $157 billion. In other words, Vanguard and iShares collected more than 100% of flows while the rest of the industry was in net outflows (Morningstar 2019a).

Let's Get Orthogonal

From the post-war era until today, most investor assets flowed into "long only" mutual funds or ETFs. However, some of the most novel searching for useful risks was found outside that world. Elsewhere, a different project was underway, one which didn't face the same regulatory and structural constraints (e.g., fully-invested portfolios, strict limits on short-selling), nor was tied to tightly-benchmarked, style-based mandates. This was the world of hedge funds.

In 1949, Alfred Winslow Jones launched the first "hedged fund" with the objective of generating positive absolute returns for investors, distinct from beating a broad market benchmark. His two funds – set up as limited partnerships, thereby rendering them unavailable to the mass investor class – employed a "long-short" equity strategy that took both bullish and bearish bets on individual stocks. Jones' goal was to ring fence the benefits of idiosyncratic stock picking from overall trends in the market. This would serve as an uncorrelated, or orthogonal, risk which could move an investor further out on the efficient frontier. Non-systematic and uncorrelated sources of return – alpha, not beta – was on offer.

The same model of innovation that drives the long-only world also helps makes sense of alternative investing. In this case, preferences drove both products and models.



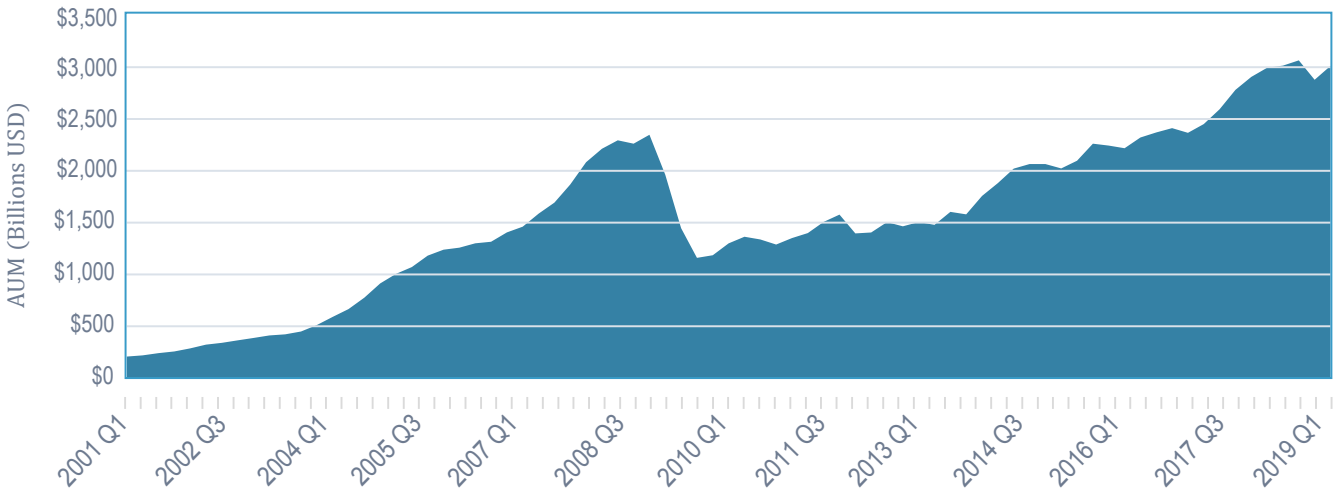
Originally, it was primarily wealthy families with higher risk tolerance and legal flexibility who were the main investors in this space. However, it was a change in the preferences of influential institutional investors in the 1960s and 1970s that would kick-start subsequent cycles of innovation, growth, and adoption.

Historically, trustees of endowments and foundation (E&Fs) charted a highly conservative course, focusing primarily on capital preservation. However, reports commissioned by the prominent Ford Foundation in 1969 recognized that institutions could meet their obligations through a less conservative "total return" orientation, in part because of the diversification insights gleaned from Modern Portfolio Theory. As this mindset caught on, E&Fs relaxed their ultra-conservative standards and took a more reasonable posture combining both capital preservation and growth. Defined benefit pension funds saw a similar evolution, partly spurred by the provisions of the 1974 Employee Retirement Income Security Act. As their focus shifted toward funding ratios, pensions adopted total return programs that incorporated not only more equity exposure, but non-traditional investments like hedge funds as well.

Relaxed structural constraints paved the way for widespread institutional adoption of absolute return (or hedge fund) strategies. And the adoption curve was further accelerated when new models arrived to further clarify how complex investments might fit into institutional portfolios. The trailblazer here was Yale Endowment chief David Swensen. His *Pioneering Portfolio Management* (2000) articulated the now-popular "endowment model," which placed alternative investments (hedge funds and private equity, in particular) front and center for investors with a long-term, total return focus. Swensen's argument that hedge funds served an important diversifying function swayed other prominent institutional investors, which in turn impacted the broader investment marketplace.

It was the general success of many hedge fund strategies – including long-short equity, merger arbitrage, global macro, and convertible arbitrage – during the bear market of 2000-2002 that spurred a massive inflow of institutional assets in the early 2000s.[6] But beyond investors' performance chasing, it was the framework from Swensen and his cohort that created the *justification* for modern alternative investing.

Total AUM of HF Industry (Billions)

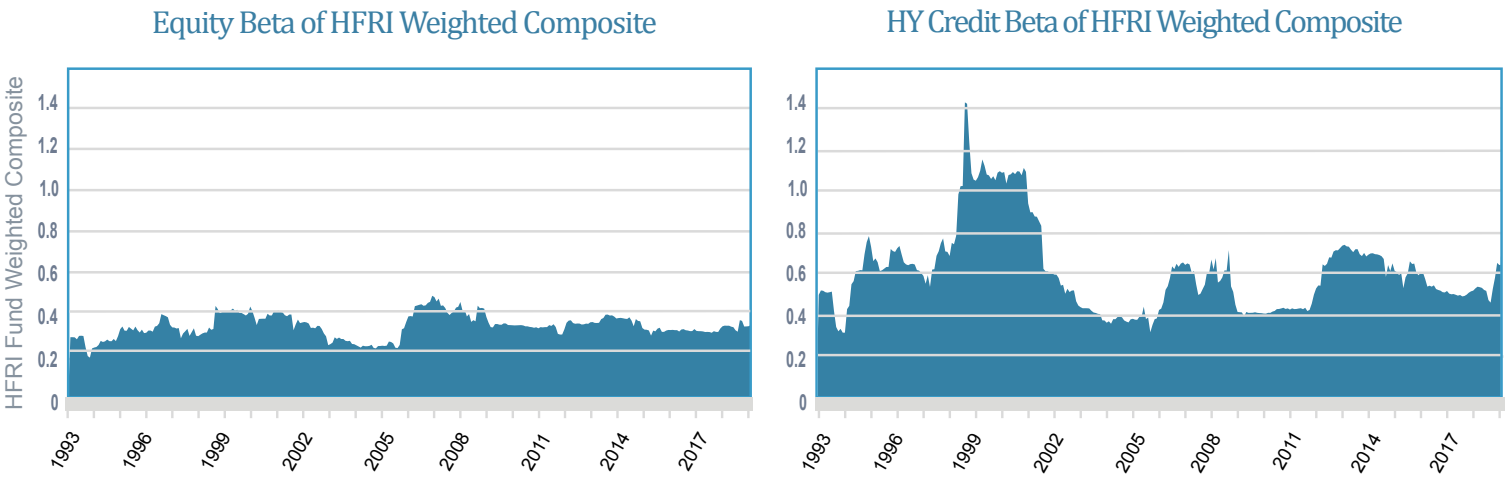


Source: https://www.barclayhedge.com/solutions/assets-under-management/hedge-fund-assets-under-management/hedge-fund-industry/. Data as of Q1 2000 to Q1 2019.

Even as institutional assets flowed into hedge funds, both practitioners and scholars sought to unpack the underlying sources of supposedly "alternative" returns. Yes, the tech bubble crash was a boon for hedge funds, but only several years later, during the Global Financial Crisis, many supposedly orthogonal strategies ended up suffering steep losses. Thus, while the active mutual fund industry had been under assault since the 1960s and had long grappled with its comeuppance, the hedge fund industry – steeped in the mystique of "market wizards" earning outsized returns in exchange for fabulous compensation – entered its own existential crisis over the last decade.

In the spirit of continuing to search for useful risks which have positive expected returns and help diversify a portfolio, innovators and investors in hedge funds – in parallel with the long-only world – have tried to identify systematic components of these risks which can be offered more broadly and at cheaper cost.

Two revelations are germane here. The first is that standard long-only decomposition models revealed that a large portion of hedge fund returns were attributable to traditional asset class betas. Take a look at the following graphics. On the left, we can see that a decent amount of hedge fund returns can be attributed to equity beta. Going back to 1993, equity beta exposure averaged roughly 0.35. On the right, and even more striking, the beta of hedge fund returns to high yield credit averaged 0.61 and at times even climbed over 1.0.



Hedge Fund Research HFRI Fund Weighted Composite Index equity betas are measured by trailing 36-month beta to S&P Total Return Index (with intercept). Its credit betas are measured by trailing 36-month beta to ICE BofAML U.S. High Yield Index (with intercept).

Far from receiving purely idiosyncratic and skill-based returns, investors have paid a premium price for higher betas and correlations than they could have expected. This has become not only a concern among investors but a source of derision among industry observers (Lack 2012).

The second revelation was that the existing models of risk and return decomposition which had been built over the past half century were insufficient to understand non-traditional investments. Let's revisit a standard CAPM + style-factor model for estimating returns:

$$Returns = Risk\text{-}free\ Rate + (Equity\ Beta\ \&\ Credit\ Beta) + Style\ Factors + \alpha$$

While this formula can explain some portion of hedge fund returns, the question is: What does it not account for? What systematic risks might be embedded in the return streams that have not yet been identified and extracted, similar to the path set out in the table on page 13?

A partial answer has been sought in the statistical decomposition of various hedge fund return streams. "Factor replication" uses statistical methods, primarily linear regression, to create a portfolio of liquid assets that performed similarly to "hedge funds" generally or to a particular hedge fund strategy. For example, by regressing hedge fund returns on a menu of liquid asset classes (e.g., S&P 500, Russell 2000, MSCI EAFE, Barclays Aggregate, High Yield, Commodities, Currencies), modelers can replicate the statistical characteristics (not just returns and volatility, but distributional qualities such as skewness and kurtosis) of a hedge fund portfolio. These efforts met with mixed results, in no small part because it attempted to replicate hedge fund return streams with significant levels of market beta.

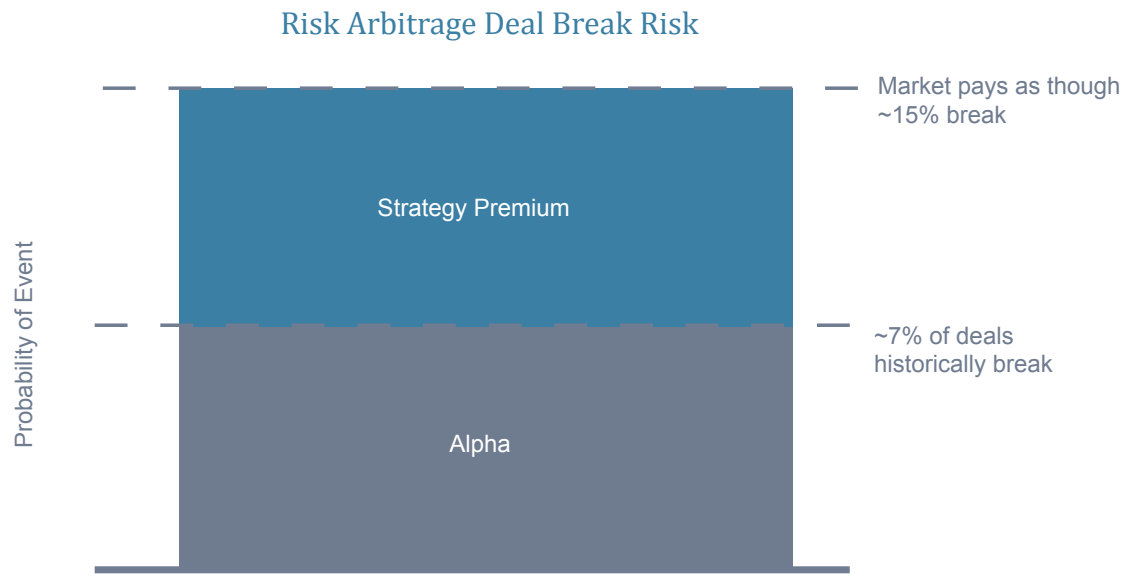
Strategy Risk

A distinct avenue of inquiry recognizes that hedge fund efficacy, if any, cannot be systematically examined using traditional return models. Why not? Because many hedge funds organize themselves along the lines of *strategies* rather than style factors. Style factors, to an important extent, can be thought of as the continued reduction or disaggregation of traditional betas that are now cheaply available. Meanwhile, strategy factors might represent the return streams derived from systematic exposure to specific hedge fund strategies.

In this sense, we may liken strategy factors to "emergent properties," which are entities that have properties their underlying parts do not have on their own.[7] Yes, a strategy might involve trading stocks or bonds or derivatives, but the risk and return profile presented by the strategy does not reduce to its component pieces. Strategy risk, in this sense, is irreducible or *sui generis*. And because it's irreducible to other elements, it might serve as a stable risk factor for building better portfolios. Contrast this to many style risks, which are effectively subsets (or "reductive properties") of broader risks such as bulk equity or credit beta.

Let's ground this in a brief example of a classic hedge fund strategy, merger (or risk) arbitrage. When a typical M&A deal is announced, the target company's investor base will often receive a big overnight windfall with the prospects of earning another small uplift – the risk arbitrage "spread" – if the M&A deal completes. While some shareholders are willing to continue holding the target through deal completion, many tend to find the asymmetric return-risk profile (more downside than upside) and the lack of fundamental drivers (e.g., regulatory processes and shareholder votes) unappealing. Thus, they often decide to sell their shares to willing buyers. That's where risk arbitrageurs, who seek to supply liquidity to these fundamental shareholders, enter the picture.

Based on historical data, risk arb spreads are wider than would be suggested by the incidence of deals falling apart (see graphic on page 18). Roughly 7% of risk arb deals have "broken," yet the spread on risk arbitrage deals on average pay as if the risk of deal break is 15%. That is a structural market inefficiency. If an investment manager were able to efficiently buy the entire risk arbitrage universe, the manager could earn this excess compensation. And they can potentially extract and harvest that compensation systematically.



Strategy risk premia can be extracted and packaged into products via systematic sets of rules. The most basic approach entails creating a broad-based rule set that aims to capture the entire systematic portion of a strategy risk premium. A more refined approach would establish more strenuous rules. In the risk arbitrage example, for example, what are the characteristics of the acquirer and target companies? What regulatory approvals are required? Is there an optimal time to start investing in a spread? And so forth.

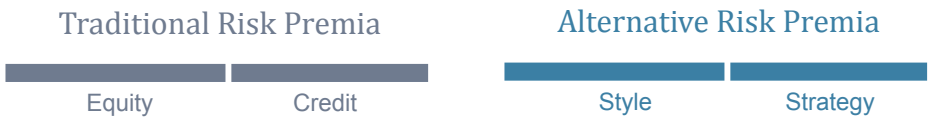
The identification and extraction of strategy risk premia fit into the century-long modern history of searching for useful risks. Like other such risks, they can have important implications for investor portfolios:

- They are potentially diversifying by delivering returns streams that differ from traditional equity or credit markets. For example, the behavior of a portfolio of risk arbitrage deals is unlikely to act like the properties of the markets from which the underlying stocks were sourced, or particular style factors like value or momentum. In addition to risk arbitrage, we can discover other strategies amenable to this disruption, including convertible bond arbitrage, global macro, long/short equity, trend following, and others.

- Because these return streams are systematically derived, it's easier to isolate and evaluate them. This is a positive because once they are no longer identified as part of the error term in a return decomposition (i.e., alpha), then we can observe their value relative to other portfolio components. It may also be revealed, however, that some of these strategy risk factors actually correlated with other portfolio elements.

- Strategy risk premia can be offered at lower fees because of their systematic origin.

All in, it's possible that what "style" did to the democratization of mutual funds, "strategy" can do for the accessibility of hedge funds. These alternative risk premia have the potential to extend the innovation cycle started roughly a century ago, with their disruptive benefits accruing to investors.



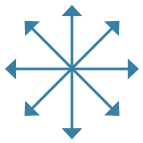
CONCLUSION: THE SEARCH FOR USEFUL RISKS NEVER ENDS

Investors deserve risks that are accessible, transparent, affordable, and measurably useful. Delivering them is easier said than done.

The obstacles for why that is so remain the same now as they were a century ago:

- *Language*. What do we call something and how should it be categorized? These questions of language strike a deep philosophical nerve: When we don't know what to call something, we don't know what it "is." Managing expectations in a linguistic void is practically impossible.

- *Analytics*. Second, what analysis is necessary to break down the underlying sources of risk and returns for a single investment or a portfolio? Modern Portfolio Theory and the Capital Asset Pricing Model, flawed as they are, delivered the early tools to do so, especially with regard to understanding how "market" exposure drives returns. The acceleration of computing power and proliferation of data have empowered scholars and practitioners to take increasingly microscopic takes on the problem. Yet even at hyper-speed, the same cycle of innovation holds, with modelers, producers, and investors interacting.



- *Dynamics*. Finally, a permanent feature of complex systems, such as markets, is change. Both the supply and demand for marketable risk change in scale, type, and pace, often unpredictably. We might gain comfort at any moment in time that we have a reasonable understanding, but the need for vigilance is evergreen.

These obstacles stand in the way of answering our two basic questions with regard to investment risk: (1) What is the risk I'm taking? (2) Is it useful to meeting my financial objectives? Answering these questions requires both art and science. It's clear the low hanging fruit has been picked. Broad market exposure for everyday investors, once beyond imagination, has effectively evolved into a commodity, both plentiful and cheap. And a series of investigations has rendered otherwise undiscovered or unexplained risks increasingly transparent, accessible, and affordable.

The final irony of this cycle is that the more something is understood by a wide audience, the less valuable it becomes. In efficient markets, the premium associated with some risk factors decays. This raises the bar for those interested to deliver new and useful risks. In our forthcoming work, we aim to exceed that bar by offering a deeper dive into some of the unexplored terrain in alternative risk premia.

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FOOTNOTES

[1] https://fs.blog/2015/01/richard-feynman-knowing-something/.

[2] Good histories of financial innovation include Bernstein (1992, 1996, 2007), Bookstaber (2007), Lo (2014), and MacKenzie (2006).

[3] A third worth recognizing is Paul Samuelson’s 1947 *Foundations of Economic Analysis*, which set the basis for modern financial economics. He revolutionized the field through the systematic application of scientific principles to better understand investor behavior (i.e., expected utility theory and rational expectations) and markets.

[4] In the 1974 inaugural issue of *The Journal of Portfolio Management*, Samuelson wrote a missive entitled “Challenge to Judgment” in which he implored anyone in the asset management industry to offer “an in-house portfolio [that] tracks the S&P 500 Index—if only for the purpose of setting up a naïve model against which their in-house gunslingers can measure their prowess.” In 1975, respected investor Ellis wrote an influential piece called “The Loser’s Game,” which made the case for market indexing over active stock picking.

[5] In one analysis (Hou et al., 2017), 93% of 447 observed market anomalies were found to be statistically insignificant. Another study (Feng et al., 2019) shows that many newly introduced factors are merely redundant of other known factors. The explosion in the number of supposed risks has aggravated our language obstacle discussed previously.

[6] For a history of the hedge fund industry, see Portnoy (2014: 55-94).

[7] On the topic of emergent properties, see https://plato.stanford.edu/entries/properties-emergent/.

DISCLOSURE