

# When the Model Says “Buy,” Beware

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As passive investment vehicles garner a growing net share of fund flows, investors might well consider whether limited data sets constrain the mechanical nature of passive investing. What’s the value of information at the individual security level compared to that at the index level? Equally important, how does portfolio construction factor into the active- and index-investing equations, in both equity and fixed income? Thornburg President and CEO Jason Brady addresses the art and limited science behind both active and passive investing.

## *Executive Summary*

- Market dynamics can’t long be captured in financial models predicated on “factor” performance. Persistence of factors can’t be engineered, as recent changes in historical market tendencies show.
- Is “smart beta” smart? What do multifactor ETFs do? Is there a tipping point at which price exceeds value, shifting the playing field for active and passive investors? Is Japan a test case?
- How does the evaluation of CEO skill, corporate culture, and management execution fit a spread sheet? What is the difference between qualitative and quantitative analysis?
- In the luck-versus-skill debate, what role does a successful portfolio manager’s firm play?



## A Conversation with Jason Brady, President and CEO

Jason Brady, cfa, is president and CEO of Thornburg Investment Management. He also heads the firm’s global fixed income investment team. Jason, who joined Thornburg in 2006, authored *Income Investing: An Intelligent Approach to Profiting from Bonds, Stocks and Money Markets*, a step-by-step guide to income investing. Prior to joining Thornburg, Jason was a portfolio manager with Fortis Investments in Boston, and has held various positions at Fidelity Investments and Lehman Brothers. Jason earned a BA in English and biology from Dartmouth College, and an MBA from Northwestern’s Kellogg Graduate School of Management.

**Q:** *Passive investments have attracted investor flows for many years but inflows accelerated after a 2009 paper by finance professors Eugene Fama and Ken French entitled “Luck Versus Skill in the Cross Section of Mutual Fund Returns.” They argued the aggregate portfolio of wealth in actively managed mutual funds showed no evidence of outperforming market indices and that the few who did outperform did so by luck, not skill. Moreover, the degree of outperformance “was not great.” Bloomberg columnist Barry Ritholtz likens those truly skilled active outperformers to professional athletes in a world of amateurs. Of course, they’re all talking about stock, not bond pickers. But as it’s hard to identify star stock-pickers, they say, passive investing is best. What’s your take on the luck versus skill debate?*

**Jason Brady:** Fama and French’s research is supported by a fair bit of data, but a fair bit of data also go the other way. The question that I come to work with every day as a portfolio manager is how are we going to add value for clients? One way to add value is to give people what they want in the cheapest package possible, especially in portfolios that mirror popular indexes such as large-cap U.S. stocks. But I would say the data outside

of large-cap U.S. equity indices are a lot more nuanced. I grew up as a fixed income portfolio manager and watched Lehman Brothers hue perhaps too closely to models employing aggregate data with less thought about the particularities of individual markets.

The active vs. passive data within the fixed income fund universe show many active managers outperform fairly consistently. That suggests the design of the benchmark is very different and gets to the idea of what you as a manager are trying to accomplish. For example, over the last 10 years mega-cap stocks have outperformed, making it a challenge to beat the benchmark, given their weighting within it. But their performance also contradicts a lot of the data that Fama and French had collected prior to their paper’s publication. And an equal-weighted index should also have outperformed the market-cap weighted index, which the mega-caps now dominate. So, perhaps, a lesson for me as I’ve made my way through market cycles is to be cognizant about over-reliance on market data sets. It’s dangerous in the absence of anything else because the market data set is terrible. It lacks historical depth in many asset classes. Most have only existed for a couple of decades in which we really haven’t seen market conditions

that are tremendously different. So the data set is quite correlated.

**Q:** *In the early 1970s, economist Paul Samuelson likened most active mutual fund managers to “financial gunslingers” incapable of consistently beating market returns. Like Fama, he found the efficient markets hypothesis compelling. That is the idea that equity prices reflect all publicly available information, making it difficult for active investors to consistently outperform their benchmarks. While Samuelson found it persuasive at the micro, or stock level, he was less convinced about its efficacy at the macro, or index level. This distinction became known as “Samuelson’s Dictum.” While a divergence in a company’s share price from its business fundamentals might be spotted by market participants, exploited and arbitrated away quickly, it doesn’t necessarily translate through to the index level. That’s because once individual stocks are inducted into an index, their fundamentals, both positive and negative, are averaged away, leaving the aggregated valuations much harder to interpret and gauge. Can you talk about the efficient market hypothesis at the individual stock and index levels?*

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**JB:** The crux of the question is the value of information at the security level compared to the value of information at the index level. Getting your fundamental analysis correct is table stakes in this business. It’s hard and takes a long time. You grapple with a flood of information that’s now widely disseminated, so information is no longer the advantage that it used to be for many professional investors.

We take information at the security level, use our best judgment in analyzing it, and create a portfolio of stocks that we believe is effective in a way that a mechanical portfolio is not. We don’t just compare Ford to GM or put Procter & Gamble up against Colgate. It’s not just picking individual stocks within one industry or another. It’s also gauging how they would fit within and complement broader portfolio construction. If you’re investing passively, you’re abrogating that thought process. At some level, though, everyone is an active investor in the context of the portfolio they’re putting together. But we take individual security analysis and think about its fit in the portfolio in a way that’s designed to achieve a desired outcome. Combining both can be a clear source of value.

**Q:** *Is it easier to analyze a company’s capex cycle and project the duration and probability of its cash flows than it is to forecast the timing of an index’s reversion to its mean, when it appears to be overvalued or undervalued relative to its history? Can you talk about the clarity of the signals at the micro level versus the macro level?*

**JB:** That’s a good question. At the micro level it varies relative to the particular security. Obviously, many analysts cover Apple or Google or any other mega-cap and there’s not a lot of new information. Maybe there’s less coverage of a mid-cap international growth stock, but certainly the mythos of the professional investor is they fall asleep with 10-Ks and 10-Qs

by the sides of their beds. While that’s important it’s not sufficient. What’s equally important and really additive or even multiplicative is how you put that portfolio together. A lot of folks abrogate their thoughts around that by outsourcing to an index, either matching exact sectors or geographic weightings, or maybe going overweight here or underweight there, all couched in relative terms. It’s very easy for organizations to organize themselves that way and many do, most do actually, though that misses the value of the portfolio construction element.

**Q:** *Yet the number of indices is skyrocketing thanks to growing computing power, widely available data feeds and economies of scale, even as the number of stocks, both in the U.S. and globally is falling. According to the Index Industry Association, there were around 3.3 million indices globally by early 2018, 95% of which are equity related. That’s about 70 times more than the 43,000 stocks that trade publicly around the world, down from about 45,000 a few years ago. Meanwhile, we’ve gone from 8,100 U.S.-listed companies in 1996 to a little more than 4,300. What’s the significance of the proliferation in indices amid a declining number of stocks?*

**JB:** Computing power is high and the cost of creation is low. Creating some list of securities is very easy nowadays. You can have a nearly infinite series of combinations. The question is, what are you trying to do? Most of those combinations, I would suggest, are not valuable; they’re not really addressing the customer’s needs. We can create a lot of combinations, but so what? As for the investments available in equities, it is interesting that the appeal of stock markets seems to be declining. The ride of the global investor over the last 10, 15, 20 years has been volatile, though

generally good. But, again, what is the customer trying to achieve?

Financial advisors tell you that perhaps their most difficult job is keeping customers invested. So, when you have a ride that’s more challenging, even if the end is valuable, it can be really tough for the customer and the advisor. Take retirement. Target-date funds have proliferated on a particular glide path of stocks and bonds and assume a certain correlation between those two asset classes. Some target-date fund investors were heavily, but maybe appropriately, invested in stocks early in their retirement. If you suffer a bear market very early in your retirement, it takes a while for you to dig out of that. So a lot more thought needs to go into what the customer needs, and what’s appropriate and effective well beyond 10, 20, 30 or 40 basis points in costs.

**Q:** *That suggests a good part of investing involves behavioral finance. Can you discuss how that plays into wealth accumulation, capital preservation, and investing more generally?*

**JB:** Sure. Investing is challenging because money makes people a little crazy. When people outside finance ask about, say, how markets did today, they assume finance professionals are happy if the market went up. That assumption can be very damaging for returns because the psychology of gains and losses is different. Losses are more painful than gains are enjoyable, and interestingly enough, large gains and large losses are not proportionally painful relative to small ones. That’s why, when you focus on shorter-term returns, whether absolute or relative, it frequently leads you to a series of errors.

**Q:** *So do you get excited when there’s a market sell-off and securities prices get*

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*cheaper, giving you more bang for your buck?*

**JB:** Remember, my professional history in this business is in fixed income, and a heightened sensitivity to risk. Yes, more challenging markets always leads to more opportunity, but there’s the asymmetric risk/reward profile in credit. So on one hand, you just want to get your money back and any kind of volatility is bad for you. You can’t make more than your coupon over the life of a bond, and you can certainly make a lot less. But the dispersion of returns in fixed income is much higher in ugly markets than in good ones because of that negative skew. So, you can have a real window to provide significant value in fixed income that isn’t open all the time. It’s episodic, and the decisions you make in a more challenging market are necessarily more impactful. But I think that’s true of all assets. I like having the opportunity to add value and in my professional career that has occurred more in challenging markets than in good ones.

**Q:** *Passive pioneer John Bogel argued that broad market, passive investing diversifies away three risks: That of individual stocks—a flat tire in a portfolio of many hundreds of stocks has less impact than one comprising dozens. That active management underperforms after fees. And that of trying to time market sectors if you’re in a broad index-based vehicle rather than a thematic or style, factor-based investment. I suppose you could add international and global indices also to diversify away geographic risk. But there’s one risk that passive investing doesn’t mitigate: downside risk. A passive investor gets the market return*

*on the upside but also on the downside. How does a bottom-up active approach use valuation analysis to tackle risk and drive allocation decisions?*

**JB:** So, let me take issue with all of that versus just one part of it. The first risk is hundreds versus dozens. A flat tire in investing doesn’t run you off the road. The math is pretty compelling that you don’t need hundreds of stocks for a diversified portfolio. In fact, if your portfolio is constructed with some balance in mind, you really don’t need much more than 20 or 30 stocks. As for the risk of underperformance, absent a zero-cost index or ETF, there is a 100% risk of underperformance in a passive vehicle.

But I think the bigger question is, do you consider risk in your portfolio to be, “did I do better or worse than the Joneses, or did I do better or worse than what I need or what my goals are?” And I would suggest that it’s healthier and more effective over the long term to consider the latter. As for investing broadly in an index eliminates the risk of timing sectors, that, at least in a market-cap weighted index—which constitutes the vast majority of indexes—is definably false. If you think about the mid-2000s in U.S. stocks, one sector that got much larger was the financial sector because it was performing very well. So you might assume there’s no risk of sector exposure because I’m investing in the whole market. Well, you were taking a large

risk of exposure to financials. In the late 1990s, it was tech. And that tech exposure risk returned in late 2018. You’re also taking a large risk of tech exposure investing in the United States, versus if you invest in, say, a broad-based European index, which has much less in information technology. So don’t say you’re not taking that risk; you’re just taking that risk without knowing it. That’s the real issue.

Getting to your downside risk question, active managers can have lower beta; they can have higher beta. In other words, a more or less linear exposure to market risk. But I think what’s more important is that active managers provide different sources or differentiated risk. They don’t always, but they can. If I provide some kind of less correlated risk than a market portfolio, then I’m necessarily providing some diversification at the portfolio level, which is not just diversification for the sake of it, but diversification in the sense of getting a different return stream. I don’t want so much diversity that I’m once again effectively securing the market portfolio. But I want an active portfolio that’s providing me good risk-adjusted returns in and of itself and has a lower correlation either to other portfolios or to a broad-based benchmark. That should improve my overall portfolio return. So, again, it’s knowing the risks you take, because investing is about risk. To get returns you need to take risks, but taking those risks in a

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purposeful way, as opposed to just getting what the broad market offers, regardless of what my needs are and regardless of what else is available with active management.

**Q:** *The other point passive advocates frequently make involves portfolio turnover. Indices sport lots of stocks that generally remain in them for some time, as the standard periodic rebalancing usually involves relatively few substitutions. Actively managed funds usually incur more trading, not just buys and sells, but also trims and adds. The academic literature has in recent times suggested that active equity funds not only need to look different from their benchmarks, exhibiting high active share, but should also have relatively low turnover. Could you address turnover, holding periods and position management, as well as tax efficiency?*

**JB:** Sure. So portfolios that are comingled, that have a mutual fund structure, ETFs, a CIT (collective investment trust), or other fairly efficient vehicles, can look a lot different in different countries. In the U.S. you have a '40-Act structure. But one key element is trying to balance the needs of all participants. One of the needs of participants tends to be accessing their investment if they need the money back sooner than later. They can just go in and get it. That necessitates trading, so if there are inflows into a particular portfolio, then the portfolio managers need to buy those stocks or bonds, and if there's outflows then they need to sell them. And that kind of tidal flow, if you like, is rather significant, especially in the context of more specialized ETF structures. That's one element of turnover, in both passive and active structures.

Now, if you take that aside, name turnover in equity mutual funds in the U.S. tends to have run in the 30- to 40-percentile range. Relative to liquidity availability, those transaction costs are not really that big. In fact, in my view,

the decisions the portfolio manager makes as far as turnover are far less consequential than the decisions that the owners make as far as turnover. In fixed income mutual funds and certainly in our portfolios, I look at the turnover data and it tends to run from the teens to the 30-percentile range. One of the reasons is that bonds mature. So you have the ability to redeploy cash, not because you have to sell them to buy something else, but because the cash comes to you, and secondly because transaction costs in fixed income relative to the returns available tend to be higher. So we're thoughtful about that. And if you outsource the management of liquidity in a passive structure, then you're exposed to the full force of those transaction costs, which isn't optimal in my view.

**Q:** *Are passive's transaction costs greater than people expect given changes in the market or index portfolio that have to be mirrored in the passive vehicle? So, in the case of equities not just periodic rebalancing, but also share buybacks or even heavy and sustained active inflows to, or outflows from, particular stocks?*

**JB:** I don't know that it's different than people would expect. It might be that the end-investor's decisions are key, especially in times of market stress. But that is why managing liquidity in a vehicle like a mutual fund or not managing it in a passive vehicle can occasionally be a bit more challenging. In any event, yes, transaction costs are real. You have to be thoughtful about them in terms of the benefit of a trade or making a change. Generally in equities and certainly in large-cap stocks, which trade with greater liquidity and price transparency, those costs are lower as a percentage of what's available to you from a return perspective. But for less transparent markets, less liquid markets, those transaction costs can be a little bigger.

**Q:** *There's an interesting dynamic taking place in Japan. The country's central bank controls more than 60% of Japanese equity ETFs as part of its quantitative easing program. And the government pension investment fund's allocation to passive equity funds surpassed 80% in 2016. We hear a lot about active managers underperforming indices, but it's interesting to note that in Japan the majority of actively managed large-cap equity funds have outperformed their respective benchmarks for the one-, three-, and five-year periods, and by large margins, according to the S&P Dow Jones Indices' Spiva report. That's also the case with small- and mid-cap active funds. Circling back to the question about market efficiency at the micro versus the macro or index level, has the amount of noneconomic ownership of shares by Japan's government pension fund and the central bank in the form of ETFs impacted the market in a way that's made it easier for active fund managers to outperform in Japan? Could we see that elsewhere in the world as the share of passive investment grows?*

**JB:** That's certainly possible. I don't manage a Japanese equity portfolio, so I'll take the statistics at face value. I would say if you cross streets without looking, that may be cheaper as far as your time's concerned. But sometimes you get run over. If many people are doing it, then maybe more people are in danger of getting run over. So the value of looking goes up. It is interesting that we're at a place where using judgment is regarded as foolish and not using judgment is regarded as intelligent. Is there a flow argument to the rise of passive markets or passive vehicles? In the sense that the more flows that go into something, the more valuable it becomes; there's probably a bit of that. Is there a point at which that flow reaches a tipping point and the price exceeds the value? Also possible. Obviously, we're not Japan, which has a higher proportion of passive investment than the U.S.

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There are places for cheap, easy exposure to a broad-based set of investments. But the ability to find appropriate investments for a particular goal is, I think, available in every market, and ultimately that’s what we’re trying to achieve. Will that be easier relative to the market portfolio if fewer people are doing that? Maybe. That could be something as simple as having a longer time horizon, which I think is certainly required in an environment where flows in and out of markets are more peripatetic and where, if there is a flow argument to be made in passive, that it might be changing valuations beyond which would be traditionally economically useful. Then we must have a time horizon that can make it through that pressure, that flow moment.

**Q: One category of ETFs that has been getting tremendous inflows in the last three or four years is smart beta. It purports to identify factors that active managers employ.**

**JB:** Is there dumb beta?

**Q: Maybe we can identify some. But this type of ETF purports to use value, growth, momentum, market-cap size and many other factors that have been identified as historical drivers of outperformance. So, traditionally small-cap stocks outperform large-cap stocks, value outperforms growth. Some of those historical tendencies seem to have reverted in recent times, however, as over the last decade growth has outperformed value.**

**JB:** Was that just after a lot of academic research showed that value always outperformed growth?

**Q: Correct.**

**JB:** So maybe there’s a flow argument?

**Q: There could be. A more recent wrapper of the factor, or style approach has combined them into a single security, the “multifactor ETF.” Interestingly, if you look at the performance of the better known, they’ve underperformed since their inception three to four years ago. What does the active manager bring in using quantitative analysis of past results with the qualitative analysis that might enable a price target into the future on a particular stock or a return on a particular bond?**

**JB:** There’s a good reason that in this business we’re required to state, “past performance is no guarantee of future results.” The reason is people are often sure that what happened yesterday is going to happen tomorrow. “Recency bias” is one way to say adaptive expectations. This thing that happened to me yesterday I remember really well, and so I think that’s probably the way the world is. The idea behind a lot of portfolio construction in a very quantitative way—and this is not a blanket statement—is, what happened before? Let’s put together a portfolio that either performed well in the past and therefore is likely to perform well going forward, or that has these characteristics that we like, and those characteristics will continue in the future. This model has some parameters, and it spits out an answer and I just do it. That

is the ultimate quantification of recency bias, and the model hasn’t heard over and over again that past performance doesn’t guarantee future results. In fact, the model depends on that past performance being a guide to the future in a way that’s fairly mechanical. I would argue almost every financial crisis I have looked at is somewhat dependent on this behavior.

So, “housing markets aren’t correlated and house prices never go down,” would be one model that (before the housing crisis) 10 years ago said “buy.” “High-quality governments never default” ended up being more or less true in 2011/2012 in the European financial crisis, but certainly shook some markets pretty good. I have skepticism around “the model says buy,” where if I create a factor exposure, let’s call it the value factor, one that’s persistently outperforming, because clearly that doesn’t happen over time.

There was a criticism you mentioned earlier, I believe it was the Samuelson discussion—active managers can’t consistently outperform and therefore they’re useless. That is partly true. Active managers, certainly none that I’ve seen, consistently outperform period to period. The question is what happens cumulatively. The idea that there is a persistent factor that will never experience some kind of mean reversion, value factor or otherwise, is a little silly. One of the factors that has been very valuable over a long period of time has been the dividend factor, which is sort of a combination of the value factor, quality, and cash flow.

Nothing is going to always do what it did yesterday. It is the persistent belief of folks who want to put together a model that explains the world, and that gener-

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ally will not affect the world. But markets are reflexive. If we buy something, necessarily there’s less of it and generally what is left is at a higher price. That’s just basic economics. That occurs very clearly in stock markets.

But we think that markets are like Newtonian physics. If we discover that bridges work in a certain way, have certain requirements, from an engineering perspective, our discovery of that fact does not change the physics of the bridge. We got a lot of people who think about markets as engineering. It’s not engineering. We get a lot of people who think of markets as hard science, physics. Scientists would and do laugh at the data set, at the paucity of good data to actually discover some underlying truths. It’s not a hard science; it just sounds like one because there’s a lot of mathiness involved. But when the model says buy, it’s such a reductive statement, you can almost say that at some point the model’s going to blow you up.

**Q: How does the culture factor fit into the model? How does corporate culture and, say, CEO skill, assessing a CEO’s and management team’s execution of a strategic plan, factor in? Does culture eat strategy for breakfast? Do you buy the jockey, not the horse? Can you assign a value to corporate culture and stick it in a spreadsheet?**

**JB:** Corporate culture is extremely important. Conversely, I think generally CEOs are overrated. I can speak from experience that CEOs are overrated, even if opinions about them aren’t so great.

I think what you’re getting at is qualitative versus quantitative considerations. The former don’t fit so well in a model. A

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lot of information or knowledge or maybe even wisdom can’t be quantified; you can’t put it in a spreadsheet. More data is often considered better, but I’ll go back to the idea that maybe what’s more important is to understand the limits of your data, to understand the limits of information. I often ask people if they get enough email, so do you get enough email?

I would argue that we do not today have an information problem, a data problem. We have a processing or a judgment problem. When you go through your emails I’m sure you delete things from certain folks and never delete them from others. There’s lots of judgment involved. We can ask for more and more data and more and more powerful processors, but ultimately judgment around how to take that wild diversity, a huge quantity of information and process it, is more important. You can call that qualitative, and it is sometimes. You can call it knowledge, even wisdom if you like. The parallel I like is from Socrates in Plato’s Apology, the gist of which is that Socrates goes around to try to figure out who knows something. Who has wisdom and discovers that the wisest know they know nothing.

**Q: Even the one armed with massive amounts of information?**

**JB:** Especially the one armed with massive amounts of information because the financial engineer who circles the answer on the page and says, “I have it,” is exactly the person who is sure of

something that’s almost certainly not true, or at least not persistent.

**Q: Circling back to the contention that expert active managers are hard to find, apart from that questionable premise, what role does the manager’s shop play? In the luck versus skill debate, how does the firm’s structure and corporate culture fit into the equation?**

**JB:** I don’t think there’s one way to do this. There’s not one way to run a portfolio. There are lots of ways. But I can tell you how we try to accomplish what is definitely a difficult job. It’s important to have a diversity of thought available to you. I talked about the limits of knowledge and judgment. Some of the best investors I know are very aware of their limitations. They try to work with those limitations, understand them, and learn from other folks. If you have an investment shop where folks are working on a bunch of different problems, solving those problems in different ways, and communicating with one another then, while there may be one or a couple or three or whatever number of portfolio managers on a portfolio, there is a much larger number of inputs. Now that doesn’t mean a committee, or votes, or that everything’s a consensus. It means a diversity of inputs. I track the correlation of return and the correlation of excess return of all of our portfolios, and all of our portfolios have done very well since inception. Some look better or worse in shorter time periods, but they’ve all been very effective for clients. But what’s also interesting is that they generally don’t correlate with one another, certainly from an excess return perspective, so folks have a bunch of different ways of doing it and they’re

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doing it inside of a building, inside of a company that values that difference.

**Q: *And luck versus skill?***

**JB:** I think another element of that is certainly a fee drag. Obviously, it's harder to perform better if your fees are higher, and if they're lower it's easier. Although if you're trying to mirror the benchmark and you have any fee, the probability that you will outperform is zero.

I understand the luck versus skill arguments. What I think is important is, what is your goal? What are you trying to achieve? If you have a very narrow definition of success, for example, “I need to outperform the S&P 500 every year by some amount without taking undue risk,” that is very hard to accomplish. If your goal is capital appreciation over time, over a market cycle, etc., where you're aware of other investment options, beyond the S&P 500, and you're aware of the risks that you're taking, well now it's a very different subject. If you think about the incentives as an investor, as a

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portfolio manager, many of the incentives don't look bad.

**Q: *But they look different. Doesn't that involve risk?***

**JB:** When you look different, then you're exposed to risk. You're exposed to relative risk which, as we said, may or may not be actual risk for the customer, but it's career risk for the investor. If you look at any chart, any examination of dispersion of returns within different kinds of portfolios over decades, what you see is from the '70s to the '80s to the '90s, 2000s to the last several years, dispersion from high to low within virtually every asset class or collection of portfolios has come down. And a number of market participants, or commentators would say that's because it's harder to outperform, and perhaps that's part of it. But my contention is it's scarier

to try. Perhaps we have collected here at Thornburg, given the performance of our portfolios since inception, an incredible team of expert coin flippers, such that we tend to get heads somehow more often than not. And perhaps it is complete luck that we've delivered this performance to our clients. Perhaps, as an alternative explanation, an element of the marketplace itself so penalizes difference that it narrows the ability of any individual portfolio manager to try to perform well, to try to look different. There are a number of interesting studies on portfolio construction, one of which shows that portfolios that look different, that have different securities than a particular benchmark, but that are balanced, that have an array of different risks, aren't all one big bet, actually tend to perform very well. In other words, a differentiated portfolio with some balance is actually a route to significant performance. ■

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Beta – A measure of market-related risk. Less than one means the portfolio is less volatile than the index, while greater than one indicates more volatility than the index.

Exchange Traded Fund (ETF) – A security that tracks an index, a commodity or a basket of assets like an index fund, but trades like a stock on an exchange. ETFs experience price changes throughout the day as they are bought and sold.

CapEx – Capital expenditures are funds used by a company to acquire or upgrade physical assets such as property, industrial buildings, or equipment.

Duration – A bond's sensitivity to interest rates. Bonds with longer durations experience greater price volatility than bonds with shorter durations.

Target Date Fund – A mutual fund, usually a fund of funds, where the portfolio asset mix becomes more conservative as the target date approaches. The specified target date is approximately when investors plan to start withdrawing money, usually for retirement. The principal investment is not guaranteed at any time, including the target date.

The S&P 500 Index is an unmanaged broad measure of the U.S. stock market.

**Before investing, carefully consider the Fund's investment goals, risks, charges, and expenses. For a prospectus or summary prospectus containing this and other information, contact your financial advisor or visit [thornburg.com](http://thornburg.com). Read them carefully before investing.**

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