

KATHMERE CAPITAL MANAGEMENT INVESTMENT COMMENTARY

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KATHMERE
CAPITAL MANAGEMENT

OUR CORE PURPOSE:
To bring clarity and confidence to our clients about all aspects of their financial lives, and to help them achieve and maintain a secure financial future.

Pascal's Wager and Type I and Type II Errors

I have a habit of skimming through books I've previously read and re-reading the passages that I highlighted or otherwise annotated. I was recently flipping through Peter Bernstein's fantastic book, *Against the Gods*, and came across a passage which caught my attention and which serves as the basis for this investment commentary. The passage at hand describes what's been come to be known as Pascal's Wager, after Blaise Pascal, the father of what's been called "decision theory" which Ian Hacking described as "the theory of deciding what to do when it is uncertain what will happen."

"...portfolio management can thus be thought of as the ongoing battle of defending against bad ideas (i.e., minimizing the risk of type I errors) while also remaining vigilant for opportunities to improve the portfolio (i.e., minimizing the risk of type II errors)"

Pascal's Wager

Pascal's Wager, postulated in the 17th century, asks, "God is, or he is not. Which way should we incline? Reason cannot answer." To Pascal, as described by Bernstein, one didn't necessarily make a decision to believe or not to believe in God but rather decided "whether to act in a manner that will lead to believing in God, like living with pious people and following a life of 'holy water and sacraments.' The person who follows these precepts is wagering that God is. The person who cannot be bothered with that kind of thing is wagering that God is not."

Given that we cannot simply run an experiment to test and determine whether or not God exists, as a way of resolving the question Pascal proposes a game of chance that ends at an infinite distance in time: "At that moment, a coin is tossed. Which way would you bet—heads (God is) or tails (God is not)?"

Pascal's key insight, which was groundbreaking at the time, was that the best way to decide how to wager (i.e., to live your life) was to consider the consequences of

the two outcomes. Specifically, Pascal suggested that one ought "to decide whether an outcome in which God exists is preferable—more valuable in some sense—than an outcome in which

God does not exist, even though the probability may only be 50-50."

Pascal's logic induces us to consider and ascribe a value to—by considering what we stand to gain and lose—each of four different scenarios based on combinations of our belief in the existence of God (we believe or we don't) and the ultimate existence of God (God is or God isn't). The matrix presented to the right summarizes Pascal's assessment.

Paraphrasing Pascal, if we bet that God is, we'll have lived a pious, holy life and if we're

	<i>Believe in God</i>	<i>Do Not Believe in God</i>
<i>God Exists</i>	salvation and eternal joy (infinite gain)	damnation and eternal misery (infinite loss)
<i>God Does Not Exist</i>	nothing happens; missed giving into temptations (finite loss)	nothing happens; experienced giving into temptations (finite gain)

ultimately proven correct, we'll stand to receive salvation and eternal joy. Conversely, if it turns out that God isn't, nothing of significance happens and our downside is limited to the few potentially enjoyable temptations that we'll have passed up on along the way that we otherwise could have gotten away with.

On the other hand, if we bet that God isn't, we'll have eschewed the life of "holy water and sacraments" and periodically given into our temptations. If proven correct we stand to gain the potential joy we'd have derived from giving into our temptations at the risk of losing everything in the form of damnation and eternal misery owing to our sinful life if we're ultimately proven incorrect.

In Pascal's ultimate assessment, he concludes that given that "salvation is clearly preferable to eternal damnation, the correct decision is to act on the basis that God is."

We see parallels between Pascal's Wager and investing. **Just**

as Pascal's bettors wagering on the existence of God are engaging in an activity that involves decisions clouded with uncertainty and with consequences in the future, so too are investors when determining how best to allocate their capital. To explore this idea a bit further in an investing context, let's first take a detour into the domain of statistics and empirical research to introduce the concept of type I and type II errors.

Type I and Type II Errors

Type I error is a false positive.

According to the venerable online encyclopedia, Wikipedia, "Examples of type I errors include a test that shows a patient to have a disease when in fact the patient does not have the disease, a fire alarm going on indicating a fire when in fact there is no fire, or an experiment indicating that a medical treatment should cure a disease when in fact it does not." In investing, examples of type I errors are adding a new strategy or position to the portfolio or making some other type of

change that does not have an expected net benefit. **It's the error of implementing a bad idea.**

A type II error on the other hand is a false negative. Examples of type II errors, again from Wikipedia are "a blood test failing to detect the disease it was designed to detect, in a patient who really has the disease; a fire breaking out and the fire alarm does not ring; or a clinical trial of a medical treatment failing to show that the treatment works when really it does." In investing, a type II error occurs if a research idea is not implemented or new position is not added to the portfolio that would have had a net expected benefit to the portfolio. **It's the error of not implementing a good idea.** Whereas a type I error can be thought of as an error of commission, a type II error can be thought of as an error of omission.

It's important to recognize that minimizing the risk of one type of error comes at the cost of increasing the risk of the other.

In this construct, **portfolio management can thus be thought of as the ongoing battle of defending against bad ideas (i.e., minimizing the risk of type I errors) while also remaining vigilant for opportunities to improve the portfolio (i.e., minimizing the risk of type II errors).** We can apply Pascal's to help us evaluate and determine whether it's preferable to bias ourselves to be more on guard against committing type I or type II errors.

Establishing Our Baseline

We believe that the baseline portfolio against which all investment decisions should be evaluated is a balanced portfolio comprised of broad-based asset class index strategies appropriately tailored to our unique goals, time horizon and risk tolerance. Many highly-regarded investors including the founder of Vanguard, Jack Bogle, and none other than Warren Buffet, who's regarded by many to be the best and most successful investor of all-time, recommend such a portfolio as the most appropriate approach for the vast majority of investors¹. Bogle and Buffet favor this simple indexed approach primarily because it enables an investor to efficiently and cost-effectively capture the returns of the broad asset class markets in which they invest in. Given its simplicity and the high praise it garners from our industry's titans, it seems sensible to us that it serves as the foun-

ation of any portfolio and as the yardstick against which all decisions to deviate from ought to be judged.

Playing Defense: Defending Against Type I and Type II Errors

Our ability to defend against type I and II errors is predicated conceptually on how high or low we set the bar to deviate from the buy-and-hold indexed approach. Setting the bar high and thus making very few (if any) deviations (e.g., adding potentially valuable actively managed strategies or tactically trading the portfolio based on new research ideas) will minimize the risk of type I errors. On the other hand, setting the bar low and thus significantly deviating from the indexed portfolio and routinely making changes will minimize the risk of type II errors.

Our desire to bias toward defending against type I or II errors meantime should be predicated on our perspective as to how easy we believe it is to find and implement value-enhancing strategies or research ideas in the portfolio. If we believe that markets generally work and that value-enhancing ideas are rare or non-existent we should be biased toward defending against type I errors. Put differently, if we viewed efforts to outperform the markets by outguessing or outsmarting other investors to be futile and unlikely to suc-

ceed in the long run after accounting to the increased costs associated with pursuing such an actively managed approach, we ought to bias ourselves toward the indexed approach and prioritize avoiding type I errors. On the other hand, if we believe that markets are generally flawed or otherwise inefficient and that opportunities to capture value at the expense of others' mistakes or errors are in rich abundance such that long run outperformance is an easily attainable goal, we ought to be biased toward setting the bar low and emphasize avoiding type II errors.

Ultimately, whether markets work or not and whether value-enhancing ideas are rare or abundant is an issue, like the existence of God in Pascal's Wager, that cannot be known for certain in advance and that the consequences of our belief will be realized in the future. These similarities enable us to apply Pascal's logic to help us evaluate and determine whether we ought to bias ourselves toward defending against type I or type II errors.

Pascal's Wager (On Minimizing Type I and Type II Errors)

As we did above when evaluating how to place our bets in Pascal's wager, we can construct a matrix evaluating the consequences of biasing ourselves toward minimizing type I or type II errors depending on whether or not markets work

	Minimize Risk of Type I Error	Minimize Risk of Type II Error
Markets Work (Value-Enhancing Opportunities Rare)	capture market returns and outperform active approaches on average	underperform market averages (potentially significantly)
Markets Don't Work (Value-Enhancing Opportunities Abundant)	capture market returns and miss out on some opportunities for (likely modest) outperformance	outperform indexed approaches by capturing rewards (likely modest) of value-enhancing ideas

and consequentially whether or not value-enhancing opportunities are rare or abundant. Our summary matrix is presented above.

If we bias ourselves toward avoiding type I errors and adhere largely to a buy-and-hold indexed approach and it turns out that markets work, we'll have captured the market returns and on average outperformed investors adhering to active approaches primarily due to their higher costs (e.g., management fees, commissions, taxes, market impact costs, etc.)

On the other hand, if it turns out that markets don't work and that it's easy to capitalize on the mistakes of other investors by outworking and outsmarting them, then we'll have collected market returns throughout or investment horizon but will have missed out on some gains that could have been ours from active management. This is self-evidently not an optimal outcome. However, such a result is highly unlikely to have significantly impaired our

chances of achieving our financial goals given that stock and bond markets have historically rewarded disciplined, patient investors in the long run by delivering returns in excess of risk-free cash and inflation. Further, we should recognize that the foregone incremental gains that could have been earned from outperformance are likely to have been relatively modest in comparison to the total return generated by market-matching indexed investments. The difference in consequences between the two outcomes can thus be considered to be relatively minor.

Alternatively, we could bias ourselves toward avoiding type II errors by setting a low bar over which new portfolio strategies or research ideas must clear in order to be included in the portfolio. If we took such an approach based on our view that value-enhancing ideas were abundant and our assessment turned out to be correct, we'll have outperformed index approaches by capturing the rewards of the various value-en-

hancing ideas we invested in. However, let's consider the consequences of taking this approach if markets work and efforts to outsmart others are for naught. Sadly, the consequences could be very painful and harmful to our wealth.

You may be inclined to think that investing in a strategy or making a trade that ultimately confers no benefit to the portfolio is a neutral event (i.e., no harm, no foul). Unfortunately, that's not the case. On top of our strategy not working as planned (i.e., it underperformed our expectations), we'll have still paid trading costs, management fees, and potentially taxes to implement it. What's worse, is that by shifting portfolio assets and risk to this new strategy, we'll have by necessity shifted assets and risk away from other strategies that may have actually worked for us and rewarded us.

In short, the upside to minimizing the risk of committing type II errors can be viewed and relatively marginal in comparison

to the potential downside if of assessment as to the efficiency of markets is incorrect.

Crucially, one notable difference between Pascal's Wager and ours is that we have the ability to look back on a wealth of empirical evidence to help inform our perspective on whether or not we believe value-enhancing investment opportunities are rare or abundant.

Specifically, we can look to the **multitude of studies that have demonstrated time and again that the majority of active managers fail to beat passive benchmarks**². The results of these studies indicate to us that it's reasonable to conclude that it's more likely than not that markets generally work and that value-enhancing ideas or strategies are relatively rare.

Ultimately logic and evidence suggest that we should be more guarded about implementing a bad idea (type I error) than fretting about missing out on a good one (type II error).

Tying it All Together: Finding the Right Balance

At Kathmere, we strive every day to bring the best possible investment strategy to our clients to help them to achieve their investment goals. We are ever vigilant in our efforts to

strike the appropriate balance between minimizing the risk of both type I and II errors. Our approach to balancing these two competing objectives is outlined below.

We start with a buy-and-hold indexed approach as our baseline.

We're circumspect about the ability of active managers and strategies to add significant risk-adjusted value above and beyond indexing.

We rely on empirical evidence drive our decisions as to when to deviate from indexing.

We don't invest in strategies or investment styles simply on the basis of past performance.

We look for strategies and styles that are: persistent (they've worked over very long periods of time and across market cycles), pervasive (they've worked in multiple markets and asset classes), robust (they're not reliant on one specific application or definition) and sensible (there's a logical economic rationale as to why they should work).

We emphasize diversification and low costs to limit the consequences of being wrong and to enable our clients to keep as much as possible of what

returns the markets given them.

We recognize that our clients place their trust in us every day to make wise investment decisions and to exercise sound judgement on their behalf and we work hard to earn and retain that trust by adhering to an evidence-based approach predicated on making well-informed decisions grounded on solid economic rationale and supported by robust empirical research.

As always, we'd welcome your thoughts and feedback and opportunity to discuss this commentary with you further.

Thank you for your time and please reach out if you have any questions or would like to talk in more detail,

***Kathmere Capital
Management Investment
Committee***

¹ Buffett once wrote in his annual letter to shareholders of Berkshire Hathaway "What I advise here is essentially identical to certain instructions I've laid out in my will... My advice to the trustee could not be more simple: Put 10% of the cash in short-term government bonds and 90% in a very low-cost S&P 500 index fund... I believe the trust's long-term results from this policy will be superior to those attained by most investors—whether pension funds, institutions or individuals..."

² See "The Case for Low-Cost Index-Fund Investing" from Vanguard, "The US Mutual Fund Landscape 2016" from Dimensional Fund Advisors and "SPIVA US Scorecard" from S&P Dow Jones Indices among others.



IMPORTANT DISCLOSURES

The S&P data is provided by Standard & Poor's Index Services Group.

The opinions voiced in this material are for general information only and are not intended to provide or be construed as providing specific investment advice or recommendations for any individual security. To determine which investment(s) may be appropriate for you, consult your financial advisor prior to investing.

All performance referenced is historical and is no guarantee of future results. All indices are unmanaged and cannot be invested into directly. Unmanaged index returns do not reflect fees, expenses, or sales charges. Index performance is not indicative of the performance of any investment.

Stock investing involves risk including loss of principal.

The S&P 500 Index is a capitalization-weighted index of 500 stocks designed to measure performance of the broad domestic economy through changes in the aggregate market value of 500 stocks representing all major industries.

There is no guarantee that a diversified portfolio will enhance overall returns or outperform a non-diversified portfolio. Diversification and asset allocation do not protect against market risk.

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