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A Guide to Rational Investing

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Executive Summary: Capital markets have created enormous amounts of wealth for the world and reward disciplined, long-term investors for their contribution to the productive capacity of the economy. Most individuals would do well to invest most of their wealth in the capital markets, particularly equities. Most investors, however, consistently make poor investment decisions as a result of a poor theoretical understanding of financial markets as well as cognitive and emotional biases, leading to inferior investment returns and inefficient allocation of capital. Using an empirically rigorous approach, a rational investor may reasonably expect to exploit inefficiencies in the market and earn excess returns in so doing.

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Most people understand that they need to save money for their future, and surveys consistently find a large majority of Americans expressing a desire to save and invest more than they currently are. Yet the savings rate and percentage of people who report owning stocks has trended down in recent years[1], despite the increasing ease with which individuals can participate in financial markets, thanks to the spread of discount brokers and employer 401(k) plans. Part of the reason for this is likely the unrealistically pessimistic expectations of would-be investors. According to a recent poll barely one third of Americans consider equities to be a good way to build wealth over time.[2] The verdict of history, however, is against the skeptics.

[1] "U.S. Stock Ownership Stays at Record Low," Gallup.
[2] "U.S. Investors Not Sold on Stock Market as Wealth Creator," Gallup.

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The Greatest Deal of all Time

Equity ownership is probably the easiest, most powerful means of accumulating wealth over time, and people regularly forego millions of dollars over the course of their lives letting their wealth sit in cash. Since its inception in 1926, the annualized total return on the S&P 500 has been 9.8% as of the end of 2012.[3] $1 invested back then would be worth $3,533 by the end of the period. More saliently, a 25 year old investor investing $5,000 per year at that rate would have about $2.1 million upon retirement at 65.

The strong performance of stock markets is robust to different times and places. Though the most accurate data on the US stock market goes back to 1926, financial historians have gathered information going back to 1802 and find the average annualized real return in earlier periods is remarkably close to the more recent official records. Looking at rolling 30 year returns between 1802 and 2006, the lowest and highest annualized real returns have been 2.6% and 10.6%, respectively.[4] The United States is not unique in its experience, either. In a massive study of the sixteen countries that had data on local stock, bond, and cash returns available for every year of the twentieth century, the stock market in every one had significant, positive real returns that exceeded those of cash and fixed income alternatives.[5] The historical returns of US stocks only slightly exceed those of the global average.

The opportunity cost of not holding stocks is enormous. Historically the interest earned on cash equivalent investments like savings accounts has barely kept up with inflation – over the same since-1926 period inflation has averaged 3.0% while the return on 30-day treasury bills (a good proxy for bank savings rates) has been 3.5%.[6] That 3.5% rate would only earn an investor $422k over the same $5k/year scenario above. The situation today is even worse. Most banks are currently paying about 0.05% on savings.

Similarly, investment grade bonds, such as those issued by the US Treasury and highly rated corporations, though often an important component of a diversified portfolio, have offered returns only modestly better than cash over the long run. The average return on 10-year treasury bonds has been 5.1%,[7] earning an investor $619k over the same 40 year scenario. The yield on the 10-year treasury is currently about 3%.

Homeownership has long been a part of the American dream, and many have been taught that building equity in your home is the safest and most prudent way to save for the future. The fact of the matter, however, is that residential housing is more of a consumption good than an investment. Over the last century the value of houses have

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[3] Data provided by Morningstar.
[4] Siegel, *Stocks for the Long Run*, 5-25
[5] Dimson et al, *Triumph of the Optimists.*
[6] Ibid. 3
[7] Ibid

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barely kept up with inflation,[8] and as the recent mortgage crisis demonstrated, home prices can crash just as any other market.

In virtually every time and place we look, equities are the best performing asset available, a fact which is consistent with the economic theory that risky assets must offer a premium to their investors to compensate them for the additional uncertainty they bear. What has puzzled economists for decades is why the so-called equity risk premium is so large and why so many individuals invest so little in stocks.[9]

Your Own Worst Enemy

Recent insights from multidisciplinary approaches in cognitive science have shed light on the issue, demonstrating that instead of rationally optimizing between various trade-offs, human beings regularly rely on heuristics - mental shortcuts that require little cognitive effort - when making decisions.[10] These heuristics lead to taking biased approaches to problems that deviate from optimal decision making in systematic and predictable ways. Such biases affect financial decisions in a large number of ways, one of the most profound and pervasive being the tendency of myopic loss aversion.

Myopic loss aversion refers to the combined result of two observed regularities in the way people think: that losses feel bad to a greater extent than equivalent gains feel good, and that people rely too heavily (anchor) on recent and readily available information.[11] Taken together, it is easy to see how these mental errors could bias an individual against holding stocks. Though the historical and expected return on equities greatly exceeds those of bonds and cash, over short time horizons they can suffer significant losses. And while the loss of one's home equity is generally a nebulous abstraction that may not manifest itself consciously for years, stock market losses are highly visible, drawing attention to themselves in brokerage statements and newspaper headlines. Not surprisingly, then, an all too common pattern among investors is to start investing at a time when the headlines are replete with stories of the riches being made in markets, only to suffer a pullback and quickly sell out at ten, twenty, thirty plus percent losses and sit on cash for years until the next bull market is again near its peak in a vicious circle of capital destruction. Indeed, in the 20 year period ending 2012, the S&P 500 returned 8.2% and investment grade bonds returned

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[8] Shiller, "Understanding Recent Trends in House Prices and Home Ownership."

[9] Mankiw and Zeldes, for example, find that to justify the historical equity risk premium observed, investors would in aggregate need to be indifferent between a certain payoff of $51,209 and a 50/50 bet paying either $50,000 or $100,000. Mankiw and Zeldes, "The consumption of stockholders and nonstockholders," 8.

[10] For a highly readable introduction to the idea of cognitive biases, see Daniel Kahneman's book "Thinking: Fast and Slow." Kahneman has been a pioneer in the field and for his work won the 2002 Nobel prize in economics.

[11] Benartzi and Thaler, "Myopic Loss Aversion and the Equity Premium Puzzle."

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6.3% annualized. The inflation rate was 2.5%, and the average retail investor earned an annualized rate of 2.3%[12].

Even when investors can overcome their myopic loss aversion and stay in the stock market for the long haul, investment success is far from assured. The methods by which investors choose which stocks or stock managers to buy, hold, and sell are also subject to a host of biases which consistently lead to suboptimal investing and performance. Chief among these is overconfidence, the belief that one's judgements and skills are reliably superior.

Overconfidence is endemic to the human experience. The vast majority of people think of themselves as more intelligent, attractive, and competent than most of their peers,[13] even in the face of proof to the contrary. 93% of people consider themselves to be above-average drivers,[14] for example, and that percentage decreases only slightly if you ask people to evaluate their driving skill after being admitted to a hospital following a traffic accident.[15] Similarly, most investors are confident they can consistently beat the market. One survey found 74% of mutual fund investors believed the funds they held would "consistently beat the S&P 500 every year" in spite of the statistical reality that more than half of US stock funds underperform in a given year and virtually none will outperform it each and every year. Many investors will even report having beaten the index despite having verifiably underperformed it by several percentage points.[16]

Overconfidence leads investors to take outsized bets on what they know and are familiar with. Investors around the world commonly hold 80% or more of their portfolios in investments from their own country,[17] and one third of 401(k) assets are invested in participants' own employer's stock.[18] Such concentrated portfolios are demonstrably riskier than a broadly diversified portfolio, yet investors regularly evaluate their investments as less risky than the general market, even if their securities had recently lost significantly more than the overall market.

If an investor believes himself to possess superior talent in selecting investments, he is likely to trade more as a result in an attempt to capitalize on each new opportunity that presents itself. In this endeavor, the harder investors try, the worse they do. In one major study, the quintile of investors who traded the most over a five year period

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[12] "Guide to the Markets," J.P. Morgan Asset Management
[13] See, for example, Kruger and Dunning, "Unskilled and Unaware of It: How Difficulties in Recognizing One's Own Incompetence Lead to Inflated Self-Assessments" and Zuckerman and Jost, "What Makes You Think You're So Popular? Self Evaluation Maintenance and the Subjective Side of the 'Friendship Paradox'"
[14] Svenson, "Are We All Less Risky and More Skillful than Our Fellow Drivers?"
[15] Preston and Harris, "Psychology of Drivers in Traffic Accidents."
[16] Zweig, *Your Money and Your Brain.* 88-91.
[17] French and Poterba, "Investor Diversification and International Equity Markets."
[18] Ibid. 14. p. 98-99.

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earned an average annualized 7.1 percentage points less than the quintile that traded the least.[19]

The Folly of Wall Street

Relying on experts does little to help. Wall Street employs an army of analysts to follow the every move of all the major companies traded on the market, predicting their earnings and their expected performance relative to peers, but on the whole they are about as effective as a strategy of throwing darts. Burton Malkiel explains in his book *A Random Walk Down Wall Street* how he tracked the one and five year earnings forecasts on companies in the S&P 500 from analysts at 19 Wall Street firms and found that in aggregate the estimates had no more predictive power than if you had just assumed a given company's earnings would grow at the same rate as the long-term average rate of growth in the economy. This is consistent with a much broader body of literature demonstrating that the predictions of *statistical prediction rules* - formulas that make predictions based on simple statistical rules - reliably outperform those of human experts. Statistical prediction rules have been used to predict the auction price of bordeaux better than expert wine tasters,[20] marital happiness better than marriage counselors,[21] academic performance better than admissions officers,[22] criminal recidivism better than criminologists,[23] and bankruptcy better than loan officers,[24] to name just a few examples. This is an incredible finding that's difficult to overstate. When considering complex issues such as these our natural intuition is to trust experts who can carefully weigh all the relevant information in determining the best course of action. But in reality experts are simply humans who have had more time to reinforce their preconceived notions on a particular topic and are more likely to anchor their attention on items that only introduce statistical noise.

Back in the world of finance, It turns out that to a first approximation the best estimate on the return to expect from a given stock is the long-run historical average of the stock market, and the best estimate of the return to expect from a stock picking mutual fund is the long-run historical average of the stock market minus its fees. The active stock pickers who manage mutual funds have on the whole demonstrated little ability to outperform the market. To be sure, at any given time there are plenty of managers who have recently beaten the market smartly, and if you look around you will even find a few with records that have been terrific over ten years or more. But just as a coin-flipping contest between thousands of contestants would no doubt yield a few who had uncannily "called it" a dozen or more times in a row, the number of

[19] Barber and Odean, "Trading is Hazardous to Your Wealth: The Common Stock Investment Performance of Individual Investors."
[20] Ashenfelter et al, "Predicting the Quality and Prices of Bordeaux Wine."
[21] Thornton, "Toward a Linear Prediction of Marital Happiness."
[22] Swets et al, "Psychological Science Can Improve Diagnostic Decisions."
[23] Carroll et al, "Evaluation, Diagnosis, and Prediction in Parole Decision-Making."
[24] Stillwell et al, "Evaluating Credit Applications: A Validation of Multiattribute Utility Weight Elicitation Techniques."

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market beating mutual fund managers is no greater than what you should expect as a result of pure luck.[25]

Expert and amateur investors alike underestimate how competitive the capital markets are. News is readily available and quickly acted upon, and any fact you know about that you think gives you an edge is probably already a value in the cells of thousands of spreadsheets of analysts trading billions of dollars. Professor of Finance at Yale and Nobel Laureate Robert Shiller makes this point in a lecture using an example of a hypothetical drug company that announces it has received FDA approval to market a new drug:

> Suppose you then, the next day, read in *The Wall Street Journal* about this new announcement. Do you think you have any chance of beating the market by trading on it? I mean, you're like twenty-four hours late, but I hear people tell me — I hear, "I read in *Business Week* that there was a new announcement, so I'm thinking of buying." I say, "Well, *Business Week* — that information is probably a week old." Even other people will talk about trading on information that's years old, so you kind of think that maybe these people are naïve. First of all, you're not a drug company expert or whatever it is that's needed. Secondly, you don't know the math — you don't know how to calculate present values, probably. Thirdly, you're a month late. You get the impression that a lot of people shouldn't be trying to beat the market. You might say, to a first approximation, the market has it all right so don't even try.[26]

In that last sentence Shiller hints at one of the most profound and powerful ideas in finance: the efficient market hypothesis. The core of the efficient market hypothesis is that when news that impacts the value of a company is released, stock prices will adjust instantly to account for the new information and bring it back to equilibrium where it's no longer a "good" or "bad" investment but simply a fair one for its risk level. Because news is unpredictable by definition, it is impossible then to reliably outperform the market as a whole, and the seemingly ingenious investors on the latest cover of Forbes or Fortune are simply lucky.

A Noble Lie

In the 50s, 60s, and 70s several economists who would go on to win Nobel prizes worked out the implications of the efficient market hypothesis and created a new

[25] See Fama and French, "Luck versus Skill in the Cross-Section of Mutual Fund Returns." They do find modest evidence of skill at the right tail end of the distribution under the capital asset pricing model. After controlling for the value, size, and momentum factor premiums (discussed below), however, evidence of net-of-fee skill is not significantly different than zero.
[26] Shiller, "Efficient Markets vs. Excess Volatility."

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intellectual framework known as modern portfolio theory.[27] The upshot is that capital markets reward investors for taking risk, and the more risk you take, the higher your return should be (in *expectation*, it might not turn out to be the case, which is why it's risky). But the market doesn't reward unnecessary risk, such as taking out a second mortgage to invest in your friend's hot dog stand. It only rewards *systematic* risk, the risks associated with being exposed to the vagaries of the entire economy, such as interest rates, inflation, and productivity growth.[28] Stock of small companies are riskier and have a higher expected return than stocks of large companies, which are riskier than corporate bonds, which are riskier than Treasury bonds. But owning one small cap stock doesn't offer a higher expected return than another small cap stock, or a portfolio of hundreds of small caps for that matter. Owning more of a particular stock merely exposes you to the idiosyncratic risks that particular company faces and for which you are not compensated. Diversifying assets across as many securities as possible, it is possible to reduce the volatility of your portfolio without lowering its expected return.

This approach to investing dictates that you should determine an acceptable level of risk for your portfolio, then buy the largest basket of securities possible that targets that risk, ideally while paying the least amount possible in fees. Academic activism in favor of this passive approach gained momentum through the 70s, culminating in the launch of the first commercially available index fund in 1976, offered by The Vanguard Group. The typical index fund seeks to replicate the overall market performance of a broad class of investments such as large US stocks by owning all the securities in that market in proportion to their market weights. Thus if XYZ stock makes up 2% of the value of the relevant asset class, the index fund will allocate 2% of its funds to that stock. Because index funds only seek to replicate the market instead of beating it, they save costs on research and management teams and pass the savings along to investors through lower fees.

Index funds were originally derided and attracted little investment, but years of passionate advocacy by popularizers such as Jack Bogle and Burton Malkiel as well as the consensus of the economics profession has helped to lift them into the mainstream. Index funds now command trillions of dollars of assets and cover every segment of the market in stocks, bonds, and alternative assets in the US and abroad. In 2003 Vanguard launched its target retirement funds, which took the logic of passive investing even further by providing a single fund that would automatically shift from more aggressive to more conservative index investments as its investors approached

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[27] Professor Goetzmann of the Yale School of Management has a introductory hyper-text textbook on modern portfolio theory available on his website, "An Introduction to Investment Theory."

[28] In the language of modern portfolio theory this risk is known at a security's *beta*. Mathematically it is the covariance of the security's returns with the market's returns, divided by the variance of the market's returns.

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retirement. Target retirement funds have since become especially popular options in 401(k) plans.

The rise of index investing has been a boon to individual investors, who have clearly benefited from the lower fees and greater diversification they offer. To the extent that investors have bought into the idea of passive investing over market timing and active security selection they have collectively saved themselves a fortune by not giving in to their value-destroying biases. For all the good index funds have done though, since their birth in the 70s, the intellectual foundation upon which they stand, the efficient market hypothesis, has been all but disproved.

The EMH is now the noble lie of the economics profession; while economists usually teach their students and the public that the capital markets are efficient and unbeatable, their research over the last few decades has shown otherwise. In a telling example, Paul Samuelson, who helped originate the EMH and advocated it in his best selling textbook, was a large, early investor in Berkshire Hathaway, Warren Buffett's active investment holding company.[29] But real people regularly ruin their lives through sloppy investing, and for them perhaps it is better just to say that beating the market can't be done, so just buy, hold, and forget about it. We, on the other hand, believe a more nuanced understanding of the facts can be helpful.

Premium Investing

Shortly after the efficient market hypothesis was first put forth researchers realized the idea had serious theoretical shortcomings.[30] Beginning as early as 1977 they also found empirical "anomalies," factors other than systematic risk that seemed to predict returns.[31] Most of the early findings focused on valuation ratios - measures of a firm's market price in relation to an accounting measure such as book value or earnings - and found that "cheap" stocks on average outperformed "expensive" stocks, confirming the value investment philosophy first promulgated by the legendary Depression-era investor Benjamin Graham and popularized by his most famous student, Warren Buffett. In 1992 Eugene Fama, one of the fathers of the efficient market hypothesis, published, along with Ken French, a groundbreaking paper demonstrating that the cheapest decile stocks in the US, as measured by the price to book ratio, outperformed

[29] Setton, "The Berkshire Bunch."
[30] For example, Grossman and Stiglitz prove in "On the Impossibility of Informationally Efficient Markets" that market efficiency cannot be an equilibrium because without excess returns there is no incentive for arbitrageurs to correct mispricings. More recently, Markowitz, one of fathers of modern portfolio theory, showed in "Market Efficiency: A Theoretical Distinction and So What" that if a couple key assumptions of MPT are relaxed, the market portfolio is no longer optimal for most investors.
[31] Basu, "Investment Performance of Common Stocks in Relation to their Price-Earnings Ratios: A Test of the Efficient Market Hypothesis."

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the highest decile stocks by an astounding 11.9% per year, despite there being little difference in risk between them.[32]

A year later, researchers found convincing evidence of a momentum anomaly in US stocks: stocks that had the highest performance over the last 3-12 months continued to outperform relative to those with the lowest performance. The effect size was comparable to that of the value anomaly and again the discrepancy could not be explained with any conventional measure of risk.[33]

Since then, researchers have replicated the value and momentum effects across larger and deeper datasets, finding comparably large effect sizes in different times, regions, and asset classes. In a highly ambitious 2012 paper, Clifford Asness (a former student of Fama's) and Tobias Moskowitz documented the significance of value and momentum across 18 national equity markets, 10 currencies, 10 government bonds, and 27 commodity futures.

Though value and momentum are the most pervasive and best documented of the market anomalies, many others have been discovered across the capital markets. Others include the small-cap premium[34] (small company stocks tend to outperform large company stocks even *in excess* of what should be expected by their risk), the liquidity premium[35] (less frequently traded securities tend to outperform more frequently traded securities), short-term reversal[36] (equities with the lowest one-week to one-month performance tend to outperform over short time horizons), carry[37] (high-yielding currencies tend to appreciate against low-yielding currencies), roll yield[38][39] (bonds and futures at steeply negatively sloped points along the yield curve tend to outperform those at flatter or positively sloped points), profitability[40] (equities of firms with higher proportions of profits over assets or equity tend to outperform those with lower profitability), calendar effects[41] (stocks tend to have stronger returns in January and weaker returns on Mondays), and corporate action premia[42] (securities of corporations that will, currently are, or have recently engaged in mergers, acquisitions, spin-offs, and other events tend to consistently under or outperform relative to what would be expected by their risk).

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[32] Fama and French, "The Cross-Section of Expected Stock Returns."
[33] Jegadeesh and Titman, "Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency"
[34] Ibib. 32.
[35] Pastor and Stambaugh, "Liquidity Risk and Expected Stock Returns."
[36] Jegadeesh, "Evidence of Predictable Behavior of Security Returns."
[37] Froot and Thaler, "Anomalies: Foreign Exchange."
[38] Campbell and Shiller, "Yield Spreads and Interest Rate Movements: A Bird's Eye View."
[39] Erb and Harvey, "The Tactical and Strategic Value of Commodity Futures."
[40] Novy-Marx, "The Other Side of Value: The Gross Profitability Premium."
[41] Thaler, "Seasonal Movements in Security Prices."
[42] Mitchell and Pulvino, "Characteristics of Risk and Return in Risk Arbitrage."

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Most of these market anomalies appear remarkably robust compared to findings in other social sciences,[43] especially considering that they seem to imply trillions of dollars of easy money is being overlooked in plain sight. Intelligent observers often question how such inefficiencies could possibly persist in the face of such strong incentives to exploit them until they disappear. Several conflicting explanations have been put forth.

The first interpretation of the anomalies is to deny that they are actually anomalous, but rather are compensation for risk that isn't captured by the standard asset pricing models. This is the view of Eugene Fama, who first postulated that the value premium was compensation for assuming risk of financial distress and bankruptcy that was not fully captured by simply measuring the standard deviation of a value stock's returns.[44] Subsequent research, however, disproved that the value effect was explained by exposure to financial distress.[45] More sophisticated arguments point to the fact that the excess returns of value, momentum, and many other premiums exhibit greater skewness, kurtosis, or other statistical moments than the broad market: subtle statistical indications of greater risk, but the differences hardly seem large enough to justify the large return premiums observed.[46]

The only sense in which e.g. value and momentum stocks seem genuinely "riskier" is in career risk; though the factor premiums are significant and robust in the long term, they are not consistent or predictable along short time horizons. Reaping their rewards requires patience, and an analyst or portfolio manager who recommends an investment for his clients based on these factors may end up waiting years before it pays off, typically more than enough time to be fired.[47] Though any investment strategy is bound to underperform at times, strategies that seek to exploit the factors most predictive of excess returns are especially susceptible to reputational hazard. Value stocks tend to be from unpopular companies in boring, slow growth industries. Momentum stocks are often from unproven companies with uncertain prospects or are from fallen angels who have only recently experienced a turn of luck. Conversely, stocks that score low on value and momentum factors are typically reputable companies with popular products that are growing rapidly and forging new industry standards in their wake.

Consider then, two companies in the same industry: Ol'Timer Industries, which has been around for decades and is consistently profitable but whose product lines are

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[43] See McLean and Pontiff, "Does Academic Research Destroy Stock Return Predictability?" A meta analysis of 82 equity return factors was able to replicate 72 using out of sample data.
[44] Fama and French, "Size and Book-to-Market Factors in Earnings and Returns."
[45] Daniel and Titman, "Evidence on the Characteristics of Cross Sectional Variation in Stock Returns."
[46] Hwang and Rubesam, "Is Value Really Riskier than Growth?"
[47] Numerous investor profiles have expounded on the difficulty of being a rational investor in an irrational market. In a recent article in *Institutional Investor*, Asness and Liew give a highly readable overview of the risk vs. mispricing debate and discuss the problems they encountered launching a value-oriented hedge fund in the middle of the dot-com bubble.

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increasingly considered uncool and outdated. Recent attempts to revamp the company's image by the firm's new CEO have had modest success but consumers and industry experts expect this to be just delaying further inevitable loss of market share to NuTime.ly, founded eight years ago and posting exponential revenue growth and rapid adoption by the coveted 18-35 year old demographic, who typically describe its products using a wide selection of contemporary idioms and slang indicating superior social status and functionality. Ol'Timer Industries' stock will likely score highly on value on momentum factors relative to NuTime.ly and so have a higher expected return. But consider the incentives of the investment professional choosing between the two: if he chooses Ol'Timer and it outperforms he may be congratulated and rewarded perhaps slightly more than if he had chosen NuTime.ly and it outperforms, but if he chooses Ol'Timer and it underperforms he is a fool and a laughingstock who wasted clients' money on his pet theory when "everyone knew" NuTime.ly was going to win. At least if he chooses NuTime.ly and it underperforms it was a fluke that none of his peers saw coming, save for a few wingnuts who keep yammering about the arcane theories of Gene Fama and Benjamin Graham.

For most investors, "it is better for reputation to fail conventionally than to succeed unconventionally" as John Maynard Keynes observed in his *General Theory*. Not that this is at all restricted to investors, professional or amateur. In a similar vein, professional soccer goalkeepers continue to jump left or right on penalty kicks when statistics show they'd block more shots standing still.[48] But standing in place while the ball soars into the upper right corner makes the goalkeeper look incompetent. The proclivity of middle managers and bureaucrats to default to uncontroversial decisions formed by groupthink is familiar enough to be the stuff of popular culture; nobody ever got fired for buying IBM, as the saying goes. Psychological experiments have shown that people will often affirm an obviously false observation about simple facts such as the relative lengths of straight lines on a board if others have affirmed it before them.[49]

We find ourselves back to the nature of human thinking and the biases and other cognitive errors that afflict it. This is what most interpretations of the market anomalies focus on. Both amateur and professional investors are human beings that are apt to make investment decisions not through a methodical application of modern portfolio theory but based rather on stories, anecdotes, hunches, and ideologies. Most of the anomalies make sense in light of an understanding of some of the most common biases such as anchoring and availability bias, status quo bias, and herd behavior.[50] Rational investors seeking to exploit these inefficiencies may be able to do so to a limited extent, but if they are using other peoples' money then they are constrained by

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[48] Bar-Eli, "Action Bias Among Elite Soccer Goalkeepers: The Case of Penalty Kicks. Journal of Economic Psychology."
[49] Asch, "Opinions and Social Pressure."
[50] Daniel et al provides one of the most thorough theoretical discussions on how certain common cognitive biases can result in systematically biased security prices in "Investor Psychology and Security Market Under- and Overreaction."

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the biases of their clients. The more aggressively they attempt to exploit market inefficiencies, the more they risk badly underperforming the market long enough to suffer devastating withdrawals of capital.[51]

It is no surprise then that the most successful investors have found ways to rely on "sticky" capital unlikely to slip out of their control at the worst time. Warren Buffett invests the float of his insurance company holdings, which behaves in actuarially predictable ways; David Swensen manages the Yale endowment fund, which has an explicitly indefinite time horizon and a rules based spending rate; Renaissance Technologies, arguably the most successful hedge fund ever, only invests its own money; Dimensional Fund Advisors, one of the only mutual fund companies that has consistently earned excess returns through factor premiums, only sells through independent financial advisors who undergo a due diligence process to ensure they share similar investment philosophies.

Building a Better Portfolio

So what is an investor to do? The prospect of delicately crafting a portfolio that's adequately diversified while taking advantage of return premiums may seem daunting, and one may be tempted to simply buy a Vanguard target retirement fund appropriate for their age and be done with it. Doing so is certainly a reasonable option. But we believe that with a disciplined investment strategy informed by the findings discussed above superior results are possible.

The first place to start is an assessment of your risk tolerance. How far can your portfolio fall before it adversely affects your quality of life? For investors saving for retirement with many more years of work ahead of them, the answer will likely be "quite a lot." With ten years or more to work with, your portfolio will likely recover from even the most extreme bear markets. But people do not naturally think in ten-year increments, and many must live off their portfolio principal; accept that in the short term your portfolio will sometimes be in the red and consider what percentage decline over a period of a few months to a year you are comfortable enduring. Over a one year period the "worst case scenario" on diversified stock portfolios is historically about a 40% decline. For a traditional "moderate" portfolio of 60% stocks, 40% bonds it has been about a 25% decline.[52]

With a target on how much risk to accept in your portfolio, modern portfolio theory shows us a technique for achieving the most efficient tradeoff between risk and return possible called mean-variance optimization. An adequate treatment of MVO is beyond the scope of this paper,[53] but essentially the task is to forecast expected returns on the

[51] Schleifer and Vishny, "The Limits of Arbitrage."
[52] Data provided by Vanguard.
[53] Chapter 2 of Goetzmann's "An Introduction to Investment Theory" provides an introductory discussion.

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major asset classes (e.g. US Stocks, International Stocks, and Investment Grade Bonds) then compute the weights for each that will achieve the highest expected return for a given amount of risk. We use an approach to mean variance optimization known as the Black-Litterman model[54] and estimate expected returns using a limited number of simple inputs; for example, the expected return on an index of stocks can be closely approximated using the current dividend yield plus the long run growth rate of the economy.[55]

With optimal portfolio weights determined, next the investor must select the investment vehicles to use to gain exposure to the various asset classes. Though traditional index funds are a reasonable option, in recent years several "enhanced index" mutual fund and ETFs have been released that provide inexpensive, broad exposure to the hundreds or thousands of securities in a given asset classes while enhancing exposure to one or more of the major factor premiums discussed above such as value, profitability, or momentum. Research Affiliates, for example, licenses a "fundamental index" that has been shown to provide efficient exposure to value and small-cap stocks across many markets.[56] These "RAFI" indexes have been licensed to the asset management firms Charles Schwab and PowerShares to be made available through mutual funds and ETFs to the general investing public, and have generally outperformed their traditional index fund counterparts since inception.

Over the course of time, portfolio allocations will drift from their optimized allocations as particular asset classes inevitably outperform relative to other ones. Leaving this unchecked can lead to a portfolio that is no longer risk-return efficient. The investor must periodically rebalance the portfolio by selling securities that have become overweight and buying others that are underweight. Research suggests that by setting "tolerance bands" around target asset allocations, monitoring the portfolio frequently and trading when weights drift outside tolerance, investors can take further advantage of inter-asset-class value and momentum effects and boost return while reducing risk.[57]

Most investors, however, do not rebalance systematically, perhaps in part because it can be psychologically distressing. Rebalancing necessarily entails regularly selling assets that have been performing well in order to buy ones that have been laggards, exactly when your cognitive biases are most likely to tell you that it's a bad idea. Indeed, neuroscientists have observed in laboratory experiments that when individuals consider the prospect of buying more of a risky asset that has lost them money, it

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[54] The Black-Litterman model allows investors to combine their estimates of expected returns with equilibrium implied returns in a Bayesian framework that largely overcomes the input-sensitivity problems associated with traditional mean-variance optimization. Idzorek offers a thorough introduction in "A Step-By-Step Guide to the Black-Litterman Model."
[55] Ilmanen's "Expected Returns on Major Asset Classes" provides a detailed explanation of the theory and evidence of forecasting expected returns.
[56] Walkshausl and Lobe, "Fundamental Indexing Around the World."
[57] Buetow et al, "The Benefits of Rebalancing."

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activates the modules in the brain associated with anticipation of physical pain and anxiety.[58] Dealing with investment losses is literally painful for investors.

Many investors may find it helpful to their peace of mind as well as their investment assets to outsource the entire process to a party with less emotional attachment in their portfolio. Realistically, most investors have neither the time nor the motivation necessary to attain a firm understanding of modern portfolio theory, research the capital market expectations on various asset classes and securities, and regularly monitor and rebalance their portfolio, all with enough rigor to make it worth the effort compared to a simple indexing strategy. By utilizing the skills of a good financial advisor, however, an investor can leverage the expertise of a professional with the bandwidth to execute these tactics in a cost-efficient manner.

A financial advisor should be able to engage you as an investor and acquire a firm understanding of your goals, needs, and attitudes towards risk, money, and markets. Because he or she will have an entire practice over which to efficiently dedicate time and resources on portfolio research, optimization, and trading, the financial advisor should be able to craft a portfolio that's optimized for your personal situation. Financial advisors, as institutional investors, generally have access to institutional class funds that retail investors do not, including many of those that have demonstrated the greatest dedication to exploiting the factor premiums. Notably, DFA and AQR, the two fund families with the greatest academic support, are generally only available to individual investors through a financial advisor. Should your professionally managed portfolio provide a better risk adjusted return than a comparable do-it-yourself index fund approach, the FA's fees have paid for themselves.

Furthermore, a good financial advisor will make sure your investments are tax efficient and that you are making the most of tax-preferred accounts. Researchers have shown that after asset allocation, asset *location*, the strategic placement of investments in accounts with different tax treatment, is one of the most important factors in net portfolio returns,[59] yet most individual investors largely ignore these effects.[60] Advisor's fees can generally be paid with pre-tax funds as well, further enhancing tax efficiency.

Invest with Purpose

There is something of a paradox involved in investing. Finance is a highly specialized and technical field, but money is a very personal and emotional topic. Achieving the joy and fulfillment associated with financial success requires a large measure of emotional detachment and impersonal pragmatism. Far too often people suffer great loss by

[58] Kuhnen and Knutson, "The Neural Basis of Financial Risk Taking."
[59] Dammon et al, "Optimal Asset Location and Allocation with Taxable and Tax-Deferred Investing."
[60] Bodie and Crane, "Personal Investing: Advice, Theory, and Evidence from a Survey of TIAA-CREF Participants."

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confusing loyalties and aspirations, fears and regrets with the efficient allocation of their portfolio assets. We as advisors hate to see this happen; there is nothing to celebrate about the needless destruction of capital, it is truly a loss for us all. One of the greatest misconceptions about finance is that investing is just a zero-sum game, that one trader's gain is another's loss. Nothing could be further from the truth. Economists have shown that one of the greatest predictors of a nation's well being is its financial development.[61] The more liquid and active our capital markets, the greater our society's capacity for innovation and progress. When you invest in the stock market, you are contributing your share to the productive capacity of our world, your return is your reward for helping make it better, outperformance is a sign that you have steered capital to those with the greatest use for it.

With the right accounts and investments in place and a process for managing them effectively, you the investor are freed to focus on what you are working and investing *for*, and an advisor can work with you to help get you there. Whether you want to travel the world, buy the house of your dreams, send your children to the best college, maximize your philanthropic giving, or simply retire early, an advisor can help you develop a financial plan to turn the dollars and cents of your portfolio into the life you want to live, building more health, wealth, and happiness for you, your loved ones, and the world.

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[61] Yongseok Shin of the Federal Reserve provides a brief review of the literature on this research in "Financial Markets: An Engine for Economic Growth."

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