

# Looking for Easy Games

## How Passive Investing Shapes Active Management

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### Authors

Michael J. Mauboussin

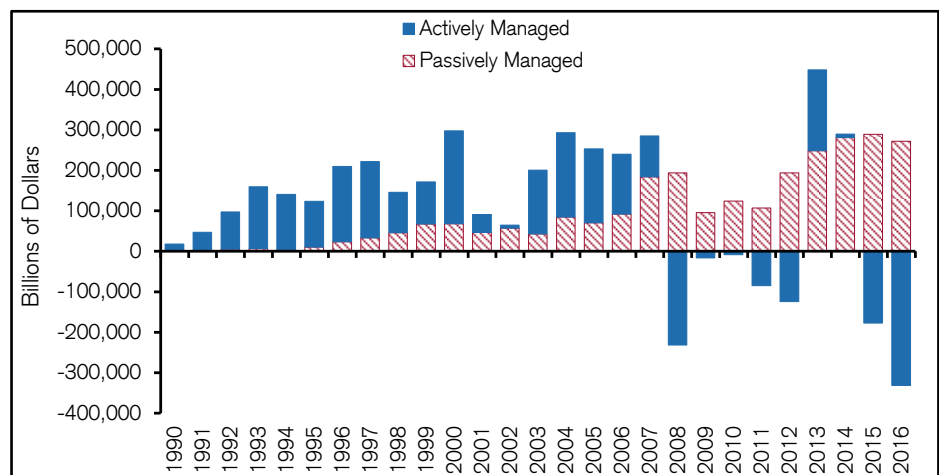
[michael.mauboussin@credit-suisse.com](mailto:michael.mauboussin@credit-suisse.com)

Dan Callahan, CFA

[daniel.callahan@credit-suisse.com](mailto:daniel.callahan@credit-suisse.com)

Darius Majd

[darius.majd@credit-suisse.com](mailto:darius.majd@credit-suisse.com)



Source: Simfund.

“As they say in poker, ‘If you’ve been in the game 30 minutes and you don’t know who the patsy is, *you’re* the patsy.’”

Warren E. Buffett<sup>1</sup>

- Investors are rapidly shifting their investment allocations from active to passive management. This trend has accelerated in recent years.
- The investors leaving active managers are likely less informed than those who remain. This is equivalent to the weak players leaving the poker table. Since the winners need losers, this can make the market even more efficient, and hence less attractive, for those who remain.
- Active management provides price discovery and liquidity, valuable social goods. However, the fees are higher for active managers than passive ones, identifying skill ahead of time is not easy, and there is a cost to assessing skill.
- Passive management has lower costs and hence higher returns per dollar invested than active management does in the aggregate. But passive management introduces the possibility of market distortions.
- Active managers have to constantly ask, “Who is on the other side?” The unrelenting objective is to find easy games, where differential skill pays off.

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## Executive Summary

- Investors are shifting their investment allocations from active to passive management. This trend has accelerated in recent years. The investors who are shifting from active to passive are less informed than those who stay. This is equivalent to the weak players leaving the poker table. Since the winners need losers, this can make the market even more efficient, and hence less attractive, for those who remain. If you can't identify the patsy, or weak player, it's probably you.
- Active management provides price discovery and liquidity. These are valuable social goods. However, the fees are higher for active managers than passive ones, identifying skill ahead of time is not easy, and there is a cost to assessing skill. Average fees for the industry have declined as the result of the rise of passive investing, and closet indexers have been the biggest losers.
- Passive management has lower costs than active management and hence delivers higher returns per dollar invested than active management does in the aggregate. However, passive management introduces the possibility of market distortions, including crowding and illiquidity. Exchange-traded funds, in particular, are worth watching closely because of their explosive growth and high trading volume. There is evidence that passive investing has had an influence on valuations, correlations, and liquidity.
- How efficiently inefficient markets are determines the appropriate balance between active and passive. More active management can lead to more efficiency and an inducement to go passive. More passive investors and noise traders may create more inefficiency and hence opportunity for active managers.
- Four drivers have led to the development of the mutual fund industry and, more recently, to the shift toward passive investing. These include regulation, the market environment, technology, and the balance between informed and uninformed investors. In particular, technology has contributed a great deal to informational efficiency as a result of advances in the speed and cost of information dissemination, computing, trading, and communication.
- Active money managers need to seek easy games. These include competing against individuals, investors who buy and sell without regard for fundamental value, and investors who use simple decision rules. Wealth transfers are another potential source of excess returns.
- Small and unsophisticated investors should build passive portfolios, with an emphasis on asset allocation and low cost. Sophisticated investors should seek active managers in asset classes with high dispersion. There are ways to assess money managers beyond past performance that may shade the odds in your favor.
- Active managers must constantly consider who is on the other side of the trade. Research shows that fundamental money managers who take a long view and are truly active can deliver excess returns. It is essential to identify a repeatable source of edge and to align the investment process to capture that edge.
- There is an academic case for indexing, which is based on the work by Nobel Laureates Harry Markowitz and William Sharpe. They developed a way to understand the trade-off between risk and reward and emphasized the importance of thinking about portfolios. Subsequent to their work, researchers identified factors associated with returns beyond risk, measured as variance, which has led to factor investing ("smart beta").

## Introduction

Say that I invite you to my house for a game of poker on Friday night. If you play to make money, your first question should be, "Who else will be there?" If I tell you that some rich players who have poor skills will attend, you will put the date on your calendar. If I say that the other players are better than you are, you will make alternative plans.

Let's make this a little more interesting. Rather than providing you with an assessment of each player's skill, I'll tell you about some scenarios for the outcomes of the evening. I will invite 5 players, each of whom will bring \$200.

In the first scenario, I tell you that the expected winning of each player is zero. While money will move around because of normal variance, the players are anticipated to gain or lose nothing by the end of the night.

In the second scenario, I tell you that one player is expected to leave with the same \$200 he or she walked in with, two are expected to lose \$100 each and thus depart with only \$100, and the final pair is expected to gain from those losses and exit with \$300. The standard deviation is \$100.

In the final scenario, one player is expected to leave with \$200, two are going to lose all of their money, and two are going to take home \$400. The standard deviation doubles to \$200.

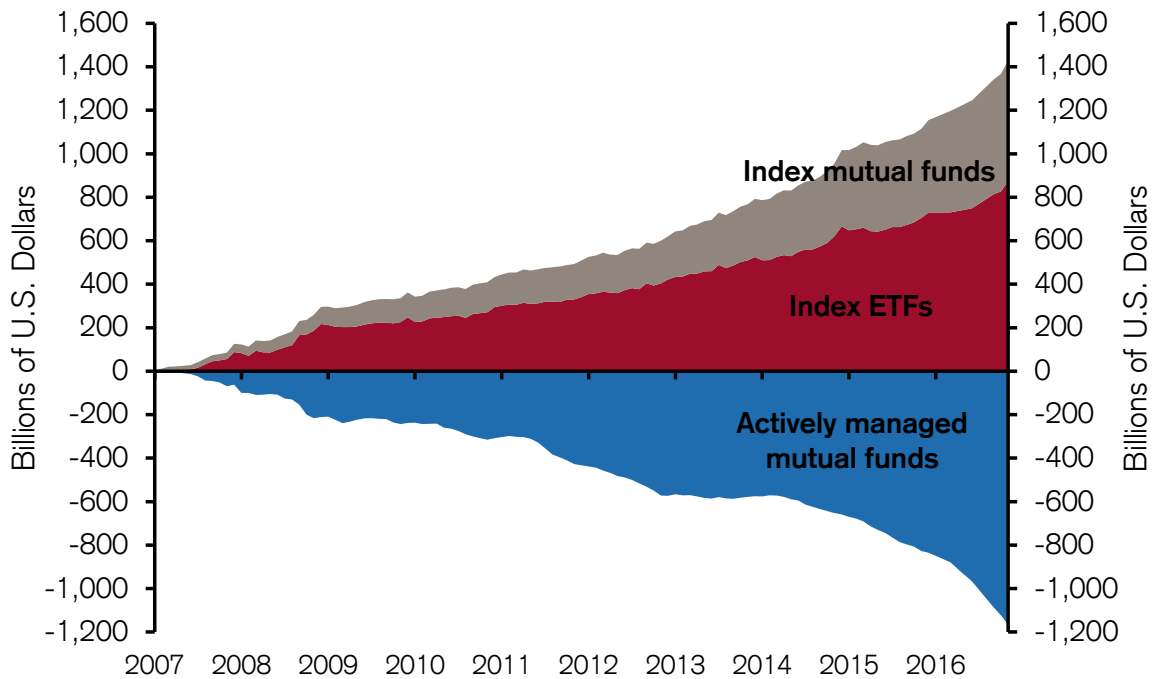
How much would you be willing to pay to access each scenario?

In the first case, the answer is nothing. In the second and third cases, your answer depends on an assessment of your skill. If you think you are one of the top two players, you should be willing to offer something less than your expected profits. If you think you are below the average, or do not know where you stand, you are better off not playing.

As simple as it is, our poker game reveals three important lessons for investors. First, for every winner there has to be a loser. The money coming in the room at the beginning of the evening is the same as the money going out. Second, the players end up with less money than they started with if there is some cost to play. Finally, randomness ensures that some players will win or lose more than their underlying skill justifies. Skill is revealed only over a large sample of games.

One of the biggest issues in the investment management industry today is the shift from active management, where a portfolio manager selects securities in an attempt to deliver higher returns than a benchmark index, to passive management, where a fund mirrors an index or operates according to set rules. Since the end of 2006, investors have withdrawn nearly \$1.2 trillion from actively managed U.S. equity mutual funds and have allocated roughly \$1.4 trillion to U.S. equity index funds and exchange-traded funds (ETFs). See exhibit 1.

**Exhibit 1: Flows from Active to Passive Funds in U.S. Equities**



Source: Investment Company Institute; Simfund; Credit Suisse.  
 Note: U.S. domestic equity funds; 2016 figure as of 11/30/16.

In this report, we will try to explain why this shift has happened, what the impact is on markets, how to think about how much more there is to go, and what to do about it.

Let's establish some important points right away. Active management promotes price discovery. A market that is close to efficient, where prices accurately reflect available information, is a positive externality that benefits society.<sup>2</sup> Think of the classic arbitrageur. He or she buys what's cheap, sells what's dear, and leaves efficient prices in the wake. Our arbitrageur enjoys an excess return and delivers a proper price. Markets must be inefficient enough to encourage active managers to participate. At the same time, the participation of active managers creates efficiency.<sup>3</sup>

Index investors benefit from this externality. There is nothing wrong with that. We all benefit from prices every day. A corollary is that the market cannot be made up solely of passive investors: we need some investors to collect information and to reflect it in prices.

Active investors also create liquidity in markets. Liquidity is the ability to turn assets into cash, and vice versa, in a timely fashion without suffering large transaction costs or a sizable price impact. Because buyers and sellers do not always seek to transact at the same time, investors have to compensate market makers to create a liquid market. Research shows that liquidity has an impact on asset prices, and assets with low liquidity are susceptible to large price reversals.<sup>4</sup>

The questions relate to how many active investors we need to approximate this efficiency and how much our society should be willing to pay for price discovery and liquidity.<sup>5</sup>

In 1991, William Sharpe, a professor of finance and winner of the Nobel Prize, described what he called “the arithmetic of active management.”<sup>6</sup> He argued that the return on the average dollar managed actively will equal that of a dollar managed passively before costs, and that the return on the actively managed dollar will be less than that of a passively managed dollar after costs.<sup>7</sup>

Here’s the way to think about it. Say you define the market as the stocks that comprise the S&P 500. The index and the passive funds that mirror it will generate the same return before costs. The return for the active managers must, then, also equal the S&P 500’s returns as well because the parts, passive plus active, must equal the whole. Since the fees of 81 basis points for active funds, weighted by assets under management, exceed the 21 basis points that passive funds charge, active management will underperform the index as well as passive funds tracking the index over time.<sup>8</sup>

Studies going back as far as the 1930s have consistently shown that active managers generate net returns less than that of the market.<sup>9</sup> Exhibit 2 shows that 42 percent of all U.S. equity funds outperformed the S&P Composite 1500 Index, on average, in each individual year from 2000-2015. This average rate of outperformance has a standard deviation of about 15 percent. It also shows that only about 1 in 8 funds outperformed the S&P Composite 1500 Index over the past 3 and 10 years, and only 1 in 20 did so for the trailing 5 years. The percentage of outperformance varies by fund category, but most of the annual averages are in the range of 30-40 percent.

The intuition behind these results is straightforward. If my 5 poker players each walk in with \$200 and agree to pay me to play, the net amount that walks out will be less than \$1,000. The same math applies to passive funds. Almost all passive funds underperform their relevant indexes after fees.<sup>10</sup> For example, the compound annual total shareholder return for the Vanguard 500 Index Fund Investor (VFINX) shares was 17 basis points less than that of the S&P 500 Index, an amount comparable to the fund’s fee, for the five years ended December 31, 2016.

**Exhibit 2: Percentage of U.S. Equity Funds That Outperformed Their Benchmarks**

Fund Category	Benchmark Index	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Average 2000-2015	Past 3 Years	Past 5 Years	Past 10 Years
All Domestic Funds	S&P Composite 1500	59.5	45.5	41.0	52.3	48.6	56.0	32.2	51.2	35.8	58.3	42.4	15.9	33.9	54.0	12.8	25.2	41.5	12.6	5.4	12.5
All Large-Cap Funds	S&P 500	63.1	42.4	39.0	35.4	38.4	55.5	30.9	55.2	45.7	49.3	38.2	18.7	36.8	44.2	13.6	33.9	40.0	18.7	8.1	14.6
All Mid-Cap Funds	S&P MidCap 400	21.1	32.7	29.7	43.6	38.2	24.0	53.3	53.6	25.3	42.4	21.8	32.6	19.6	61.0	33.8	43.2	36.0	16.2	12.1	8.7
All Small-Cap Funds	S&P SmallCap 600	29.3	33.6	26.4	61.2	15.0	39.5	36.4	55.0	16.2	67.8	37.0	14.2	33.5	31.9	27.1	27.8	34.5	5.9	2.4	9.3
Large-Cap Growth Funds	S&P 500 Growth	84.0	12.5	28.2	55.3	60.5	68.4	23.9	68.4	10.1	60.9	18.0	4.4	53.9	57.4	4.0	50.7	41.3	9.7	2.6	1.4
Large-Cap Core Funds	S&P 500	64.4	41.9	37.0	34.0	33.1	55.4	28.7	56.0	48.0	47.9	36.8	18.7	33.7	42.3	20.7	26.2	39.0	12.2	7.8	11.8
Large-Cap Value Funds	S&P 500 Value	45.5	79.4	60.6	21.5	16.8	41.2	12.3	53.7	77.8	53.8	65.3	45.7	14.9	33.4	21.4	40.8	42.8	17.6	11.2	32.2
Mid-Cap Growth Funds	S&P MidCap 400 Growth	21.6	21.0	13.1	68.3	40.4	21.5	65.2	60.7	11.1	40.4	17.9	24.6	12.8	63.3	43.8	20.1	34.1	18.9	12.0	4.8
Mid-Cap Core Funds	S&P MidCap 400	27.2	29.5	35.4	50.0	48.2	27.6	64.1	35.4	37.7	31.4	18.0	35.9	20.3	56.5	41.6	32.1	36.9	15.0	12.3	7.7
Mid-Cap Value Funds	S&P MidCap 400 Value	5.2	44.2	25.7	18.1	36.4	28.2	61.6	43.9	32.9	52.2	28.2	35.1	23.8	54.7	26.4	67.7	36.5	14.7	18.3	12.8
Small-Cap Growth Funds	S&P SmallCap 600 Growth	27.0	18.7	5.8	64.7	6.4	27.8	47.9	60.6	4.5	66.5	27.3	6.3	36.3	44.4	35.5	11.6	30.7	4.7	3.2	5.5
Small-Cap Core Funds	S&P SmallCap 600	33.2	34.4	24.8	66.7	17.1	38.6	37.2	48.1	17.5	65.6	39.8	13.9	31.6	22.3	32.1	22.4	34.1	4.4	2.1	10.2
Small-Cap Value Funds	S&P SmallCap 600 Value	25.6	51.3	62.5	50.7	22.5	54.0	23.3	60.2	27.5	73.7	48.2	17.0	38.2	21.0	5.7	53.4	39.7	7.9	1.8	9.8

Source: Aye M. Soe, "SPIVA® U.S. Scorecard: Year End 2015," S&P Dow Jones Indices Research, March 11, 2016; Aye M. Soe and Ryan Poirier, "SPIVA® U.S. Scorecard: Mid-Year 2016," S&P Dow Jones Indices Research, September 15, 2016.

Note: 3-, 5-, and 10-year outperformance rates are as of June 30, 2016; Outperformance is based upon equal-weighted fund counts.

While passive investing makes a great deal of sense for most investors, it comes with potential negative externalities. The overarching notion is crowding, a condition where investors do the same thing at the same time without full consideration of the implications for future asset returns. We can separate the concerns about crowding into asset mispricing and a reduction in liquidity. There is growing evidence that passive investing may lead to less efficient prices and an increase in market fragility associated with lower liquidity.<sup>11</sup>

It is worth noting that crowding is a risk for active managers as well, especially those engaged in quantitative, rules-based strategies.<sup>12</sup> In this case, a combination of leverage and an exogenous shock can lead to large market moves that are unrelated to changes in fundamental value. The massive losses that quantitative funds suffered in August 2007 are an example of this phenomenon.<sup>13</sup>

Active managers must believe in differential skill to justify their existence. Recall the poker metaphor. You want to join the game only if you are more skilled than some of the other players and hence can expect to take their money. In markets as in poker, excess gains and losses net to zero. For you to win, someone has to lose on the other side of the trade.

Richard Grinold, the former global director of research at Barclays Global Investors, defined “the fundamental law of active management” more than 25 years ago.<sup>14</sup>

$$IR = IC * \sqrt{BR}$$

In words, the information ratio (IR), a measure of the return of a portfolio adjusted for risk, equals the information coefficient (IC), which measures skill through the average correlation between forecasts and outcomes, times the square root of breadth (BR), the number of independent opportunities for excess return that are predicted to be available during some period of time.

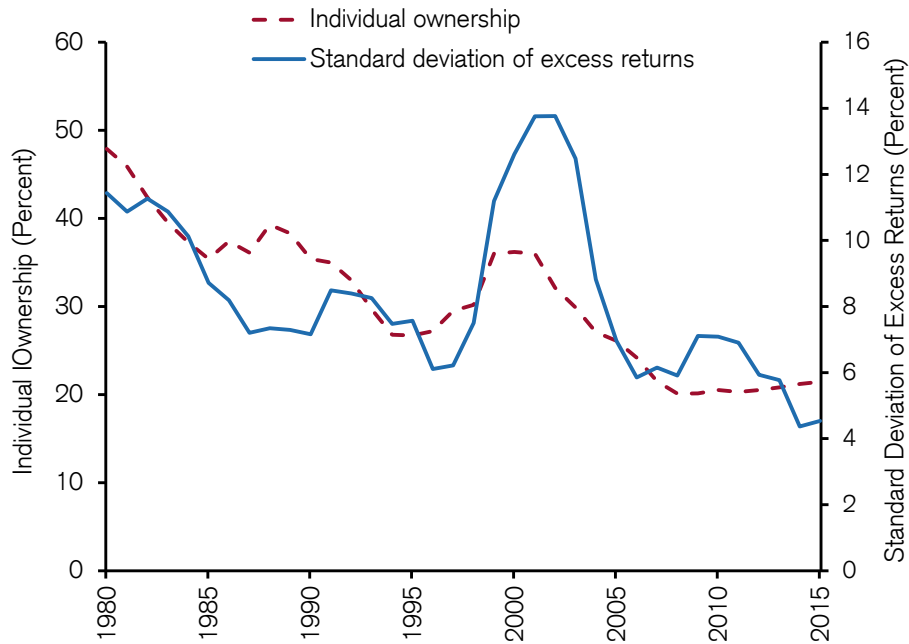
In plain language, it says that excess return equals skill times opportunity. You can apply the law to determine whether you want to play poker at my house. Assume your skill is high. Scenario one has no excess return because all of the players are of similar skill. That means the breadth is zero and your expected excess gain is zero. On the other hand, scenario three is very attractive because you can employ your skill to earn an excess return at the expense of the weak players.

A closer examination of the mutual fund industry shows the average active manager generates an excess return before fees, but the return is not enough to cover the costs.<sup>15</sup> If active managers are winning before fees, who is losing?

Fischer Black, a renowned economist, suggested the idea of “noise traders.”<sup>16</sup> He writes, “People who trade on noise are willing to trade even though from an objective point of view they would be better off not trading. Perhaps they think the noise they are trading on is information. Or perhaps they just like to trade.” Noise traders create profit opportunities for more skillful investors and supply markets with liquidity. But they can also slow the rate of price discovery and cause pricing distortions.

The percentage of equity ownership by individuals may be a good proxy for noise traders. Studies of results of individual investors show that they lose to institutions because they succumb to a number of biases described in the behavioral finance literature.<sup>17</sup>

Exhibit 3 tests this idea. The dotted line shows the direct ownership of stocks by individuals in the U.S. from 1980 through 2015. During that period, the percentage was cut roughly in half, from about 50 to 25 percent. The downward trend reversed in the late 1990s as individuals were drawn into the dot-com boom.

**Exhibit 3: Individual Direct Ownership and the Standard Deviation of Excess Returns**

Source: Markov Processes International; Morningstar; Kenneth R. French; Credit Suisse.

The solid line shows the five-year rolling average of the standard deviation of excess returns for large capitalization equity mutual funds. A high standard deviation means there are big winners and losers and a low figure means results are clustered toward the middle. If you are skillful, you want a high standard deviation.

The figure shows that these lines move together. The correlation ( $r$ ) is 0.66. In particular, participation of relatively unsophisticated investors in the dot-com boom and bust created the opportunity for substantial returns for active managers. For example, in the two years ended March 2002, the S&P 500 Index was down more than 20 percent while the average stock listed in the U.S. gained more than 20 percent.<sup>18</sup> That's a good environment for stock picking. In recent years, the opportunities have not been as readily available. Using Grinold's equation, skill has not paid off because of a dearth of opportunity.

You need differential skill to explain the winners and losers in active management over time.<sup>19</sup> But there are three reasons it is difficult for investors to take advantage of the skill of money managers.

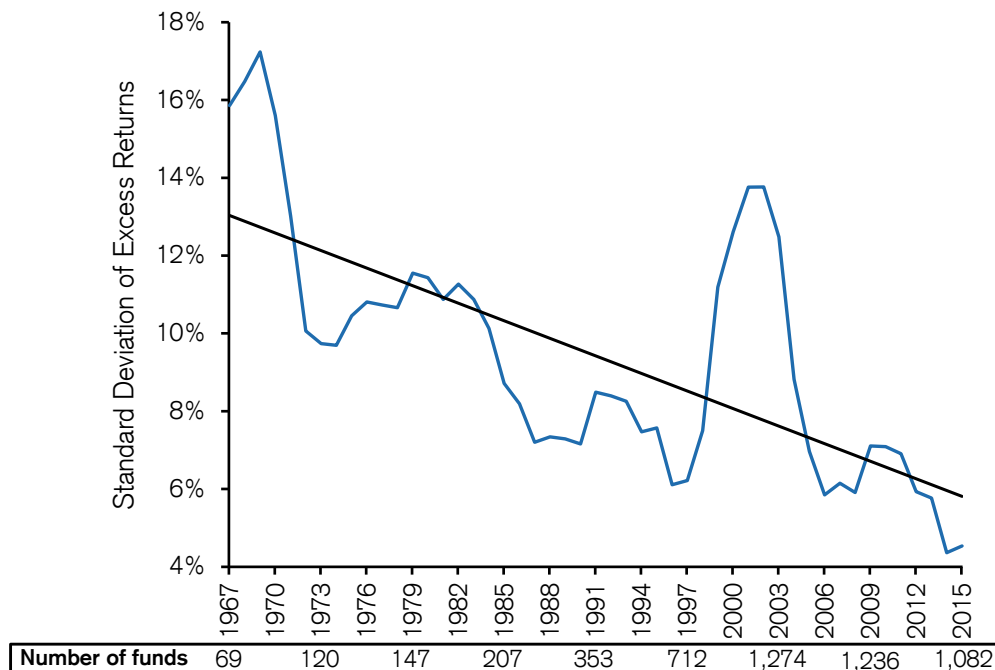
The first is the "paradox of skill," which says that luck can contribute more to an outcome of an activity even as skill improves.<sup>20</sup> The essential insight is the consideration of absolute and relative skill. Absolute skill has improved in nearly all domains of human performance. This is readily evident in athletics, especially when results are measured versus the clock. For example, on average elite athletes run and swim faster than ever before. The reasons for this improvement include a larger population of competitors, better training techniques, enhanced nutrition, and more refined coaching.

Skill in investing has followed the same course as sports. Today's professional investors are better trained, have greater access to information, can rely on better theory, and have more computing power than their predecessors. If an investor with today's capabilities were to travel back to the 1960s, he or she could run circles around the competition.

The key to the paradox is that relative skill has been shrinking in most realms. Said differently, a decline in relative skill means the difference between the best and the average participant is less today than it was in the past. Stephen Jay Gould, a biologist at Harvard, made this point with batting average in Major League Baseball: while the mean batting average has remained relatively stable over time, the standard deviation has steadily declined. The last player to sustain a batting average in excess of .400 for a full season did so in 1941.

Exhibit 4 extends the standard deviation of excess returns from exhibit 3 back to the early 1960s.<sup>21</sup> The reduction is evident, with the notable deviation during the dot-com period. The results for hedge funds demonstrate a similar pattern. This is the outcome you expect in a market that is largely efficient.

**Exhibit 4: Decline in Standard Deviation of Excess Returns for U.S. Large Capitalization Funds**



Source: Markov Processes International; Morningstar; Credit Suisse.

Second, even if past performance provides evidence of differential skill, identifying which managers will be skillful in the future is a challenge.<sup>22</sup> Persistence is one way to measure skill. Persistence measures the degree to which outcomes are consistent over time. High persistence suggests skill. Low persistence indicates that luck is a substantial contributor to results.

Excess returns adjusted for risk have low persistence.<sup>23</sup> This means that luck plays a substantial role and that predicting the future from the past is difficult. This is not because of a lack of skill. Rather, it reflects the uniformity of skill that is manifest in asset prices. We will explore some approaches to shade the odds in favor of the investor later in this report.

The final reason it is hard for investors to benefit from skill is that the talented money managers capture most of the excess returns they generate. Jonathan Berk and Richard Green, professors of finance, created a model that helps to explain the phenomenon.<sup>24</sup> They start with the assumption that there are skillful money managers and that investors and the managers can identify this skill.

Berk and Green do not measure skill as excess return but rather as the value the fund extracts from the market, or the fund's gross excess return times the assets under management. The skill of a manager of a \$100 million fund that has a gross excess return of 100 basis points is \$1 million ( $.01 * \$100 \text{ million} = \$1 \text{ million}$ ), while the skill for the same excess return is \$10 million for a \$1 billion fund ( $.01 * \$1 \text{ billion} = \$10 \text{ million}$ ). This idea is similar to economic profit, a measure of corporate performance. Skill measured this way is persistent.

Berk and Green share an example to make the idea more concrete. In his first five years running the Magellan Fund at Fidelity, Peter Lynch had monthly gross alpha of 200 basis points on roughly \$40 million of assets under management. In his final five years, he had 20 basis points of monthly gross alpha on \$10 billion of assets. So his value added went from \$800,000 per month ( $.02 * \$40 \text{ million} = \$800,000$ ) to \$20 million per month ( $.002 * \$10 \text{ billion} = \$20 \text{ million}$ ). As Lynch's fund grew, his value added increased even as the gross alpha decreased.

Follow-up work by Berk and Jules van Binsbergen, also a professor of finance, found that the average value added for a mutual fund was \$3.2 million per year for the roughly 6,000 funds they analyzed from 1962 to 2011, while the median value added was -\$2.4 million. Most funds fail to create value, but skillful managers control more assets than less skilled ones. That the average net alpha was essentially zero suggests that it is the money managers, not the investors, who benefit from this skill.<sup>25</sup>

The rational course for skillful managers is to increase their assets under management to the point where their expected alpha approaches zero.<sup>26</sup> As in other competitive labor markets, the portfolio manager captures most of the excess rents generated by his or her skill through higher compensation.<sup>27</sup> A point of equilibrium exists where all managers have an identical expected return irrespective of their skill.

Before we turn to the data, drivers, and opportunities, here is a summary of the discussion:

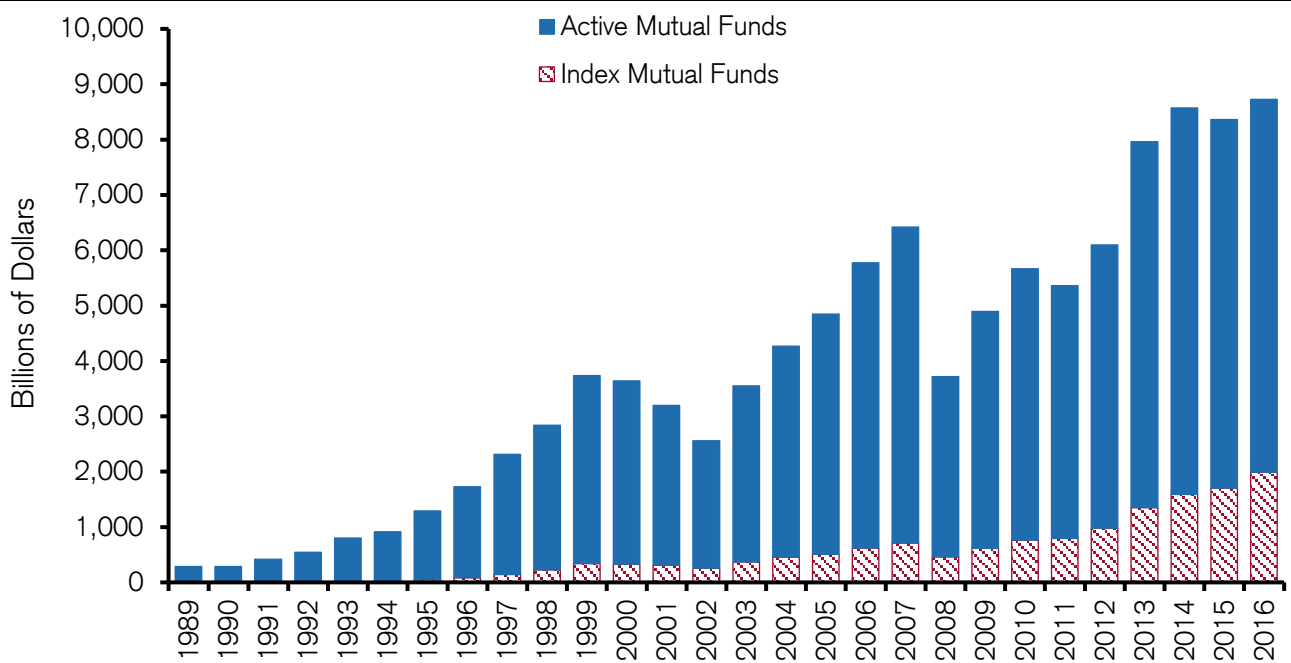
- Investors are shifting their investment allocations from active to passive management. This trend has accelerated in recent years.
- It is likely that the investors moving from active to passive are less informed than those who remain. This is equivalent to the weak players leaving the poker table. Since the winners need losers, this makes the market even more efficient, and hence less attractive, for those who remain. If you can't identify the patsy, or weak player, it's probably you.<sup>28</sup>
- Active management provides price discovery and liquidity. These are valuable social goods. However, the fees are higher for active managers than passive ones, identifying skill ahead of time is not easy, and there is a cost to assessing skill.
- Passive management has lower costs than active management and hence delivers higher returns per dollar invested than active management does in the aggregate. Passive management introduces the possibility of crowding and illiquidity.
- How efficiently inefficient markets are determines the appropriate balance between active and passive. More active management leads to more efficiency and an inducement to go passive. More passive and noise investors create more inefficiency and hence opportunity for active managers.<sup>29</sup>
- Active managers have to constantly ask, "Who is on the other side?" The unrelenting objective is to find easy games, where differential skill will pay off.

## Documenting the Shift

**Where We Are.** The U.S. equity mutual fund industry has grown from \$287 billion in assets under management in 1989 to about \$8.7 trillion in late 2016 (see exhibit 5). During that time, gross domestic product has grown from \$8.9 trillion to \$16.7 trillion (in 2009 dollars).

An index fund is a mutual fund designed to track a specific basket of stocks. The largest of these funds tracks the S&P 500 Index. Assets under management (AUM) for index funds were only \$3 billion in 1989, or about 1 percent of the industry. By 2016, they reached nearly \$2 trillion, or 23 percent of assets under management. As exhibit 1 shows, the growth in indexing has been particularly pronounced following the financial crisis in 2008.<sup>30</sup>

**Exhibit 5: Assets Under Management of U.S. Domestic Equity Mutual Funds, 1989-2016**



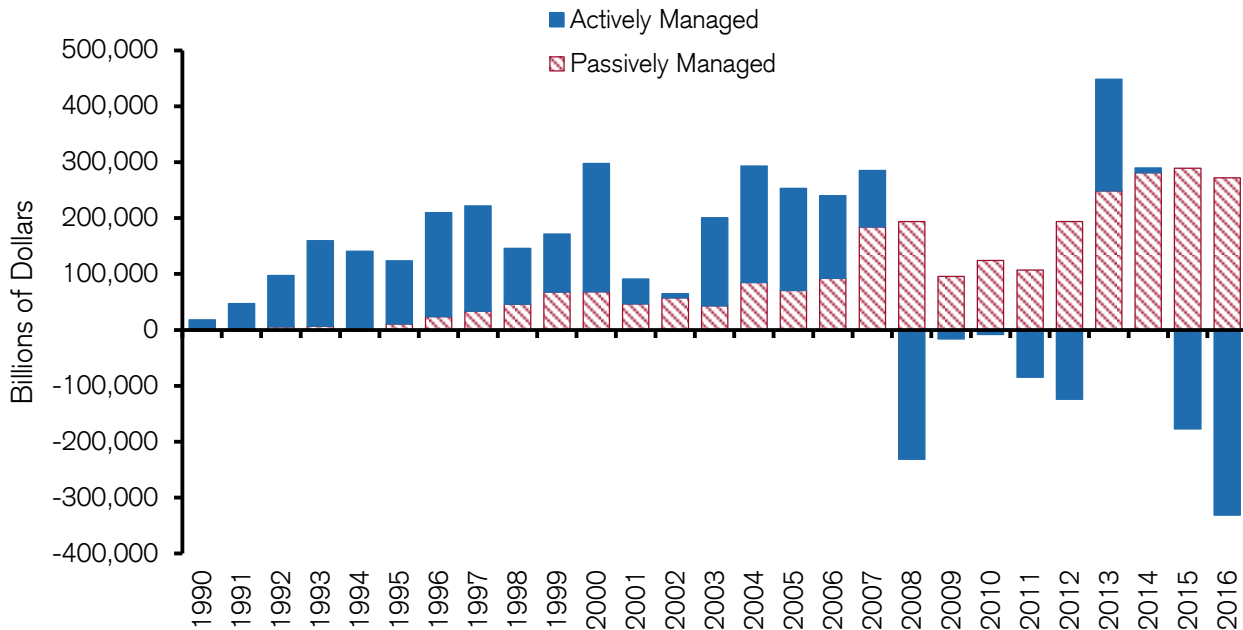
Source: Simfund.

Note: U.S. domiciled equity funds; 2016 figure as of 11/30/16.

While exhibit 5 shows where we are, exhibit 6 shows how we have arrived at this point by documenting fund flows into actively and passively managed funds since 1990. During the bull market of the 1990s, inflows went largely to active managers. It was not until the late 1990s that passive funds started to gain market share. But even then, the vast majority of the flows went active.

The tide turned markedly starting with the financial crisis in 2008. Poor market returns and the rise of exchange-traded funds as a financial innovation were large drivers. In recent years, active managers have lost substantial market share to passive vehicles. For U.S. equities, active funds had an outflow of \$331 billion while passive funds had an inflow of \$272 billion in the 11 months ended November 2016.

**Exhibit 6: Fund Flows Into Active and Passive Funds and ETFs, U.S. Domestic Equity, 1990-2016**

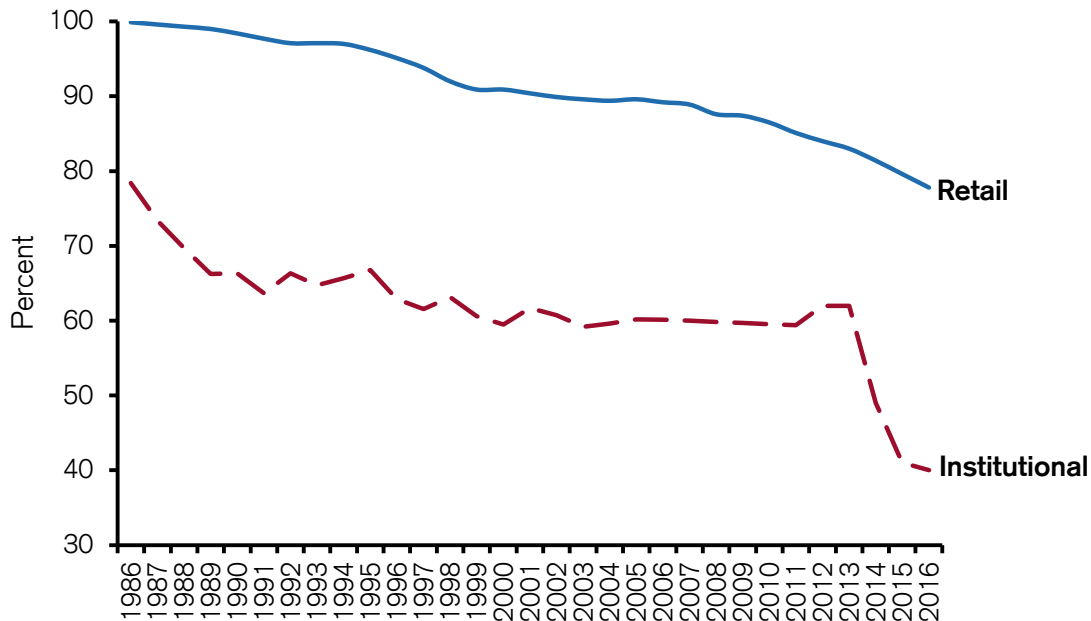


Source: Simfund.

Note: 2016 figure as of 11/30/16; Active includes actively managed mutual funds and active ETFs; Passive includes index mutual funds, market capitalization-weighted ETFs, and smart beta ETFs.

Individuals have been slower to embrace passive investing than institutional investors have. Exhibit 7 shows that even as indexing was gaining traction in the late 1980s, nearly one-fifth of institutional money was dedicated to passive vehicles. Today, institutions have about 40 percent of their equity assets in actively managed funds.

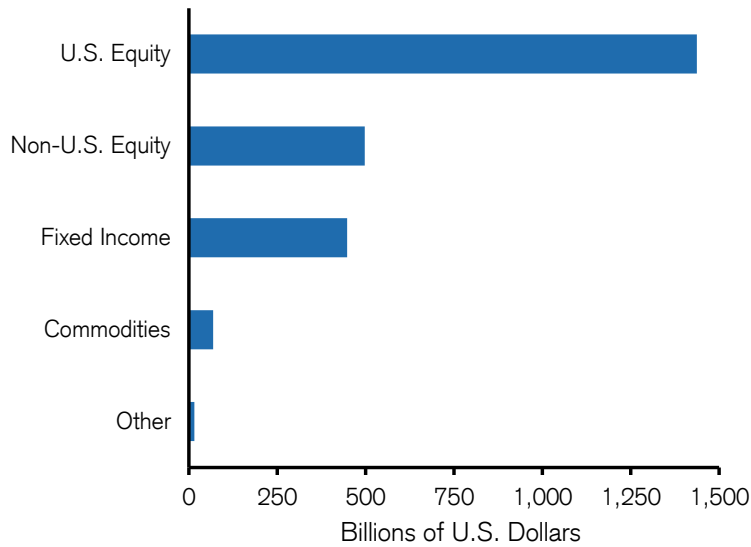
**Exhibit 7: Active Allocations for Retail and Institutional Investors, U.S. Domestic Equity**



Source: Kenneth R. French; Greenwich Associates, "Is There a Future for Active Management? How Active Managers Will Thrive in a Maturing Industry," Q4 2016; Credit Suisse estimates.

Besides classic index funds, the last two decades have seen the rapid rise of exchange-traded funds (ETFs). Created in 1993, an ETF is an investment fund that trades on an exchange, similar to a stock. The ETF holds assets that typically track an index, stocks within a sector, stocks that exhibit certain factors, bonds, or commodities. In principle, the ETF is supposed to trade close to the net asset value of the securities it is tracking. About one-fifth of the AUM for ETFs track traditional indexes such as the S&P 500. The AUM for active ETFs remains small at less than \$30 billion. Exhibit 8 shows the asset classes that ETFs reflect.

**Exhibit 8: Assets Under Management of Exchange-Traded Funds by Asset Class**

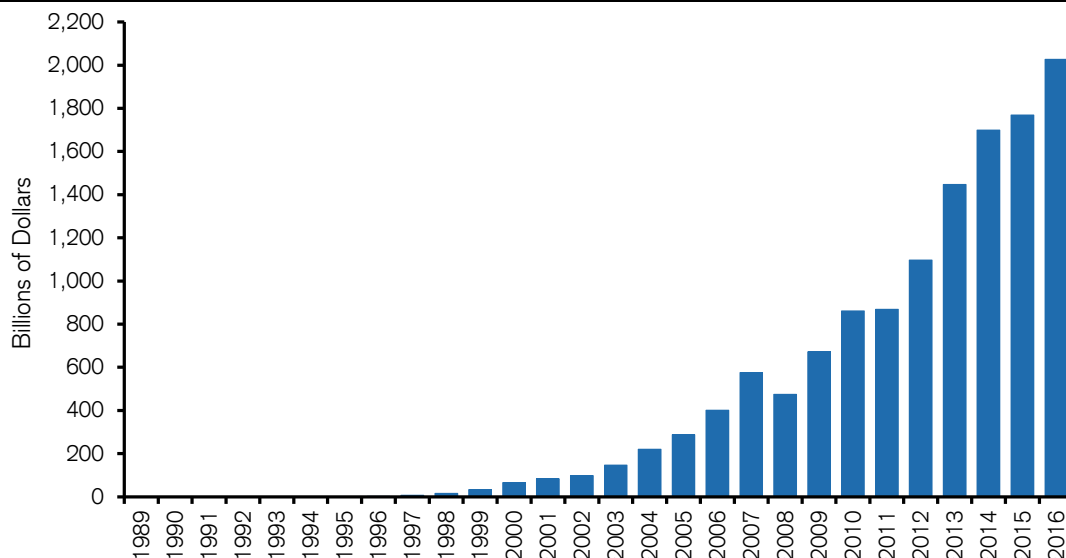


Source: [www.etf.com](http://www.etf.com).

Note: "Other" category includes currency, asset allocation, and alternatives; as of 11/25/2016.

In 1996, ETFs of U.S. domiciled equity funds had AUM of just \$2 billion, but that has grown to \$2.0 trillion in 2016 (see exhibit 9). ETFs trade all day, unlike mutual funds which are priced once a day, can be bought and sold through a broker, and are more tax efficient than traditional mutual funds as they trigger fewer tax events.

**Exhibit 9: Assets Under Management of Exchange-Traded Funds, U.S. Domestic Equity**



Source: *Simfund*.

Note: U.S. domiciled equity funds; includes traditional, smart beta, and active ETFs; 2016 figure as of 11/30/16.

Exhibit 10 shows the percentage of each sector's market capitalization that ETFs hold for stocks with an equity capitalization in excess of \$2.9 billion. The range is between about 4 percent for technology to more than 10 percent for real estate. The percentage ownership that ETFs have is even larger for small capitalization stocks, in a range of about 6 to 11 percent. Traditional market capitalization-weighted and sector ETFs are the strategies that hold the highest percentage of large capitalization stocks.

#### Exhibit 10: ETF Assets as a Percentage of Market Capitalization for Large Stocks

	Low Dividend	Multi-Volatility	Factor Growth	Value	Sector	Market Cap	Total	
<b>Consumer Discretionary</b>	0.3%	0.1%	0.1%	0.6%	0.2%	0.5%	2.6%	<b>4.4%</b>
<b>Consumer Staples</b>	0.7	0.2	0.2	0.4	0.3	0.6	2.3	<b>4.7</b>
<b>Energy</b>	0.5	0.0	0.2	0.1	0.7	1.7	2.6	<b>5.8</b>
<b>Financials</b>	0.4	0.1	0.1	0.2	0.7	0.9	2.6	<b>4.9</b>
<b>Health Care</b>	0.3	0.1	0.1	0.5	0.3	1.1	2.7	<b>5.2</b>
<b>Industrials</b>	0.7	0.1	0.1	0.4	0.5	0.6	2.8	<b>5.2</b>
<b>Information Technology</b>	0.2	0.1	0.1	0.6	0.2	0.6	2.6	<b>4.3</b>
<b>Materials</b>	0.8	0.1	0.1	0.4	0.6	1.1	2.8	<b>5.9</b>
<b>Real Estate</b>	0.3	0.3	0.1	0.6	0.5	5.8	2.9	<b>10.6</b>
<b>Telecommunication Services</b>	0.7	0.1	0.2	0.1	0.6	0.5	2.2	<b>4.5</b>
<b>Utilities</b>	1.5	0.5	0.3	0.0	1.0	1.6	2.9	<b>7.8</b>
<b>Total</b>	<b>6.3</b>	<b>1.5</b>	<b>1.6</b>	<b>4.1</b>	<b>5.7</b>	<b>15.1</b>	<b>29.1</b>	

Source: Credit Suisse Trading Strategy and Delta One Solutions.

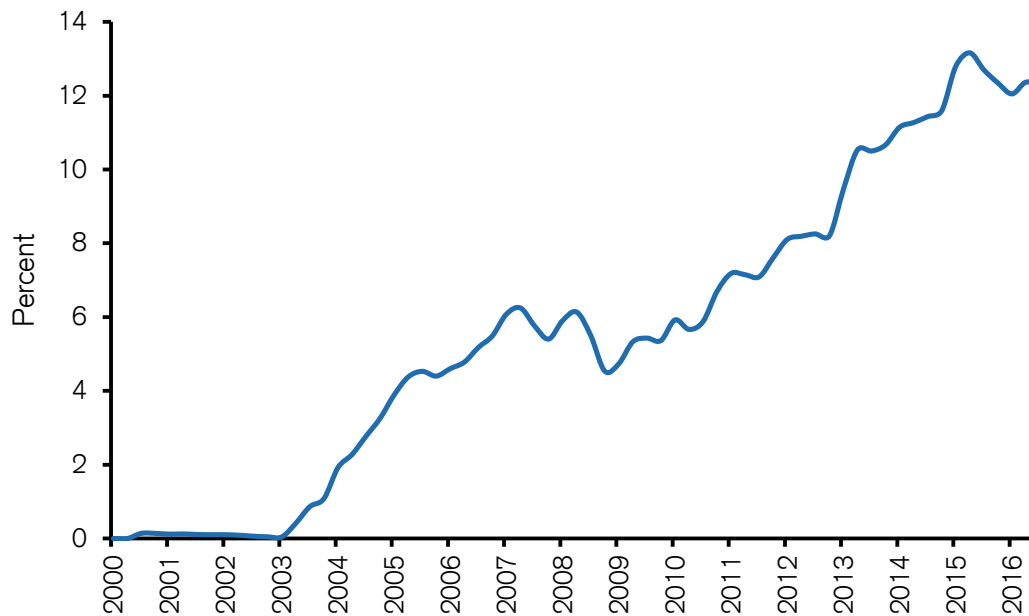
Note: As of 9/30/2016.

Investors, or speculators, trade ETFs actively. Jack Bogle, founder and former chief executive officer of the Vanguard Group, notes that the shares of the 100 largest ETFs have an annualized turnover rate of 880 percent while the annualized turnover rate for the 100 largest stocks is about 120 percent. The SPDR S&P 500 ETF Trust alone has averaged about 9 percent of the volume on the New York Stock Exchange over the past five years, and its average daily trading volume is more than four times that of Apple, Inc. the company with the largest market capitalization in the U.S.<sup>31</sup>

Institutions that use ETFs to speculate, hedge, and arbitrage are the most active traders of ETFs. Individuals who trade frequently are the next largest segment. Finally, individual investors, often working through financial advisers, use ETFs to build low-cost, diversified portfolios.<sup>32</sup>

The intellectual case for indexing was built by researchers including Harry Markowitz and William Sharpe. Since they laid the theoretical foundation for holding a diversified portfolio, researchers have discovered that some factors predict excess returns relative to the capital asset pricing model. These factors include small capitalization and value stocks. Fundamental indexation strategies are also popular.<sup>33</sup>

This research encouraged the financial innovation of "smart beta," essentially portfolios built to reflect these factors in the hope of delivering excess returns. See the appendix for the academic case for indexing and smart beta. Investors have embraced smart beta strategies. The AUM for ETFs based on smart beta was 1/10 of 1 percent in 2000 and today is between 10 and 30 percent of the total depending on how you define the term. By our definition, smart beta funds represent 12 percent of the assets for U.S. equity ETFs (see exhibit 11). The percentage is similar for the AUM of traditional mutual funds.

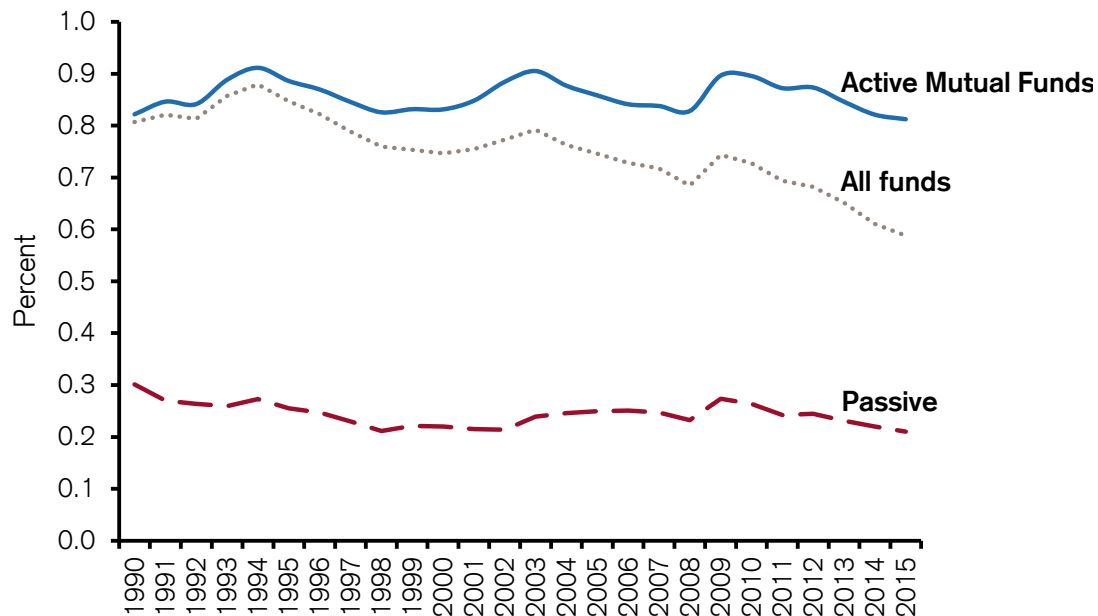
**Exhibit 11: Smart Beta as a Percentage of Total Assets in ETFs**

Source: Simfund.

Note: Quarterly data, as of 9/30/2016; U.S. domiciled equity funds.

**What It Means.** If excess returns in the U.S. equity markets are becoming scarcer, it stands to reason that investors should pay less to seek them. If nothing else, the shift from active to passive exerts downward pressure on aggregate fees. Kenneth French, a professor of finance at the Tuck School of Business, underscored the importance of fees in his presidential address to the American Finance Association in 2008. By his calculations, the typical investor would have realized annual returns that were 67 basis points higher in a passive portfolio than an active portfolio from 1980 through 2006. That return difference is largely explained by the higher fees that active managers charge.<sup>34</sup>

Exhibit 12 shows the fees for active mutual funds, passive funds, and a blended average of the two from 1990 through 2015. Fees for active funds remained relatively stable at around 80 basis points during this period. In the early years of the industry's growth, many mutual funds were offered with a "front-end load," an upfront cost. For example, an investor with \$1,000 who bought a fund with a 5 percent front-end load would pay \$50, and \$950 would be invested. Consideration of annuitized loads made the total cost of owning mutual funds in excess of 200 basis points per year in 1980. Research shows that investors are attuned to this explicit expense which explains the decline in load funds. However, they focused less on ongoing fund fees, allowing hot performing funds to attract flows irrespective of the underlying fees. Further, there remains substantial dispersion in fees, even for funds with similar objectives.<sup>35</sup>

**Exhibit 12: Fees on U.S. Equity Mutual Funds**

Source: Morningstar.

Note: Weighted by assets under management; passive includes index funds and passive ETFs.

Fees for passive investments, including both traditional index mutual funds and ETFs, are roughly 21 basis points today, down from 30 basis points in 1990. As the passive investment industry is dominated by a handful of companies that can achieve economies of scale, the trend of lower fees is likely to continue.

As a consequence of the shift from active to passive investing, the average fees for all funds have declined from 81 basis points in 1990 to 59 basis points today. You can think of this as the cost that society pays for price discovery and liquidity.

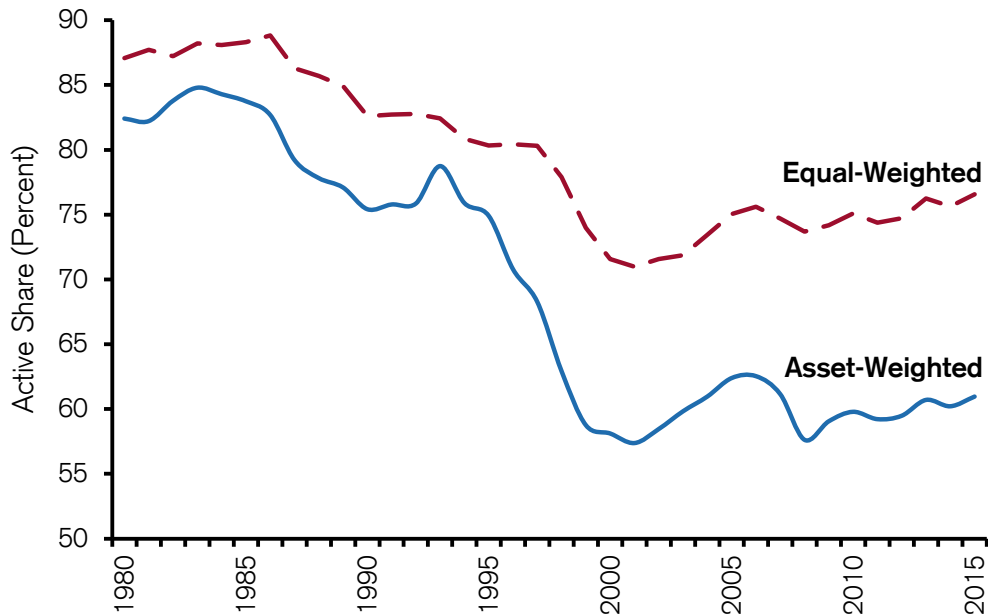
Fees for institutional investors are consistently lower than those for individuals.<sup>36</sup> This is because institutions have a higher percentage of their assets invested passively and because they can negotiate lower fees for the active funds they do use. This discussion excludes alternative investments, although institutions can access those investments at a lower cost than individuals can as well.

The academic community continues to debate whether mutual fund fees are set competitively.<sup>37</sup> Both the lowering of fees, especially if they start at the high-end of the industry range, and innovation in the form of new products, contributes to market share gains for mutual fund families.<sup>38</sup>

We can zoom in and take a look at which active funds are losing market share. One approach is to examine active share, a measure of “the percentage of the fund’s portfolio that differs from the fund’s benchmark index.”<sup>39</sup> Assuming no leverage or shorting, active share is 0 percent if the fund perfectly mimics the index and 100 percent if the fund is totally different than the index. Generally, an active share of 60 percent or less is considered to be closet indexing and an active share of 90 percent or more indicates a manager who is truly picking stocks.

Exhibit 13 shows the asset-weighted and equal-weighted active share for the U.S. equity mutual fund industry from 1980 through 2015. Asset-weighted active share went from 82 to 61 percent, reflecting the shift from essentially all active management in 1980 to about one-third passive assets under management today.

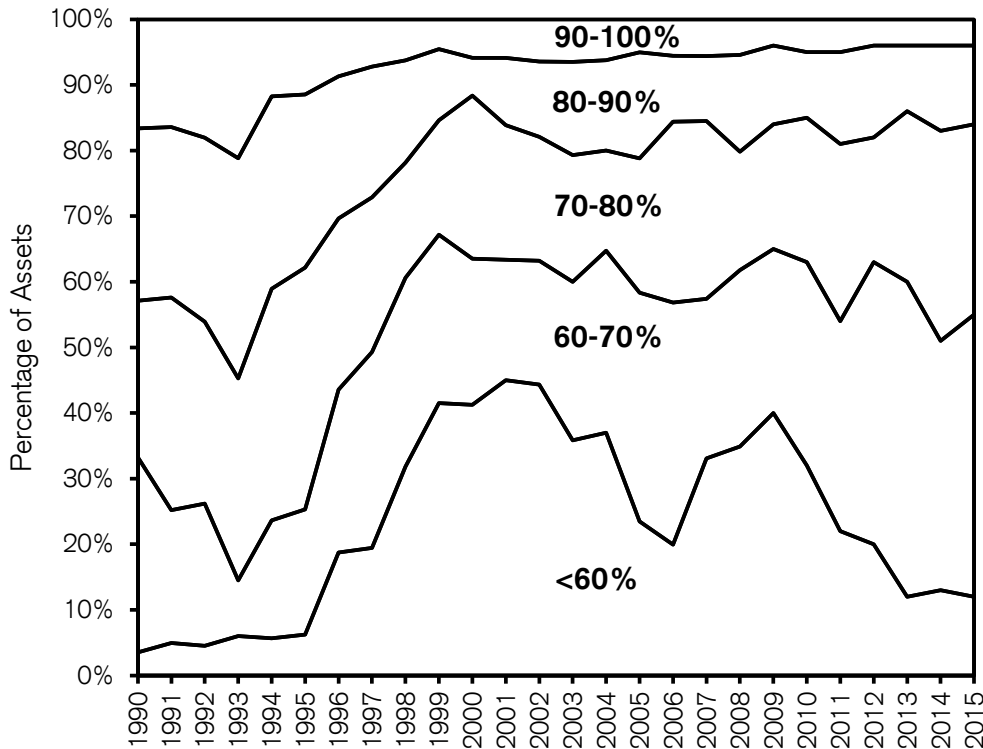
**Exhibit 13: Active Share for U.S. Equity Mutual Funds, 1980-2015**



Source: Antti Petajisto, see [www.petajisto.net/data.html](http://www.petajisto.net/data.html); Antti Petajisto, "Active Share and Mutual Fund Performance," *Financial Analysts Journal*, Vol. 69, No. 4, July/August 2013, 73-93; Martijn Cremers, see <http://activeshare.nd.edu/data/>; Credit Suisse.

Another big contributing factor is the trend toward closet indexing. Exhibit 14 shows active share broken down by percentage of assets under management for funds that own equities of large capitalization stocks from 1990 through 2015. From the mid-1990s through 2000, the closet indexers gained substantial market share. Since then passive funds and high-active-share funds have taken market share from the closet indexers. That explains much of the dip in equal-weighted active share, which went from 87 percent in 1980 to 77 percent today.

**Exhibit 14: Active Share by Percentage of Assets for U.S. Large Cap Mutual Funds, 1990-2015**



Source: Antti Petajisto, see [www.petajisto.net/data.html](http://www.petajisto.net/data.html); Martijn Cremers, "Active Share and the Three Pillars of Active Management: Skill, Conviction and Opportunity," Working Paper, August 2016; Credit Suisse.

There is a clear logical link between active share and fees.<sup>40</sup> Essentially, it is reasonable to pay active fees only for the part of the portfolio that is truly active. Say a fund has an expense ratio of 75 basis points and an active share of 25 percent. That means that three-quarters of the portfolio is earning the same return as the benchmark index. Therefore, the active component would have to generate an excess return of 300 basis points just to have the same return as the market.

Exhibit 15 shows that the mix of explicit indexing, closet indexing, and active funds varies for markets around the world. Active managers deliver higher excess returns in countries where there is substantial explicit indexing as the result of lower average fees and more differentiated portfolios.

**Exhibit 15: Explicit Indexing, Closet Indexing, and Active Funds Around the World**

	Number of Funds	Total Net Assets (\$Bn)	Market Share (Percent)			Total Shareholder Cost (Percent)		
			Explicit Indexing	Closet Indexing	Active Funds	Explicit Indexing	Closet Indexing	Active Funds
<b>Austria</b>	167	15.0	3	36	61	2.23	2.58	2.61
<b>Belgium</b>	150	17.9	21	43	36	1.16	2.01	1.98
<b>Canada</b>	895	326.4	8	37	55	0.42	2.11	2.80
<b>Denmark</b>	201	30.5	2	27	71	0.83	1.87	2.09
<b>Finland</b>	147	26.2	3	44	53	0.34	2.16	1.91
<b>France</b>	492	134.1	25	29	46	0.77	2.07	2.22
<b>Germany</b>	356	139.5	16	34	50	0.69	2.34	2.37
<b>Ireland</b>	484	222.5	31	25	44	0.56	1.89	2.17
<b>Italy</b>	125	31.4	0	36	64		2.44	2.59
<b>Liechtenstein</b>	101	6.0	0	18	82		1.70	1.98
<b>Luxembourg</b>	2,057	750.5	4	26	70	1.21	2.60	2.43
<b>Netherlands</b>	75	33.6	1	21	78	0.59	1.40	1.30
<b>Norway</b>	117	41.4	6	26	68	0.42	1.44	1.82
<b>Poland</b>	46	8.4	0	58	42		4.02	3.00
<b>Portugal</b>	53	2.0	0	39	61	1.03	2.01	2.08
<b>Spain</b>	267	13.1	9	42	49	1.51	2.12	1.97
<b>Sweden</b>	266	113.5	10	56	34	0.56	1.47	1.42
<b>Switzerland</b>	220	69.7	58	24	18	1.01	1.73	2.08
<b>United Kingdom</b>	975	504.1	9	32	59	0.62	2.33	2.38
<b>United States</b>	3,153	5,150.3	27	15	58	0.26	1.07	1.31
<b>Asia Pacific</b>	1,204	255.5	24	20	56	0.75	1.46	1.90
<b>Other Regions</b>	225	29.3	0	41	59	1.35	2.14	2.08
<b>Total</b>	11,776	7,921.1	22	20	58	0.35	1.64	1.66

Source: Martijn Cremers, Miguel A. Ferreira, Pedro Matos, and Laura Starks, "Indexing and Active Fund Management: International Evidence," *Journal of Financial Economics*, Vol. 120, No. 3, June 2016, 539-560.

Because passive funds charge a very low fee, economies of scale are important. Three mutual fund firms, BlackRock, Vanguard, and State Street, dominate the business of index funds and ETFs. Exhibit 16 shows that those organizations control approximately 95 percent of the indexed assets under management of the top 15 mutual fund families.

These asset managers are the largest shareholder in at least 40 percent of all U.S. listed companies, prompting some academics to refer to them as the "de facto permanent governing board" for this population of companies. Further, this concentration raises concern about "new financial risk, including increased investor herding and greater volatility in times of severe financial instabilities."<sup>41</sup> Some academics have gone so far as to recommend that the government impose a limit on stock holdings based on the Clayton Antitrust Act, legislation meant to prevent anticompetitive practices.<sup>42</sup>

**Exhibit 16: Largest Index Fund Equity Managers**

<b>Asset Manager</b>	<b>Total AUM</b>	<b>Index Funds AUM</b>	<b>Index Funds Fraction of AUM</b>
BlackRock	2,644	2,166	81.3%
Vanguard	2,270	1,839	81.1%
State Street	1,377	1,275	96.9%
Fidelity	1,004	170	16.9%
Invesco	377	85	22.5%
T. Rowe Price	337	30	8.9%
BNY Mellon	247	14	6.9%
Capital Group	838	0	0.0%
Wellington Mgmt	476	0	0.0%
JPMorgan Chase	342	0	0.0%
Affiliated Managers	336	0	0.0%
Franklin Templeton	297	0	0.0%
Goldman Sachs	254	0	0.0%
Dimensional Fund Advisors	245	0	0.0%
Legg Mason	204	0	0.0%

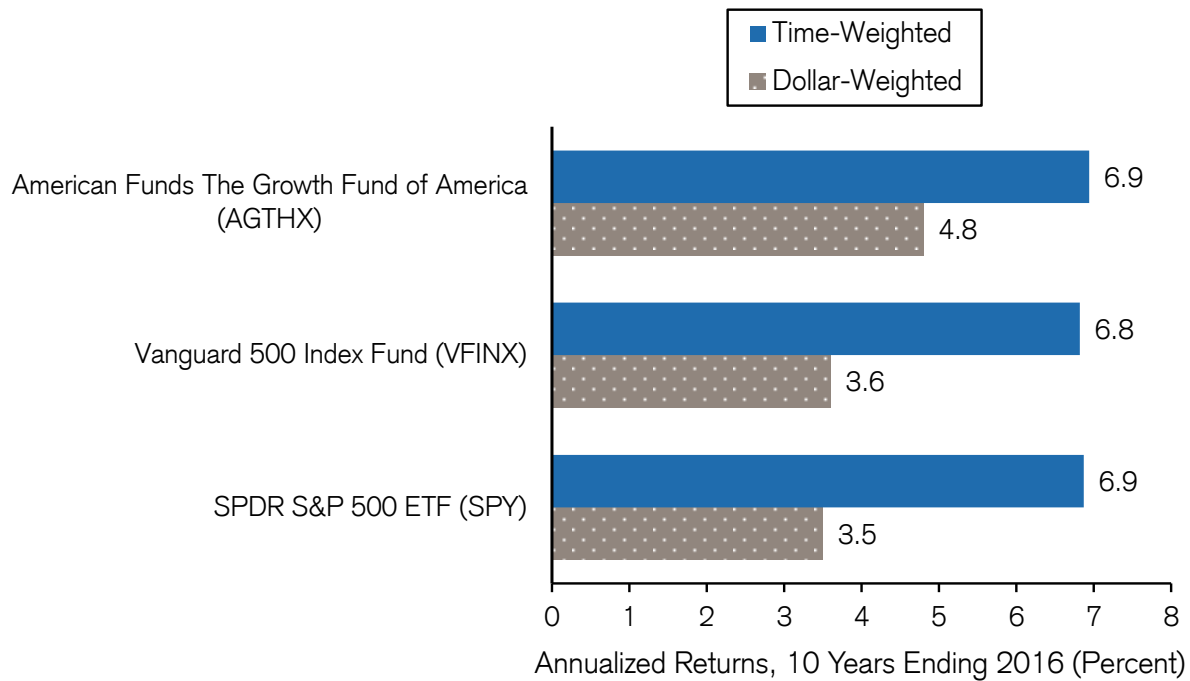
Source: Jan Fichtner, Eelke M. Heemskerk, and Javier Garcia-Bernardo, "Hidden Power of the Big Three? Passive Index Funds, Re-Concentration of Corporate Ownership, and New Financial Risk," Working Paper, October 28, 2016.

Note: Billions of U.S. dollars; Assets under management for equities only.

**Investor Behavior.** Ilia Dichev, a professor of finance at Emory University, introduced the analysis of time-weighted versus dollar-weighted returns for funds.<sup>43</sup> He finds that the realized returns for many investors in mutual funds and hedge funds are lower than those of a buy-and-hold strategy. This difference represents the timing of investments and the wealth transfers that result. These wealth transfers consider the role of participants other than investors, including companies that buy and sell their own stock.<sup>44</sup>

We saw that investors actively trade ETFs. Exhibit 17 shows the annualized time-weighted and dollar-weighted returns for The Growth Fund of America (AGTHX), the Vanguard 500 Index Fund (VFINX), and the SDPR S&P 500 ETF (SPY). Each is comparable to the S&P 500. For the 10 years ended in 2016, the three investments had time-weighted returns that were nearly identical. However, The Growth Fund of America had the highest dollar-weighted return, at 4.8 percent. That exceeded the 3.6 percent dollar-weighted return for the Vanguard 500 Index Fund and an estimated 3.5 percent return for the SDPR S&P 500 ETF.

**Exhibit 17: Dollar-Weighted and Time-Weighted Returns for Three Investments**



Source: Morningstar; www.seeitmarket.com; Credit Suisse.

**The Drivers of Mutual Funds and Passive Investing**

From the launch of the first mutual fund, Massachusetts Investment Trust, in March 1924 to an industry with \$7.5 trillion in assets under management today, the growth in the U.S. equity mutual fund industry has a handful of drivers. These include regulation, the market environment, technology, and the balance of informed and uninformed investors. Each of these has also contributed in some degree to the shift from active to passive investment. We consider each.

**Regulation.** Regulation has played a substantial role in the development of the mutual fund industry.<sup>45</sup> Exhibit 18 summarizes some of the key regulations and rulings since 1933 and provides a brief discussion of the significance for the industry. We segregate these regulations into three categories: those that protect investors, those that promote growth in the industry, and those that encourage investment in passive funds.

Prior to 1933, investors in stocks and funds were treated poorly by today’s standards. Disclosure was meager, costs were high, and agents commonly placed their interests ahead of those of the principals they served. The Securities Exchange Act of 1934 and, in particular, the Investment Company Act of 1940, addressed those issues. The Securities Exchange Act created the Securities Exchange Commission (SEC) with the goal of protecting investors. The Investment Company Act of 1940 dealt with specific prior abuses and stated what the investment industry could and could not do.

From the time the 1940 Act passed to 1960, the assets under management for the mutual fund industry went from \$450 million to \$17 billion, close to a 20 percent compound annual growth rate.<sup>46</sup> This growth was the result of good market gains, new entrants into the industry, and rising public confidence in mutual funds.

**Exhibit 18: A History of Regulation in the Mutual Fund Industry**

Year	Regulation/Ruling	Significance for Mutual Fund Investors
1933	Securities Act of 1933	Mandated disclosure of new securities via prospectus
1934	Securities Exchange Act of 1934	Established Securities and Exchange Commission (SEC) to protect investors
1936	Revenue Act of 1936	Granted conduit tax treatment and made funds subject to federal regulation
1940	Investment Company Act of 1940	Prevented abuses of the past and permitted investment companies to operate and innovate on behalf of investors
1958	Ruling by U.S. Court of Appeals for the Ninth Circuit	Allowed Insurance Securities, Incorporated, against the objection of the SEC, to sell shares in the investment corporation
1962	Self Employed Individuals Tax Retirement Act of 1962	Allowed self-employed individuals to establish "Keogh" retirement plans
1970	Investment Company Amendments Act of 1970 (1970 Amendments)	Added new safeguards for public investors, including increasing the independence of boards of directors and restrictions on sales charges and fund expenses
1974	Employee Retirement Income Security Act of 1974	Established minimum standards for pension plans in private industry and dealt with tax effects; created the first individual retirement accounts (IRAs); increased permissible contributions to Keogh plans; authorized mutual funds as an investment medium
1978	Revenue Act of 1978	Section 401(k) of the tax code sanctions salary reductions as a source of plan contributions
1980	Bearing of Distribution Expenses by Mutual Funds (12b-1)	Permission to use fund assets to pay broker-dealers for providing services that are intended to result in the sale of the fund's shares
1981	Economic Recovery Act of 1981	Allowed any worker to make a tax deductible contribution of up to \$2,000 to an IRA
2000	Regulation Fair Disclosure (Reg FD)	Prohibits companies from giving selective disclosure of material nonpublic information to financial professionals
2004	Shareholder Reports and Quarterly Portfolio Disclosure of Registered Management Investment Companies	Improved disclosures about costs and holdings
2016	Department of Labor Fiduciary Rule	Advisors must go beyond client suitability to a fiduciary responsibility to put the interests of clients first

Source: Matthew P. Fink, *The Rise of Mutual Funds: An Insider's View* (Oxford, UK: American Oxford University Press, 2008); William J. Baumol, Stephen M. Goldfeld, Lilli A. Gordon, and Michael F. Koehn, *The Economics of Mutual Fund Markets: Competition Versus Regulation* (Norwell, MA: Kluwer Academic Publishers, 1990); Investment Company Institute, *2016 Investment Company Fact Book*.

A second category of regulations and rules encouraged growth in the industry. These include the Revenue Act of 1936, a ruling by a district court in 1958, the Employee Retirement Income Security Act (ERISA) of 1974, the Revenue Act of 1978, and The Bearing of Distribution Expenses decision in 1980.

Mutual funds were at risk of becoming nonviable as the result of tax law changes in the 1930s. One proposal had the investment companies paying a tax once, and the shareholders a second time, on the dividends the fund received. The Revenue Act made a mutual fund exempt from taxation assuming it met certain criteria, allowing fund holders the same treatment as direct shareholders.

In 1958, the U.S. Court of Appeals for the Ninth Circuit ruled that an investment company could be sold. This was over the objection of the SEC, which believed that such a transaction was a breach of fiduciary duty.<sup>47</sup> This opened the door for M&A and initial public offerings for investment management firms.

Today, of the 50 largest mutual fund management companies, 28 are owned by financial conglomerates, 11 are public companies, 10 are private companies, and 1 is a mutual. The key point is that the 1958 ruling created the opening to think about the investment industry as a business, with an emphasis on profit, versus a profession, with an emphasis on results for investors.<sup>48</sup>

While defined benefit programs were ERISA's main focus, the legislation paved the way for rapid growth in mutual funds in a few ways. ERISA tripled the allowable contributions into retirement plans (Keogh) for the self-employed where mutual funds were already strong, permitted investments in mutual funds for 403(b) plans which had been restricted to insurance company annuities, established individual retirement accounts (IRAs) for workers not covered by their employer's plan, and laid out the fiduciary standards for self-directed plans that invested in mutual funds.<sup>49</sup>

The Revenue Act of 1978 sought to clarify some tax issues, but also created a large tailwind for mutual funds. Defined contribution plans could invest in mutual funds without worrying about fiduciary responsibility and an employer would not be responsible for the employee's investment choices provided it offered a wide range of alternatives. Mutual funds also started to gain more awareness through stars such as Peter Lynch, and newspapers started to quote prices daily. Add this to a bull market that emerged in the early 1980s and rapid growth ensued.

Finally, in October 1980 the SEC adopted rule 12b-1, which allowed mutual funds to pay for distribution. For example, investment companies used 12b-1 fees to pay financial advisers to sell their funds. This, too, accelerated growth in assets under management.

This set of regulations and rulings, when paired with the bull market of the 1980s and 1990s, led to extraordinary growth. Equity mutual funds in the U.S. had \$54 billion in assets in 1982, the year the bull market started, and \$3.9 trillion in 2000, the year the bull market ended.<sup>50</sup> Nearly all of these assets were actively managed in 1982, and passive funds were only about 10 percent of the total in 2000.

The final category of regulations has promoted the shift from active to passive funds. These include Regulation Fair Disclosure (Reg FD) implemented in 2000, the SEC's initiative to enhance mutual fund expense and portfolio disclosure in 2004, and the Department of Labor Fiduciary Rule, adopted in 2016.

While cheap access to information is desirable, regulators have focused in particular on uniform information dissemination. Reg FD, ratified in 2000, requires companies to disclose material information to all investors simultaneously. Research shows that the returns for some large fund families suffered following the implementation of the regulation, suggesting these investors did receive preferential treatment.<sup>51</sup> This degradation of results may have contributed to the migration from active to passive.

Disclosure is always high on the SEC's list of priorities, and in 2004 the commission pressed for greater disclosure of holdings and fees. This transparency allowed mutual fund holders to more readily compare the expense of their funds to less expensive passive alternatives. From 1990-1999, the S&P 500 had a compound annual total shareholder return of 18.2 percent. There was little focus on fees. From 2000-2009 the S&P 500's annual return was -1.0 percent, making the cost differential between active and passive even more pronounced.

In April 2016, the Department of Labor passed the fiduciary rule, which requires financial advisers to recommend what is in the best interests of clients when they offer advice on retirement savings. This affects more than \$3 trillion in assets. Prior to the ruling, some investment advisors were held to a "suitability standard," which ensures only that an investment is suitable for the client. With the fiduciary rule, an advisor choosing between two funds with similar characteristics will be pressed to select the less expensive one. This favors passive investment.

**Market Environment.** Flows into passive funds and out of active funds have accelerated in the last 10-15 years. We believe that this shift reflects, in part, the results for the stock market. Strong growth in active management correlates with high returns in the market, and when markets are weak investors seek alternatives. Prime years for growth in active management included the 1940s-1950s and the 1980s-1990s. The 1970s and the first 15 years of this century have presented a much larger challenge.

There is precedent for investors fleeing actively managed equity mutual funds following poor stock market results. The 1970s are instructive. After strong years in 1971-72, assets under management for the U.S. equity mutual fund industry were \$56 billion. Money market funds were not yet launched.

Following the sharp bear market of 1973-74, assets under management for equities dipped to \$31 billion, while nascent money market funds reached \$2 billion. By 1980, money market funds had \$76 billion in assets and equity funds had only \$44 billion.<sup>52</sup> The yields on money market funds were attractive relative to the stock market, rising from the mid-single digits in the mid-1970s to low double-digits by 1980. The broader point is that the market environment influences how investors allocate assets within their portfolios.

The S&P 500 had a total shareholder return of 4.5 percent from the beginning of 2000 through the end of 2016, with almost a quarter of those years having negative returns. Once again, investors sought to make changes. Flows into bond funds have exceeded those of equity funds since 2000, and in the last decade active funds have lost substantial assets to passive funds.

**Technology.** Perhaps nothing has affected the investment landscape more than technology in the past half century. Specific drivers include advances in the speed and cost of information dissemination, computing, trading, and communication. The advent of the Internet, in particular, has allowed the tools of investing to be shared with a larger population at a lower cost than ever before.

There are a few requirements for a securities market to function well, including cheap and accurate information, uniform disclosure of that information, and secondary markets that have low costs and limited constraints.<sup>53</sup> Technology has allowed for progress across each of these requirements.

The Internet, which diffused quickly across the population since its commercial introduction in the early 1990s, now allows investors to obtain information at a very low cost. Access to company data, including regulatory filings and stock quotes, was more time consuming and costlier prior to the advent of the Internet. Because of Moore's Law, which allowed for substantial performance improvement over time, the costs of computing, communication, and storage have all plummeted in recent decades.

One particularly important consequence of this access is an improved ability to make comparisons. Investors can now see the performance of their portfolio in real time, and can consider investment opportunities quickly and with little effort. For example, investors can now easily compare the expenses of two similar funds in order to make an informed decision.

Finally, it is clear that technology has dramatically lowered transaction costs. Prior to May 1, 1975, commissions on stock purchases on U.S. exchanges were regulated and high. The first index fund (see appendix) was non-viable because of the cost of trading and administration. The transaction cost per share is much lower and bid-offer spreads are substantially smaller than in the past.<sup>54</sup> Algorithmic trading, while controversial to some, has been shown to improve liquidity.<sup>55</sup> These developments have allowed the index fund industry to emerge and for the industry to charge progressively lower fees over time.

The combination of cheap computing power, lots of data, and low transaction costs has allowed quantitative funds to emerge. Perhaps the best known of these is Renaissance Technologies.<sup>56</sup> Many of these funds trade frequently, aiding both price discovery and liquidity. For these active funds to win someone on the other side of the trade must lose.

The main implication here is that computer programs, built by humans, may exceed human judgment in investing. David Siegel, founder of the quantitative fund, Two Sigma, recently said, “Eventually the time will come that no human investment manager will be able to beat the computer.”<sup>57</sup> This presents a challenge for traditional mutual funds. We believe that a combination of man and machine may be a viable alternative to either all fundamental or all quantitative approaches.<sup>58</sup>

Active managers have to consider people, process, and information in the search to gain edge.<sup>59</sup> There has historically been a chasm between qualitative and quantitative investment approaches. The skills required to succeed in the future are likely to be at an intersection of these approaches. Process relates to decision making. Technology allows for greater rigor in modeling corporate performance, simulation, and position sizing. Finally, edge is information. Translating data into information is a central challenge in investing.

Those active managers that cannot incorporate technology into their businesses will likely lose assets to passive strategies. Technology is a two-edged sword: it contributes to excess returns if used effectively but also promotes disintermediation.

**Balance of Informed and Uninformed Investors.** The final driver of the shift from active to passive is at the heart of this discussion. Our point of departure is a paper by two economists, Sanford Grossman and Joseph Stiglitz, called “On the Impossibility of Informationally Efficient Markets.”<sup>60</sup> The paper was published in 1980, which is noteworthy because the 1970s were probably the peak in enthusiasm for the efficient market hypothesis.<sup>61</sup>

Their basic argument is that markets cannot be perfectly informationally efficient because there is a cost to gathering information and reflecting it in asset prices. Investors who absorb those costs should receive a proportionate benefit. That benefit comes in the form of excess returns as the result of inefficient prices.

This leads to a paradox: the more individuals who are informed, the more efficient prices become, and the less value there is in being informed. Efficient prices lead investors to move from active to passive, which may create inefficiencies from which active managers can profit. So if everybody invests actively, you want to be passive. If everyone invests passively, you want to be active. This is similar to the “El Farol Bar Problem” in game theory.<sup>62</sup>

We believe that the drivers above, most notably technology, led to more efficient asset prices. As a result, in recent years the cost of active management outstripped the benefit in the Grossman-Stiglitz model. The move to passive reduces the amount that investors spend, bringing the cost-benefit balance closer to even.

We cannot have a world of passive investors only and we are not going back to all active managers. The problem is that the equilibrium is dynamic. Here are some considerations that may help determine the balance between active and passive.

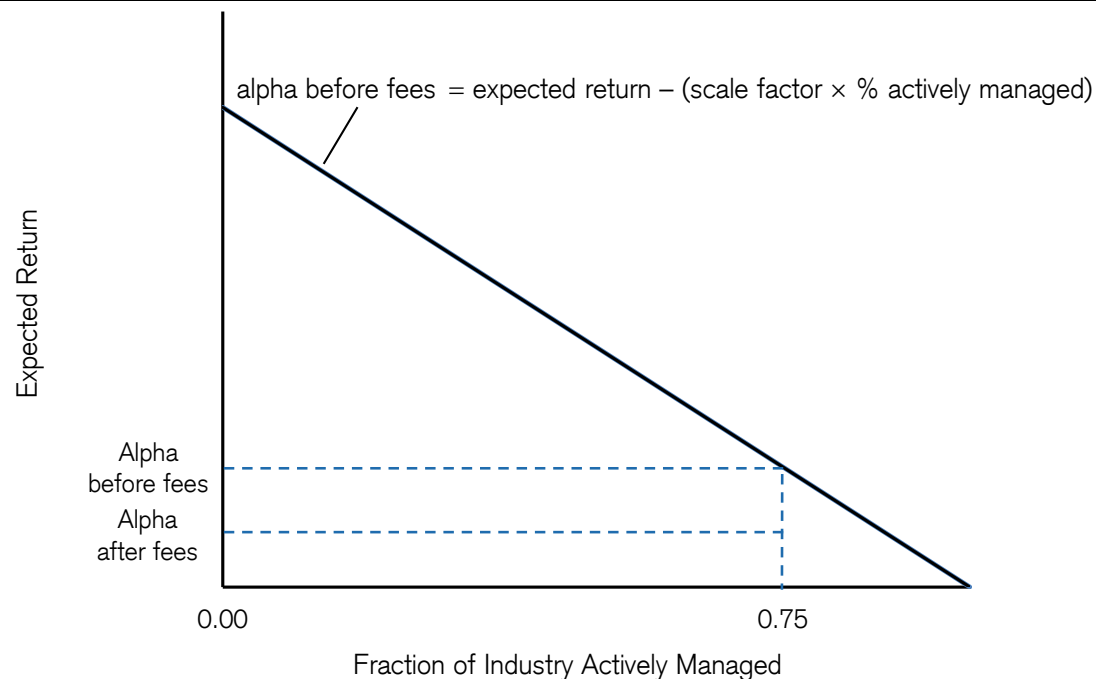
We start with a model developed by the finance professors, Ľuboš Pástor and Robert Stambaugh.<sup>63</sup> The core assumption of their model, consistent with Grossman-Stiglitz and Berk and Green, is decreasing returns to scale for the asset management industry. The higher the fraction of the industry that is active, the lower the expected return. They use the following equation to model decreasing returns to scale:

$$\alpha = a - b(S/W)$$

Where  $\alpha$  is the industry's expected return in excess of passive benchmarks,  $a$  is the expected return on the fraction of wealth invested in active, net of costs,  $b$  captures decreasing returns to scale, and  $S/W$  is the percentage of the industry that is active.

Exhibit 19 shows this tradeoff. In this simple model, we assumed  $a$  is 10 percent,  $b$  is 0.10 and  $S/W$  is 0.75, which means that 75 percent of the U.S. equity industry is managed actively. These are all close to what has been observed empirically. The central insight is that investors have to adopt a point of view on what values the parameters will take to come up with the proper allocation between active and passive.

### Exhibit 19: A Model of Decreasing Returns to Industry Scale



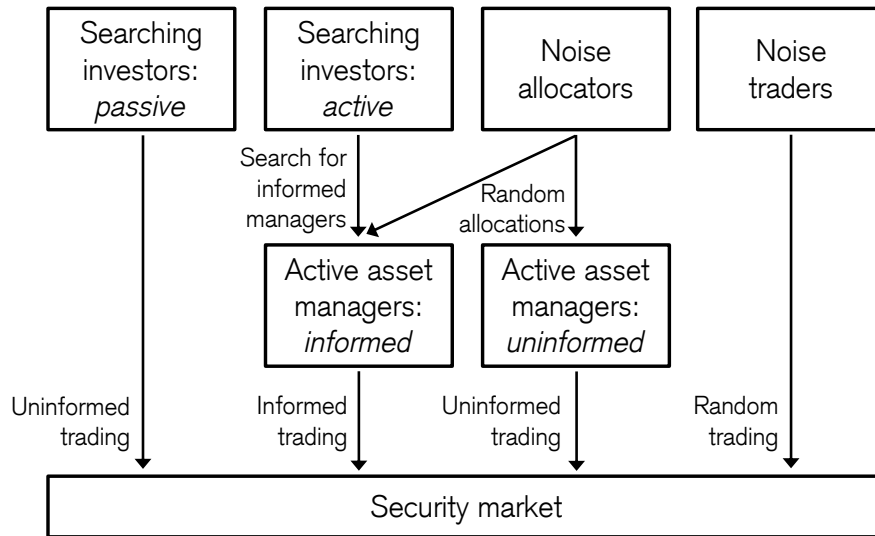
Source: Ľuboš Pástor and Robert F. Stambaugh, "On the Size of the Active Management Industry," *Journal of Political Economy*, Vol. 120, No. 4, August 2012, 749.

This model is very simple, so it is reasonable to ask whether the basic relationship between active and passive management explains returns. One way to address this question is to look at active management and indexing in markets around the world. Recent research concludes "that active funds perform better in markets in which low-cost explicitly indexed funds are more available."<sup>64</sup> The fact that competition drives down fees and compels active managers to position their portfolios with higher active shares explains this result.

A problem remains, though, which goes right back to our poker game metaphor. Passive investors always earn the benchmark returns minus their small fees. For some active managers to win in the form of excess returns, others must lose. This is implicit in the Pástor and Stambaugh model.<sup>65</sup> Further, investors have to be able to find the skillful managers, and may incur costs doing so.

Nicolae Gârleanu and Lasse Pedersen, professors of finance, built a model to reflect those considerations.<sup>66</sup> Exhibit 20 shows its main features. Note the role of noise traders and noise allocators. These are the losers. Further, smart investors incur search costs to find the informed active managers. In Gârleanu and Pedersen's model, informed asset managers outperform the uninformed asset managers and searching for informed asset managers benefits sophisticated investors.

**Exhibit 20: A Model of Efficiently Inefficient Markets**



Source: Nicolae Gârleanu and Lasse Heje Pedersen, "Efficiently Inefficient Markets for Assets and Asset Management," Working Paper, February 10, 2016.

The Gârleanu and Pedersen model makes it clear that small investors should invest in passive vehicles. It also captures a number of empirical observations that add nuance to the debate about active and passive strategies. For example, the model is consistent with the following results:

- Mutual funds that offer an institutional share class deliver higher returns than other mutual funds.<sup>67</sup> This fits with the notion that smart investors, usually institutions, are better able to identify skilled managers through effective due diligence.
- Funds of investment managers that cater to institutional investors only outperform the funds of managers that focus on retail investors.<sup>68</sup> Further, asset managers that deal exclusively with institutions generate excess returns after fees, unlike the average retail mutual fund.
- The mutual funds that searching investors buy directly deliver higher returns than the funds that are sold by brokers.<sup>69</sup> Because the brokers earn commissions, their incentives may not be fully attuned toward excess returns for their clients.
- Searching investors generate more attractive returns in less efficient markets. One study concluded "that the value of active management depends on the efficiency of the underlying market and the sophistication of the investors."<sup>70</sup> Specifically, active management outperformed passive by 180 basis points per year in emerging market equities, and by 50 basis points in Europe, Australasia and Far East (EAFE).

Consistent with the final point, evidence for decreasing returns to scale, central to the Berk and Green and the Pástor and Stambaugh models, is absent in many markets around the world.<sup>71</sup> There appear to be more weak games outside the U.S. than in it. Investors should consider each asset class carefully and consider ranking them based on the degree of efficiency and hence expected returns for active management.

David Swensen, the chief investment officer of the Yale University endowment, suggests using the dispersion of asset manager returns as a proxy for the opportunity for active management.<sup>72</sup> He examines the difference in results between first and third quartile managers, and notes that the larger the range, the more it pays to find top quartile active managers. Yale has done a good job of that.

Exhibit 21 shows the dispersion between first and third quartile managers over the past five years for seven asset classes. The dispersion for emerging market debt funds is much larger than that for U.S. investment grade debt funds, and international small capitalization funds have greater dispersion than do U.S. large capitalization funds.

**Exhibit 21: Dispersion in Returns**

<u>Actively-Managed Funds</u>	<u>Percentage Points</u>
U.S. Investment Grade Long	1.3
U.S. Large Cap Core Equity	2.5
U.S. Small Cap Core Equity	2.8
Global Equity Funds	3.1
International Small Cap Equity	3.6
U.S. Real Estate Equity	4.8
Emerging Market Debt	6.6

Source: Aye M. Soe, "SPIVA® U.S. Scorecard: Year End 2015," S&P Dow Jones Indices Research, March 11, 2016. See <https://us.spindices.com/documents/spiva/spiva-us-yearend-2015.pdf>.

Note: Annualized total shareholder returns for five years ending December 31, 2015.

A number of drivers, including regulation, market conditions, and technology have built the mutual fund industry. Many of these same drivers are behind the shift from active to passive investing.

The Grossman-Stiglitz model tells us that getting a handle on the level at which markets are "efficiently inefficient" is vital. This is tricky because it requires estimates of the participation of informed and uninformed active investors as well as passive investors. But the general observation is that the ratio of active to passive management should decline as market efficiency increases.

## Finding the Easy Game

When discussing market efficiency, behavioral economists generally distinguish between the concepts of “prices are right” and “no free lunch.”<sup>73</sup> Prices are right means that investors have access to all information, agree on the implications, have sensible preferences, and set prices accordingly. Markets are informationally efficient. No free lunch says that there are no investment strategies that can reliably earn excess returns after adjustment for risk. In other words, it is hard to beat the market.

If prices are right, there is no free lunch. But just because there is no free lunch does not mean that prices are right. One of the main reasons for this is the limits of arbitrage. These limits include implementation costs and substitution risk. Prices can be wrong and it can still be hard to beat the benchmark.

It is also worth mentioning that Sharpe’s fundamental law of active investing is not ironclad. This is because index funds must trade in order to constantly mirror the index. Triggers for trading include share repurchases, seasoned equity offerings, and mergers and acquisitions. These trading costs can be as large as 20-30 basis points for funds tracking the S&P 500 and 40-75 basis points for Russell 2000 index funds.<sup>74</sup>

Some of these costs are offset by activities such as securities lending.<sup>75</sup> The point is that some active managers can benefit at the expense of passive investors, although they must have a process that is organized to do so.

Active investors must believe in price inefficiency and efficiency. Inefficiency allows the investor to buy something for less than it is worth, or sell it for more than it is worth, and efficiency ensures that the security price moves toward that fundamental value. The challenge is to find edge: be the smartest player at the poker table.

We turn to the possible sources of excess returns for active investors. These include competing with individuals, competing with investors who buy or sell without regard for fundamental value, and wealth transfers within the market. These categories are not mutually exclusive, but provide a roadmap for considering who is on the other side.

**Competing Against Individuals.** As indicated in the introduction, individual investors can be a good source of excess returns for institutional investors. A survey of the behavior of individual investors noted that “the evidence indicates that the average individual investor underperforms the market—both before and after fees.”<sup>76</sup>

For example, one study of all of the investors in Taiwan found that institutions earned abnormal excess returns of 1.5 percentage points while individuals lost 3.8 percentage points.<sup>77</sup> The researchers posit that the individuals are generally overconfident, causing them to trade too much.

Institutions generally have better information and analytical skills than individuals do. For example, institutions tend to buy stocks from individuals in cases when the stock underreacts to good news about future cash flows. Institutions outperform individuals by 1.4 percentage points in these cases.<sup>78</sup> Further, initial public offerings (IPOs) with greater participation by retail investors perform worse than those dominated by institutions.<sup>79</sup>

One of the ways that academics can measure individual investor behavior is through mutual fund flows. Research finds that individuals tend to buy mutual funds with “high sentiment,” which correlates with prior strong returns and high valuations for the underlying stocks. The managers of funds, in turn, tend to buy more shares of what they already own, bidding up the shares in the short run but leading to poor subsequent results. The researchers call this the “dumb money” effect.<sup>80</sup> The companies that these mutual funds own increase their issuance of equity via seasoned equity offerings and acquisitions financed with stock, suggesting the companies may be the winner in the exchange.

Since they must provide liquidity, mutual funds become the conduit for individual investors who are uninformed.<sup>81</sup> The price impact of outflows is particularly pronounced because of liquidity constraints.<sup>82</sup> Investors who provide liquidity to the sellers generate excess returns. This research also underscores the point that fund inflows and outflows can complicate the assessment of mutual fund manager skill.<sup>83</sup>

While the dumb money exacerbates stock price return anomalies, fund flows to hedge funds attenuate them. Researchers call these flows “smart money.”<sup>84</sup> These effects apply to stocks with high valuations. The case suggests that hedge funds benefit at the expense of mutual funds, which are reacting as a result of the behaviors of their investors. Hedge funds also take advantage of mutual funds by anticipating liquidations of mutual fund positions as the result of withdrawals by investors.<sup>85</sup>

**Competing Against Investors Who Buy or Sell Without Regard for Fundamental Value.** Informed investors buy and sell based on mispricing that is either relative (arbitrage) or absolute (fundamental investing). However, some investors trade without regard for price or value, creating opportunity for other market participants.

One example is a spin-off, where a company distributes shares of a wholly owned subsidiary to its shareholders on a pro-rata and tax-free basis. Joel Greenblatt, founder of Gotham Capital, suggests that “once the spinoff’s shares are distributed to the parent company’s shareholders, they are typically sold immediately without regard to price or fundamental value.”<sup>86</sup> Imagine that you run a sizeable mutual fund that invests in large capitalization stocks. The shares of the spin-off you receive do not fit the fund’s investment objectives and are typically an inconsequential percentage of the portfolio. A quick sale makes sense.

Substantial research shows that spin-offs create value for the spin-offs themselves as well as the corporate parents.<sup>87</sup> Researchers who did a meta-analysis of more than 25 papers in the spin-off literature summed up their findings this way: “The main conclusion is consistent: spin-offs are associated with strongly significant abnormal returns.” Researchers suggest the factors that explain these wealth effects include sharpened focus, better information, and in some cases tax treatment.<sup>88</sup>

Another example is the value premium, the empirical finding that stocks that are statistically inexpensive measured by ratios such as price-to-book and price-to-earnings outperform the market. The question is whether this premium is a product of risk or “naïve” strategies followed by uninformed investors. While the issue remains open, the balance of the research suggests that a behavioral explanation best fits the facts.<sup>89</sup> The story is that uninformed investors extrapolate past earnings growth rates too far, overreact to positive or negative news, and act as if recent price action will continue.

A final example is the leverage cycle.<sup>90</sup> Developed by John Geanakoplos, an economist at Yale University, the leverage cycle focuses on the role of margin requirements. When times are good, say in the housing market, borrowers can access capital at attractive rates and with relatively high loan-to-value ratios. But when prices turn down, not only do loans become more expensive but the loan-to-value ratios drop. In other words, the investors must put up more capital.

The leverage cycle leads to unguarded optimism on the upside and devastating selling on the downside. Sellers are forced to liquidate not only to cover the old margin requirements but also the new, more stringent demands. The leverage cycle has both buyers and sellers transacting without regard for fundamental value. Geanakoplos recommends a mechanism to manage margin requirements to take out these highs and lows.

**Competing Against Investors Who Use Simple Decision Rules.** Informed investors calculate the present value of future cash flow in order to assess an asset's fundamental value. Uninformed investors use other strategies, including the assumption that past price movement indicates the prospects for future returns.

Economists have examined the impact these approaches have on asset pricing. In one laboratory experiment, the researchers had long-term investors, who determined value by considering the present value of future dividends, and short-term investors who relied on price signals.<sup>91</sup> They found that the long-term investors settled on prices that were informationally efficient. The short-term investors, unable to assess value from dividends, were prone to bubbles and crashes. Markets are generally efficient when both groups trade, but the market becomes susceptible to distortion if the long-term investors bow out for any reason.

Markets tend to be informationally efficient when investors use heterogeneous decision rules.<sup>92</sup> This is the wisdom of crowds. The loss of diversity as the result of converging decision rules creates fragility in the market and the possibility of prices departing substantially from value. This is the madness of crowds. Diversity breakdowns, which are the same as crowding, are bad for price efficiency and liquidity.

Blake LeBaron, an economist at Brandeis University, builds agent-based models to analyze asset pricing.<sup>93</sup> One version of his model has 1,000 investors ("agents") who have portfolio objectives that are well defined. LeBaron gives the agents a menu of investment strategies that evolve over time. He then lets the agents loose *in silico* and observes the asset prices that result from their interaction. The model is simple but captures many empirical features of markets, including fat-tails, persistence, and clustered volatility.

One of the model's most important revelations is the relationship between the diversity of investment strategies and asset prices. During certain periods, the diversity of investment strategies falls steadily even as the asset price rises. Diversity reaches a low when the price is at a high. Then the asset price crashes.

LeBaron discusses how crashes happen:

During the run-up to a crash, population diversity falls. Agents begin to use very similar trading strategies as their common good performance begins to self-reinforce. This makes the population very brittle, in that a small reduction in the demand for shares could have a strong destabilizing impact on the market. The economic mechanism here is clear. Traders have a hard time finding anyone to sell to in a falling market since everyone else is following very similar strategies. In the Walrasian setup used here, this forces the price to drop by a large magnitude to clear the market. The population homogeneity translates into a reduction in market liquidity.

LeBaron's model provides two additional observations that are remarkable. The first is that the relationship between diversity loss and asset price changes is non-linear. The reduction of diversity, or crowdedness, drives the asset price higher at first. But the price decline is sudden and sharp.

The second is the link between diversity and liquidity. Lower diversity leads to less liquidity as the result of demand pressure. This factor does not come into play for large capitalization stocks such as those in the S&P 500. Indeed, inclusion into the S&P 500 tends to improve a stock's liquidity.<sup>94</sup> But this factor is relevant for uninformed investors who pile into some ETFs, where trading costs can rise.<sup>95</sup>

The rise of indexing has created distortions in the market. The evidence is mounting that passive investing has increased the valuations of the stocks going into the index as well as the correlation of the constituent stocks.

Let's start with valuation. Research shows that the rise in passive investing has led to prices that are less informationally efficient. Companies that are added to the S&P 500, for instance, see their price-to-book and price-to-earnings ratios increase immediately.<sup>96</sup>

Active funds tend to trade the same stocks as passive funds, but those stocks that are held more by passive investors are less informationally efficient than those that are held more by active investors. In mid-2016, passive index funds and ETFs owned 10 percent or more of 458 of the 500 companies in the S&P 500. In 2005, that was true for only 2 of the 500.<sup>97</sup>

The rise of passive investing has also led to an increase in correlation among the constituent stocks.<sup>98</sup> From a practical point of view, this suggests that systematic market risk has risen and the ability to diversify has fallen. This is relevant for both passive investors who base their allocations on past correlations as well as active managers who might see unanticipated behavior within their portfolios for wholly non-fundamental reasons.

For active managers, this is where the distinction between “prices are right” and “no free lunch” can be frustrating. Passive investing is creating distortion in asset prices. Prices are not right. The question is how to take advantage of it. Note again that the index fund holders will always earn the index return, and that for every active manager who wins there has to be one who loses. So no free lunch still seems to hold.

There are a few ways to benefit. First is to look for reversals in flows and act as a liquidity provider. This allows you to buy low. Second, if possible, you can short large inflows and excessive valuations. This allows you to sell high. This is inherently very risky because of the limits of arbitrage and timing. Finally, you can communicate with the management team that has a stock that is over- or under-valued. Departures from fair value provide management teams with opportunities to create value for ongoing shareholders.

**Wealth Transfers.** Corporations and investors make decisions that can lead to wealth transfers. Richard Sloan and Haifeng You, professors of finance, estimate that these wealth transfers averaged 1.8 percent of market capitalization per firm-year from 1973 through 2008.<sup>99</sup> The effect was particularly pronounced in the late 1990s. Here we describe three such transfers.

Share buybacks and dividends are equivalent in theory under certain conditions.<sup>100</sup> In reality, these conditions are never met. The condition that the company repurchases shares at fair value is particularly nettlesome. In the case that a company buys back stock that is either over- or under-valued, there is a wealth transfer.

We must underscore that there is a value conservation principle from the point of view of the company.<sup>101</sup> If a company worth \$1,000 chooses to pay out \$200, the value of the firm is \$800 following the disbursement no matter what the form of payout. The wealth transfer occurs between the selling and ongoing shareholders.

The basic rule is simple. If a company buys back overvalued stock, selling shareholders benefit at the expense of ongoing shareholders, and if it buys back undervalued stock, ongoing shareholders benefit at the expense of selling shareholders. The value of the firm does not change. The wealth transfer comes from the way the value is divided up.

Similarly, if the company sells overvalued stock, ongoing shareholders benefit at the expense of those acquiring the new shares. Selling undervalued stock hurts the ongoing holders and helps those who buy.

The strategy here is to own shares of an undervalued company that is aggressively repurchasing shares. That said, Sloan and You find that overpricing leads to larger wealth transfers than underpricing.

Another form of transfer is mergers and acquisitions (M&A). The goal of an acquirer is to pay no more than the value of the target company's expected cash flows plus the present value of synergies. If an offer exceeds that value, there is a wealth transfer from the shareholders of the acquiring company to the shareholders of the selling company.

Here are some numbers to make the concept more concrete. Say the acquiring company has an equity market capitalization of \$2,000 and finds a target that has a market value of \$800 and estimates that the synergy between the businesses is worth \$200. The combined value of the firms is \$3,000 assuming a deal. If the acquirer bids \$1,000, the selling shareholders make 25 percent and the buyers see no change in value. But say the deal is contested and the price paid rises to \$1,100. In that case, the seller is up 37.5 percent and the buying shareholders lose 5 percent. The value of the combined business is still \$3,000, but now wealth is transferred.

The empirical record shows that the combined value of the seller and buyer after a deal is announced is generally higher than the value before the deal. But it is common for more than 100 percent of the synergy value to go to the selling shareholders. The strategy here is to own shares of selling companies as well as the select acquirers with a good long-term record of success.

There is a general assumption that the return for all investors in aggregate equals the return of the market because for every buyer there is a seller. This is true for a closed system, but markets are not closed. Initial public offerings (IPOs) and seasoned equity offerings (SEOs) are examples.

The story is straightforward: companies that issue equity tend to underperform the market subsequently.<sup>102</sup> This is true whether or not the issuance is part of the financing for an M&A deal. This is also true at the market level. Returns for the market tend to be relatively poor following lots of stock issuance.

Another trend to watch is government intervention in equity markets. While researchers have documented and debated central bank actions in the fixed income markets, some governments have become big shareholders. For example, in Japan the central bank is a top-ten holder of about 30 percent of the companies in the top indexes, and in China a state-owned fund is a top-ten holder of about 40 percent of the listed companies.<sup>103</sup>

The literature on wealth transfers complements the finding that dollar-weighted returns are less than time-weighted returns for investors.

## Recommendations

**Investors.** Following the model by Gârleanu and Pedersen, we can now offer some recommendations for investors who seek satisfactory long-term results.

- **Don't Be the Patsy.** Indexing makes a great deal of sense for investors who do not have the time or sophistication to evaluate investment managers. This is relevant for most individuals. These investors should focus on allocating assets appropriately and minimizing costs.
- **Seek Dispersion.** Research shows that there is more opportunity for excess returns in asset classes where the dispersion of returns for asset managers is wide. Since markets demonstrate varying degrees of efficiency, it makes sense to consider the trade-off between active and passive case by case. Investors should also be alert to the possibility of other costs and risks, including legal and political ones, for apparently inefficient markets.

- **More Sophisticated Search.** Academics suggest that careful examination of four factors allow for a better probability of identifying skillful active managers.<sup>104</sup> The first is an examination of past performance following some important adjustments for factors and random skewness in returns. Next, there is evidence that some managers do better in certain macroeconomic environments. Managers who are well educated, as evidenced by their college, SAT scores, graduate school or business school, and attainment of a chartered financial analyst credential, tend to outperform those who are less educated. Further, managers from poor families generate more alpha than those from rich families.<sup>105</sup> Finally, analysis of fund holdings, which is difficult for unsophisticated investors to access, reveals that contrarian managers outperform managers who herd.<sup>106</sup>
- **Build Your Own Index.** Andrew Lo, a professor of finance at the MIT Sloan School of Management, suggests that we are on the cusp of developing indexes that capture a particular investment strategy.<sup>107</sup> He suggests that an index should be transparent, investable, and systematic. Ironically, the most popular index in the world, the S&P 500 Index, does not embody the third property. Lo argues that sharp drops in the cost of structuring and trading securities introduces the possibility of customized indexes.

**Fundamental Asset Managers.** The question any active fundamental investor must ask constantly is, “What is my source of edge?” An equivalent question is, “Who is on the other side?”<sup>108</sup> Possible sources of edge include better information than the market, sharper analytical skills that allow you to better interpret data, a different time horizon, and the liquidity to take the other side of investors making behavioral blunders. One provocative idea is to start the investment process with a screen for potential inefficiency rather than, for example, cheap stocks.

Each source of edge requires a process that is congruent with the goals. A common mistake in the investment industry is to engage in activities that do not effectively serve the objective of finding edge.

In markets around the world where explicit indexing is high, active managers tend to deliver greater alpha and charge lower fees. Part of the explanation is a reduction in closet indexing, which has the returns of an index fund and the fees of an active manager. Active managers in these countries compete on differentiation and price.<sup>109</sup>

Here are some potential ways that an active manager can remain relevant:

- **Be Active.** The data show that passive investing is taking share from active funds that are closet indexers (see exhibit 14). Closet indexers have difficulty generating acceptable returns because they are charging relatively high fees on a large percentage of the portfolio that simply mimics the benchmark. Research shows that the best ideas within a portfolio generate excess returns.<sup>110</sup> Notwithstanding their generally higher fees, the cost of the active component of many hedge funds is similar to that of mutual funds.<sup>111</sup>
- **Be Long-Term Oriented.** The advent of cheap computing and ample price data has led to analysis of price action versus a calculation of fundamental value.<sup>112</sup> Machines can beat humans at this game. This does raise the possibility that active investors can benefit from taking a longer-term point of view. Said differently, excess returns may be available in the short run through quantitative approaches but in the long run through fundamental analysis. Indeed, funds with high active share and low turnover, implying a long-term investment horizon, generate substantial excess returns.<sup>113</sup>

- **Use Quantitative Methods.** There are at least three ways that active fundamental managers can benefit from quantitative methods. Active managers should understand how much of their performance can be attributed to standard factors such as size and valuation. If investors can gain exposure to those factors cheaply, they will not be inclined to pay active managers for the same exposure.

Recently, two finance professors, Kent Daniel and David Hirshleifer, have introduced both long- and short-term behavioral factors which, when combined with a market factor, outperform other well-known factor models.<sup>114</sup> The long-term factor uses the external financing activities of firms and is based on overconfidence. The short-term factor is based on post-earnings announcement drift and captures investor inattention. These factors are useful for active managers who seek to buy cheap and sell dear because they capture mispricing rather than risk.

Finally, active managers can appeal to the base rates of corporate performance in order to find stocks that reflect expectations that are too high or low. Incorporation of base rates into forecasts is known to be helpful in decision making and provides important insight into the rate of regression toward the mean.<sup>115</sup>

## Summary

The debate over active versus passive investing can take tones of religious fervor. Investors are voting with their feet, creating \$1.2 trillion of inflows for passive investments and \$800 billion of outflows for active investments in the past decade. Whenever the market forms a strong consensus, caution is in order.

Active managers provide the vital functions of price discovery and liquidity, but do so at a relatively high cost. As a consequence, active managers do not generate excess returns after fees in the aggregate. Passive investments have much lower costs, but raise the possibility of crowding.

Not only can active and passive co-exist, they must. The reason is that there is a cost of gathering information and reflecting it in prices, and there needs to be an offsetting benefit in the form of excess returns to compensate. Markets need to be efficiently inefficient. Passive investors, and indeed members of society, rely on the price discovery that active managers deliver.

The rise of passive investing may appear to make active management easier. But that is unlikely for two reasons. First, it is probable that the investors who are moving their funds to passive vehicles are relatively unsophisticated. That means that the average skill for the remaining active managers is rising, making it more difficult to beat the market. Second, because alpha is a zero-sum game, fewer weak players means it is harder to find a corresponding loser if you intend to win.

Small and unsophisticated investors should build passive portfolios with an emphasis on asset allocation and low costs. Sophisticated investors should seek active managers in asset classes with high dispersion. There are ways to assess money managers beyond past performance that may shade the odds in your favor.

Active managers must constantly consider who is on the other side of the trade. Research shows that fundamental money managers who take a long view and are truly active can deliver excess returns. It is essential to identify a repeatable source of edge, and to align the investment process to capture that edge.

## **Acknowledgment**

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## Appendix: The Academic Case for Indexing and Smart Beta

An investment, in its most fundamental sense, is the deferral of consumption in the present in the hope of greater consumption in the future. You cannot spend a dollar that you save today, but if you invest it successfully you can spend more than a dollar tomorrow. Productive investments fund future liabilities such as college expenses and retirement income, or simply allow you to have more money to spend in the future.

Active money managers seek to find investments that offer attractive rates of return relative to their perceived risk. The global market for stocks and bonds is huge. The capitalization is roughly \$67 trillion for the global stock market, \$48 trillion for the corporate bond market (financial and non-financial), and \$58 trillion for government debt.<sup>116</sup>

Each of these markets pulsates with activity. For example, equity markets have constant news flow about corporate results and prospects, new listings through initial public offerings and spin-offs, delistings as the result of mergers and acquisitions and bankruptcy, and cash going back to shareholders through dividends and share buybacks. There are a lot of moving parts. The task of the active manager is to sift through this information and opportunity and select securities that will deliver good returns.

In 1884, Charles Dow started an index to reflect the stock market's results. Dow selected 11 securities that he felt would represent the market overall. Since then, hundreds of indexes have been established. Some of the more prominent ones include the S&P 500 Dow Jones Index (U.S. equities), the Nikkei (Japanese equities), the Barclays Bond Index (U.S. corporate bonds), and the MSCI Global Index (global equities). Dow's original index, the Dow Jones Industrial Average, was eventually expanded to 30 stocks and still exists today. Commentators commonly use the Dow to summarize the market's results even though its practical relevance has waned. Of the more comprehensive index of 12 stocks that Dow established in 1896, only General Electric remains in the Dow Jones Industrial Average.

Finance theory as we know it today was largely established in the 1950s and 1960s. In 1952, Harry Markowitz, a graduate student at the University of Chicago studying operations research, suggested that the optimal portfolio is one that offered the highest expected return for a given level of risk, measured as the variance of expected returns.<sup>117</sup> Up to that point, investors thought a lot about returns but spent little time formalizing the notion of risk. Markowitz's mean-variance theory shifted the attention away from individual stocks toward a portfolio and made clear the benefit of diversification.

In the early 1960s, William Sharpe, a professor of economics, defined the capital asset pricing model (CAPM).<sup>118</sup> He identified a single factor, designated by the Greek letter beta ( $\beta$ ), as a measure of a security's risk relative to the market. More formally, beta measures the covariance between an asset and the market as a whole. Use of beta allows for simpler portfolio construction. Adding stocks with high betas increases the risk of the portfolio, and adding those with low betas dampens risk.

Markowitz's approach required calculating the covariance between all of the securities that an investor was considering including in a portfolio. In 1961, it took the best commercially available IBM computer more than a half hour to do that calculation for 100 securities. Sharpe's approach allowed for similar results with much less computational effort. Markowitz and Sharpe shared the Nobel Memorial Prize in Economic Sciences in 1990 for their contributions.

Sharpe proved one more thing. The market portfolio, the portfolio of all risky assets weighted by their market capitalization, is where you get the best return for the risk you assume. The theories of Markowitz and Sharpe suggest you want to own the market.

These two theories laid the groundwork for what was to come next.

In the late 1960s, investors started to take these academic ideas seriously. Wells Fargo established the first index fund with a \$6 million contribution from the pension fund of Samsonite, a luggage manufacturer. The fund owned the roughly 1,500 stocks that traded on the New York Stock Exchange in equal weights.<sup>119</sup> Because commission costs were high and fixed, the cost to administer and trade the fund made it difficult to justify. In 1973, Wells Fargo set up a fund to track the S&P 500 using money from its pension fund along with the pension fund of Illinois Bell. In 1976, Samsonite consolidated its money into that fund as well.

In August 1976, Jack Bogle, recently fired as the president of Wellington Management, a firm dedicated to active management, launched the first true index fund. Encouraged by the academic literature, the Vanguard Group sought to raise \$150 million for its First Index Investment Trust but managed to collect only \$11 million.<sup>120</sup> Index funds were slow to gain popularity, reaching a level just above \$500 million in 1985. But U.S. retail index funds grew to \$48 billion by 1995, or about 4 percent of all assets under management in U.S. equities, and reached nearly \$1.5 trillion, or one-quarter of assets, in 2015.

The CAPM also gained widespread use. For example, the CAPM is commonly employed to estimate the cost of capital and to assess the results of portfolio managers. But financial economists tested whether its most basic prediction, that risk ( $\beta$ ) and return are related, holds. They found that relative to the CAPM, stocks with lower risk earned higher returns than they were supposed to and that stocks with higher risk earned lower returns.

Starting in the 1980s, researchers found that including other factors explained returns more effectively than the CAPM alone.<sup>121</sup> This was consistent with work by Stephen Ross on arbitrage theory that was published in 1976. Ross's model allowed for multiple sources of systematic risk.<sup>122</sup>

In 1992, a pair of finance professors, Eugene Fama and Kenneth French, described a three-factor model that better explained returns than the CAPM by itself.<sup>123</sup> The first factor is beta, but the others include size (small capitalization stocks generate higher returns than large capitalization stocks) and value (cheap stocks outperform expensive ones). They later suggested that practitioners should not use the CAPM, writing, "Unfortunately, the empirical record of the model is poor—poor enough to invalidate the way it is used in applications."<sup>124</sup>

Financial economists have identified other factors that explain returns, including momentum, profitability, and investment rate.<sup>125</sup> Fama and French today advocate a five-factor model (CAPM, size, value, profitability, and investment patterns).<sup>126</sup> Establishing these factors led the way to "smart beta," which attempts to do better than a traditional market-capitalization-weighted index by creating portfolios of stocks based on how they score on these and other factors, rather than by simply their market capitalization.

One crucial question is whether the excess returns these factors imply are the result of risk or behavioral mistakes by investors.<sup>127</sup> If it is risk, the story is not very exciting because your returns are commensurate with the risk you assume. The main contribution of the factor analysis is the proper identification of the risk factors. Hence the name "smart beta."

The story is much more interesting if the factors reflect behavioral mistakes because the returns are above and beyond what you would expect from the risk you have assumed. Some research suggests that the value premium, as an example, is the result of behavioral bias.<sup>128</sup> If so, investors who capture the value premium by avoiding bias may earn true excess returns.

One major challenge with factors is that they tend to work episodically.<sup>129</sup> For example, the size factor was identified in the later 1970s and early 1980s. But if you had bet on that factor the moment that research was published, you would have suffered nearly two decades of underperformance.<sup>130</sup>

Another concern is whether the popularity of certain factors leads to returns that are a function of fund flows. In other words, short-term excess returns are neither compensation for risk nor exploitation of behavioral mistakes, but rather are an unjustified increase in valuation that are prompted by the demand created by fund flows. If the driver of returns is the flow of funds rather than compensation for risk, a sharp performance reversal is a distinct possibility.<sup>131</sup>

Academic research shows that it makes sense to invest in a diversified portfolio. Index funds provide a cheap way to do so. Further research has identified certain factors that explain returns better than the CAPM does, although there remains a debate as to whether those factors capture risk or behavioral mistakes. In either case, there is an intellectual foundation that supports indexing, and it is a suitable strategy for most small and unsophisticated investors.

## Endnotes

- <sup>1</sup> Warren E. Buffett, "Letter to Shareholders," *1987 Berkshire Hathaway Annual Report*.
- <sup>2</sup> Maureen O'Hara, "Presidential Address: Liquidity and Price Discovery," *Journal of Finance*, Vol. 58, No. 4, August 2003, 1335-1354 and Ekkehart Boehmer and Eric K. Kelley, "Institutional Investors and the Informational Efficiency of Prices," *Review of Financial Studies*, Vol. 22, No. 9, September 2009, 3563-3594.
- <sup>3</sup> Lasse Heje Pedersen, a professor of finance, calls markets "efficiently inefficient." See Lasse Heje Pedersen, *Efficiently Inefficient: How Smart Money Invests & Market Prices Are Determined* (Princeton, NJ: Princeton University Press, 2015).
- <sup>4</sup> Ľuboš Pástor and Robert F. Stambaugh, "Liquidity Risk and Expected Stock Returns," *Journal of Political Economy*, Vol. 111, No. 3, June 2003, 642-685.
- <sup>5</sup> Jules H. van Binsbergen and Christian C. Opp, "Real Anomalies," *Working Paper*, October 6, 2016. Van Binsbergen and Opp estimate that society's willingness to pay for eliminating alpha should be approximately a perpetual 10 percent of total firm net payout. If we say that number in the U.S. is approximately \$1 trillion, the perpetual willingness to pay is \$100 billion. For an example in the commodity industry, see Jonathan Brogaard, Matthew C. Ringgenberg, David Sovich, "The Economic Impact of Index Investing," *WFA-Center for Finance and Accounting Research Working Paper No. 15/06*, May 2016. See also James Ledbetter, "Is Passive Investment Actively Hurting the Economy?" *New Yorker*, March 9, 2016 and Paul Woolley and Ron Bird, "Economic Implications of Passive Investing," *Journal of Asset Management*, Vol. 3, No. 4, March 2003, 303-312.
- <sup>6</sup> William F. Sharpe, "The Arithmetic of Active Management," *Financial Analysts Journal*, Vol. 47, No. 1, January/February 1991, 7-9.
- <sup>7</sup> This is not strictly true for actively managed funds for two reasons. First, institutions can win at the expense of individuals. Second, there are costs associated with passive management, including rebalancing and additions and subtractions from the index. See Lasse Heje Pedersen, "Sharpening the Arithmetic of Active Management," *Working Paper*, November 2016.
- <sup>8</sup> Anne Tergesen and Jason Zweig, "The Dying Business of Picking Stocks," *Wall Street Journal*, October 17, 2016. Also, Charles D. Ellis, *The Index Revolution: Why Investors Should Join It* (Hoboken, NJ: John Wiley and Sons, 2016).
- <sup>9</sup> Edward D. Allen, "Study of a Group of American Management-Investment Companies, 1930-1936" *Journal of Business*, Vol. 11, No. 3, July 1938, 232-257; Michael C. Jensen, "The Performance of Mutual Funds in the Period 1945-1964," *Journal of Finance*, Vol. 23, No. 2, May 1968, 389-416; Burton G. Malkiel, "Returns from Investing in Equity Mutual Funds 1971-1991," *Journal of Finance*, Vol 50, No. 2, June 1995, 549-572; John C. Bogle, "The Arithmetic of 'All-In' Investment Expenses," *Financial Analysts Journal*, Vol. 70, No. 1, January/February 2014, 13-21; and Jeffrey A. Busse, Amit Goyal, and Sunil Wahal, "Investing in a Global World," *Review of Finance*, Vol. 18, No. 2, April 2014, 561-590.
- <sup>10</sup> Robert C. Jones and Russ Wermers, "Active Management in a Mostly Efficient Market," *Financial Analysts Journal*, Vol. 67, No. 6, November/December 2011, 29-45.
- <sup>11</sup> Eric Belasco, Michael Finke, and David Nanigian, "The Impact of Passive Investing on Corporate Valuations," *Managerial Finance*, Vol. 38, No. 11, November 2012, 1067-1084; Rodney N. Sullivan and James X. Xiong, "How Index Trading Increases Market Vulnerability," *Financial Analysts Journal*, Vol. 68, No. 2, March/April 2012, 70-84; and Itzhak Ben-David, Francesco Franzoni, and Rabih Moussawi, "Exchange Traded Funds (ETFs)," *Annual Review of Financial Economics*, Vol. 9, 2017.
- <sup>12</sup> Jeremy C. Stein, "Presidential Address: Sophisticated Investors and Market Efficiency," *Journal of Finance*, Vol. 64, No. 4, August 2009, 1517-1548.
- <sup>13</sup> Amir E. Khandani and Andrew W. Lo, "What Happened to the Quants in August 2007?" *Journal of Investment Management*, Vol. 5, No. 4, Fourth Quarter 2007, 29-78.
- <sup>14</sup> Richard C. Grinold, "The Fundamental Law of Active Management," *Journal of Portfolio Management*, Vol. 15, No. 3, Spring 1989, 30-37; Richard C. Grinold and Ronald N. Kahn, *Active Portfolio Management: A*

*Quantitative Approach for Producing Superior Returns and Controlling Risk, Second Edition* (New York: McGraw Hill, 2000), 147-169; Roger Clarke, Harindra de Silva, and Steven Thorley, "The Fundamental Law of Active Portfolio Management," *Journal of Investment Management*, Vol. 4, No. 3, Third Quarter 2006, 54-72.

<sup>15</sup> Jones and Wermers, 2011.

<sup>16</sup> Fischer Black, "Noise," *Journal of Finance*, Vol. 41, No. 3, July 1986, 529-543.

<sup>17</sup> Brad M. Barber and Terrance Odean, "The Behavior of Individual Investors," in George Constantinides, Milton Harris, and Rene M. Stulz, eds., *Handbook of the Economics of Finance* (Amsterdam: Elsevier, 2013), 1533-1570.

<sup>18</sup> Robert D. Arnott, Jason C. Hsu, and John M. West, *The Fundamental Index: A Better Way to Invest* (Hoboken, NJ: John Wiley & Sons, 2008), 4.

<sup>19</sup> Eugene F. Fama and Kenneth R. French, "Luck versus Skill in the Cross-Section of Mutual Fund Returns," *Journal of Finance*, Vol. 65, No. 5, October 2010, 1915-1947. Fama and French write, "If we assume that the cross-section of true  $\alpha$  has a normal distribution with mean zero and standard deviation  $\sigma$ , then  $\sigma$  around 1.25% per year seems to capture the tails of the cross-section of  $\alpha$  estimates for our full sample of actively managed funds."

<sup>20</sup> Stephen Jay Gould, "Entropic Homogeneity Isn't Why No One Hits .400 Any More," *Discover*, Vol. 7, No. 8, August 1986, 60-66. Also, Michael J. Mauboussin, *The Success Equation: Untangling Skill and Luck in Business, Sports, and Investing* (Boston, MA: Harvard Business Review Press 2012).

<sup>21</sup> Peter L. Bernstein, "Where, Oh Where Are the .400 Hitters of Yesteryear?" *Financial Analysts Journal*, Vol. 54, No. 6, November-December 1998, 6-14.

<sup>22</sup> Mark M. Carhart, "On Persistence in Mutual Fund Performance," *Journal of Finance*, Vol. 52, No. 1, March 1997, 57-82 and Laurent Barras, Olivier Scaillet, and Russ Wermers, "False Discoveries in Mutual Fund Performance: Measuring Luck in Estimated Alpha," *Journal of Finance*, Vol. 65, No. 1, February 2010, 179-216.

<sup>23</sup> Michael J. Mauboussin, Dan Callahan, and Darius Majd, "What Makes for a Useful Statistic: Not All Numbers Are Created Equally," *Credit Suisse Global Financial Strategies*, April 5, 2016.

<sup>24</sup> Jonathan B. Berk and Richard C. Green, "Mutual Fund Flows and Performance in Rational Markets," *Journal of Political Economy*, Vol. 112, No. 6, December 2004, 1269-1295 and Jonathan B. Berk, "Five Myths of Active Portfolio Management," *Journal of Portfolio Management*, Spring 2005, 27-31.

<sup>25</sup> Jonathan B. Berk and Jules H. van Binsbergen, "Measuring Skill in the Mutual Fund Industry," *Journal of Financial Economics*, Vol. 118, No. 1, October 2015, 1-20. For an alternative take on measuring skill, see Ajay Bhootra, Zvi Drezner, Christopher Schwarz, and Mark Hoven Stohs, "Mutual Fund Performance: Luck or Skill?" *International Journal of Business*, Vol. 20, No. 1, Winter 2015.

<sup>26</sup> This aspect of the model remains open to debate. See Joseph Chen, Harrison Hong, Ming Huang, and Jeffrey D. Kubik, "Does Fund Size Erode Mutual Fund Performance? The Role of Liquidity and Organization," *American Economic Review*: Vol. 94, No. 5, December 2004, 1276-1302; Xuemin Yan, "Liquidity, Investment Style, and the Relation between Fund Size and Fund Performance," *Journal of Financial and Quantitative Analysis*, Vol. 43, No. 3, September 2008, 741-767; Jonathan Reuter and Eric Zitzewitz, "How Much Does Size Erode Mutual Fund Performance? A Regression Discontinuity Approach," *Working Paper*, March 2013; and Ronald N. Kahn and J. Scott Shaffer, "The Surprisingly Small Impact of Asset Growth on Expected Alpha," *Journal of Portfolio Management*, Fall 2005, 49-60.

<sup>27</sup> Jahn K. Hakes and Raymond D. Sauer, "An Economic Evaluation of the *Moneyball* Hypothesis," *Journal of Economic Perspectives*, Vol. 20, No. 3, Summer 2006, 173-185.

<sup>28</sup> Warren Buffett, 1987.

<sup>29</sup> Ľuboš Pástor and Robert F. Stambaugh, "On the Size of the Active Management Industry," *Journal of Political Economy*, Vol. 120, No. 4, August 2012, 740-781.

<sup>30</sup> John C. Bogle, "The Index Mutual Fund: 40 Years of Growth, Change, and Challenge," *Financial Analysts Journal*, Vol. 72, No. 1, January/February 2016, 9-13.

<sup>31</sup> “Jack Bogle: The Lessons We Must Take from ETFs,” *Financial Times—Age of the ETF Series*, December 12, 2016 and “Do ETFs Have a Significant Impact on Equity Market Volumes?” *State Street Global Advisors*, August 2016.

<sup>32</sup> Bogle, (2016).

<sup>33</sup> Some of these approaches have critics. See, for example, André F. Perold, “Fundamentally Flawed Indexing,” *Financial Analysts Journal*, Vol 63, No. 6, November/December 2007, 31-37 and Denys Glushkov, “How Smart Are Smart Beta Exchange-Traded Funds: Analysis of Relative Performance and Factor Exposure,” *Journal of Investment Consulting*, Vol 17, No. 1, 2016, 50-74.

<sup>34</sup> Kenneth R. French, “Presidential Address: The Cost of Active Investing,” *Journal of Finance*, Vol. 63, No. 4, August 2008, 1537-1573.

<sup>35</sup> Brad M. Barber, Terrance Odean, and Lu Zheng, “Out of Sight, Out of Mind: The Effects of Expenses on Mutual Fund Flows,” *Journal of Business*, Vol. 78, No. 6, November 2005, 2095-2119. Also, Michael Cooper, Michael Halling and Wenhao Yang, “The Mutual Fund Fee Puzzle,” *Working Paper*, October, 2016. Also, John H. Cochrane, “Finance: Function Matters, Not Size,” *Journal of Economic Perspectives*, Vol. 27, No. 2, Spring 2013, 29-50.

<sup>36</sup> Burton G. Malkiel, “Asset Management Fees and the Growth of Finance,” *Journal of Economic Perspectives* Vol. 27, No. 2, Spring 2013, 97-108.

<sup>37</sup> See R. Glenn Hubbard, Michael F. Koehn, Stanley I. Ornstein, Marc van Van Audenrode, and Jimmy Royer, *The Mutual Fund Industry: Competition and Investor Welfare* (New York: Columbia Business School Publishing, 2010).

<sup>38</sup> Ajay Khorana and Henri Servaes, “What Drives Market Share in the Mutual Fund Industry?” *Review of Finance*, Vol. 16, No. 1, January 2012, 81-113.

<sup>39</sup> Antti Petajisto, “Active Share and Mutual Fund Performance,” *Financial Analysts Journal*, Vol. 69, No. 4, July/August 2013, 73-93. Also, K. J. Martijn Cremers and Antti Petajisto, “How Active Is Your Fund Manager? A New Measure That Predicts Performance,” *Review of Financial Studies*, Vol. 22, No. 9, September 2009, 3329-3365. Specifically, active share

$$= \frac{1}{2} \sum_{i=1}^N |\omega_{fund,i} - \omega_{index,i}|$$

Where  $\omega_{fund,i}$  = portfolio weight of asset  $i$  in the fund and  $\omega_{index,i}$  = portfolio weight of asset  $i$  in the index.

<sup>40</sup> Martijn Cremers, “Active Share and the Three Pillars of Active Management: Skill, Conviction and Opportunity,” *Working Paper*, August 2016.

<sup>41</sup> Jan Fichtner, Eelke M. Heemskerk, and Javier Garcia-Bernardo, “Hidden Power of the Big Three? Passive Index Funds, Re-Concentration of Corporate Ownership, and New Financial Risk,” *Working Paper*, October 28, 2016. Also, José Azar, Martin C. Schmalz, Isabel Tecu, “Anti-Competitive Effects of Common Ownership,” *Ross School of Business Working Paper Working Paper No. 1235*, July 2016.

<sup>42</sup> Eric A. Posner, Fiona Scott Morton, and E. Glen Weyl, “A Proposal to Limit the Anti-Competitive Power of Institutional Investors,” *Working Paper*, November 28, 2016.

<sup>43</sup> Ilia D. Dichev, “What Are Stock Investors’ Actual Historical Returns? Evidence from Dollar-Weighted Returns,” *American Economic Review*, Vol. 97, No. 1, March 2007, 386-401 and Ilia D. Dichev and Gwen Yu, “Higher Risk, Lower Returns: What Hedge Fund Investors Really Earn,” *Journal of Financial Economics*, Vol. 100, No 2, May 2011, 248-263.

<sup>44</sup> Richard G. Sloan and Haifeng You, “Wealth Transfers via Equity Transactions,” *Journal of Financial Economics*, Vol. 118, No. 1, October 2015, 93-112. Also Amy Dittmar and Laura Casares Field, “Can Managers Time the Market? Evidence Using Share Repurchase Data,” *Journal of Financial Economics*, Vol. 115, No. 2, February 2015, 261-282.

<sup>45</sup> William J. Baumol, Stephen M. Goldfeld, Lilli A. Gordon, and Michael F. Koehn, *The Economics of Mutual Fund Markets: Competition Versus Regulation* (Norwell, MA: Kluwer Academic Publishers, 1990).

<sup>46</sup> Matthew P. Fink, *The Rise of Mutual Funds: An Insider's View* (Oxford, UK: American Oxford University Press, 2008).

<sup>47</sup> See John C. Bogle, "The Mutual Fund Industry Today: 'Conflicts, Conflicts Everywhere'," *United States Securities And Exchange Commission Asset Management Unit*, April 28, 2015.

[http://johncbogle.com/wordpress/wp-content/uploads/2015/07/Bogle\\_SEC\\_2015-04-28\\_Print.pdf](http://johncbogle.com/wordpress/wp-content/uploads/2015/07/Bogle_SEC_2015-04-28_Print.pdf).

<sup>48</sup> Charles D. Ellis, "Will Business Success Spoil the Investment Management Profession?" *Journal of Portfolio Management*, Vol. 27, No. 3, Spring 2001, 11-15.

<sup>49</sup> Fink, 123-124.

<sup>50</sup> Fink, 78, 82, and 109.

<sup>51</sup> Sanjeev Bhojraj, Young Juncho, and Nir Yehuda, "Mutual Fund Family Size and Mutual Fund Performance: The Role of Regulatory Changes," *Journal of Accounting Research*, Vol. 50, No. 3 June 2012, 647-684.

<sup>52</sup> Fink.

<sup>53</sup> Gene D'Avolio, Efi Gildor, and Andrei Shleifer, "Technology, Information Production, and Market Efficiency," in *Economic Policy for the Information Economy*, Federal Reserve Board of Kansas City, 2002.

<sup>54</sup> James J. Angel, Lawrence E. Harris, and Chester S. Spatt, "Equity Trading in the 21st Century: An Update," *Quarterly Journal of Finance*, Vol. 5, No. 1, March 2015 and Charles M. Jones, "A Century of Stock Market Liquidity and Trading Costs," *Working Paper*, May 22, 2002.

<sup>55</sup> Terrence Hendershott, Charles M. Jones, and Albert J. Menkveld, "Does Algorithmic Trading Improve Liquidity?" *Journal of Finance*, Vol. 66, No. 1, February 2011, 1-33.

<sup>56</sup> Katherine Burton, "Inside a Moneymaking Machine Like No Other," *Bloomberg Markets*, November 21, 2016.

<sup>57</sup> Nathan Vardi, "Rich Formula: Math And Computer Wizards Now Billionaires Thanks To Quant Trading Secrets," *Forbes*, Sep 29, 2015.

<sup>58</sup> Michael J. Mauboussin and Dan Callahan, "Lessons from Freestyle Chess: Merging Fundamental and Quantitative Analysis," *Credit Suisse Global Financial Strategies*, September 10, 2014.

<sup>59</sup> Ashby H.B. Monk and Daniel Nadler, "The Rise of the Tech Model May Soon Make You Obsolete," *Institutional Investor*, March 25, 2015.

<sup>60</sup> Sanford J. Grossman and Joseph E. Stiglitz, "On the Impossibility of Informationally Efficient Markets," *American Economic Review*, Vol. 70, No. 3, June 1980, 393-408.

<sup>61</sup> In 1978, Michael Jensen, a prominent professor of finance, declared, "I believe there is no other proposition in economics which has more solid empirical evidence supporting it than the Efficient Market Hypothesis." See Michael C. Jensen, "Some Anomalous Evidence Regarding Market Efficiency," *Journal of Financial Economics*, Vol. 6, Nos. 2/3, June-September 1978, 95-101.

<sup>62</sup> W. Brian Arthur, "Inductive Reasoning and Bounded Rationality," *American Economic Review*, Vol. 84, No. 2, May, 1994, 406-411.

<sup>63</sup> Pástor and Stambaugh, 2012. Also, see Ľuboš Pástor, Robert F. Stambaugh, Lucian A. Taylor, "Scale and Skill in Active Management," *Journal of Financial Economics*, Vol. 116, No. 1, April 2015, 23-45.

<sup>64</sup> Martijn Cremers, Miguel A. Ferreira, Pedro Matos, and Laura Starks, "Indexing and Active Fund Management: International Evidence," *Journal of Financial Economics*, Vol. 120, No. 3, June 2016, 539-560.

<sup>65</sup> Noise traders are a part of an earlier model that Stambaugh created. See Robert F. Stambaugh, "Presidential Address: Investment Noise and Trends," *Journal of Finance*, Vol. 69, No. 4, August 2014, 1415-1453.

<sup>66</sup> Nicolae Gârleanu and Lasse Heje Pedersen, "Efficiently Inefficient Markets for Assets and Asset Management," *Working Paper*, February 10, 2016.

<sup>67</sup> Richard B. Evans and Rüdiger Fahlenbrach, "Institutional Investors and Mutual Fund Governance: Evidence from Retail-Institutional Fund Twins," *Review of Financial Studies*, Vol. 25, No. 12, December 2012, 3530-3571.

<sup>68</sup> Joseph Gerakos, Juhani T. Linnainmaa, and Adair Morse, "Asset Managers: Institutional Performance and Smart Betas," *Working Paper*, November 30, 2016.

- <sup>69</sup> Diane Del Guercio and Jonathan Reuter, "Mutual Fund Performance and the Incentive to Generate Alpha," *Journal of Finance*, Vol. 69, No. 4, August 2014, 1673-1704.
- <sup>70</sup> Alexander Dyck, Karl V. Lins, and Lukasz Pomorski, "Does Active Management Pay? New International Evidence," *Review of Asset Pricing Studies*, Vol. 3, No. 2, December 2013, 200-228 and David R. Gallagher, Graham Harman, Camille H. Schmidt, and Geoffrey J. Warren, "Global Equity Fund Performance: An Attribution Approach," *Financial Analysts Journal*, Vol. 73, No. 1, January/February 2017.
- <sup>71</sup> Miguel A. Ferreira, Aneel Keswani, Antonio F. Miguel, and Sofia B. Ramos, "Testing the Berk and Green Model Around the World," *Working Paper*, May 19, 2016.
- <sup>72</sup> David F. Swensen, *Pioneering Portfolio Management: An Unconventional Approach to Institutional Management* (New York: Free Press, 2000), 74-79.
- <sup>73</sup> Nicholas Barberis and Richard H. Thaler, "A Survey of Behavioral Finance" in George Constantinides, Milton Harris, and Rene M. Stulz, eds., *Handbook of the Economics of Finance* (Amsterdam: Elsevier, 2003), 1053-1128.
- <sup>74</sup> Lasse Heje Pedersen, "Sharpening the Arithmetic of Active Management," *Working Paper*, November 2016.
- <sup>75</sup> James J. Rowley Jr., Jonathan R. Kahler, and Todd Schlanger, "Explaining the Differences in Funds' Securities Lending Returns," *Vanguard Research*, May 2016.
- <sup>76</sup> Barber and Odean, (2013), 1535.
- <sup>77</sup> Brad M. Barber, Yi-Tsung Lee, Yu-Jane Liu, and Terrance Odean, "Just How Much Do Individual Investors Lose by Trading?" *Review of Financial Studies*, Vol. 2, No. 2, February 2009, 609-632.
- <sup>78</sup> Randolph B. Cohen, Paul A. Gompers, and Tuomo Vuolteenaho, "Who Underreacts to Cash-Flow News? Evidence from Trading between Individuals and Institutions" *NBER Working Paper No. 8793*, February 2002.
- <sup>79</sup> Laura Casares Field and Michelle Lowry, "Institutional versus Individual Investment in IPOs: The Importance of Firm Fundamentals," *Journal of Financial and Quantitative Analysis*, Vol. 44, No. 3, June 2009, 489-516.
- <sup>80</sup> Andrea Frazzini and Owen A. Lamont, "Dumb Money: Mutual Fund Flows and the Cross-Section of Stock Returns," *Journal of Financial Economics*, Vol. 88, No. 2, May 2008, 299-322. Also, see Brad M. Barber, Xing Huang, and Terrance Odean, "Which Factors Matter to Investors? Evidence from Mutual Fund Flows," *Review of Financial Studies*, Vol. 29, No. 10, October 2016, 2600-2642.
- <sup>81</sup> Roger M. Edelen, "Investor Flows and the Assessed Performance of Open-End Mutual Funds," *Journal of Financial Economics*, Vol. 53, No. 3, September 1999, 439-466 and Azi Ben-Rephael, Shmuel Kandel, and Avi Wohl, "Measuring Investor Sentiment with Mutual Fund Flows," *Journal of Financial Economics*, Vol. 104, No. 2, May 2012, 363-382
- <sup>82</sup> Joshua Coval and Erik Stafford, "Asset Fire Sales (and Purchases) in Equity Markets," *Journal of Financial Economics*, Vol. 86, No. 2, November 2007, 479-512.
- <sup>83</sup> Dong Lou, "A Flow-Based Explanation for Return Predictability," *Review of Financial Studies*, Vol. 25, No. 12, December 2012, 3457-3489 and Katja Ahoniemi and Petri Jylhä, "Flows, Price Pressure, and Hedge Fund Returns," *Financial Analysts Journal*, Vol. 70, No. 5, September/October 2014, 73-93.
- <sup>84</sup> Ferhat Akbas, Will J. Armstrong, Sorin Sorescu, Avaniidhar Subrahmanyam, "Smart Money, Dumb Money, and Capital Market Anomalies," *Journal of Financial Economics*, Vol. 118, No. 2, November 2015, 355-382.
- <sup>85</sup> Joseph Chen, Samuel Hanson, Harrison Hong, and Jeremy C. Stein, "Do Hedge Funds Profit From Mutual-Fund Distress?" *NBER Working Paper No. 13786*, February 2008.
- <sup>86</sup> Joel Greenblatt, *You Can Be a Stock Market Genius (Even if you're not too smart!): Uncover the Secret Hiding Places of Stock Market Profits* (New York: Fireside, 1997), 61.
- <sup>87</sup> Patrick J. Cusatis, James A. Miles, and Randall Woolridge, "Restructuring through Spinoffs: The Stock Market Evidence," *Journal of Financial Economics*, Vol. 33, No. 3, June 1993, 293-311 and Hemang Desai and Prem C. Jain, "Firm Performance and Focus: Long-Run Stock Market Performance Following Spinoffs," *Journal of Financial Economics*, Vol. 54, No. 1, October 1999, 75-101.
- <sup>88</sup> Chris Veld and Yulia V. Veld-Merkoulova, "Value Creation through Spinoffs: A Review of the Empirical Evidence," *International Journal of Management Reviews*, Vol. 11, No. 4, December 2009, 407-420.

<sup>89</sup> Josef Lakonishok, Andrei Shleifer, and Robert Vishny, "Contrarian Investment, Extrapolation, and Risk," *Journal of Finance*, Vol. 49, No. 5, December 1994, 1541-1578; Chi F. Ling and Simon G. M. Koo, "On Value Premium, Part II: The Explanations," *Journal of Mathematical Finance*, Vol. 2, No. 1, February 2012, 66-74.

<sup>90</sup> John Geanakoplos, "The Leverage Cycle," in *NBER Macroeconomics Annual 2009, Volume 24*, Daron Acemoglu, Kenneth Rogoff, and Michael Woodford, eds. (Chicago, IL: The University of Chicago Press, 2010), 1-65.

<sup>91</sup> Shinichi Hirota and Shyam Sunder, "Price Bubbles Sans Dividend Anchors: Evidence from Laboratory Stock Markets," *Journal of Economic Dynamics and Control*, Vol. 31, No. 6, June 2007, 1875-1909.

<sup>92</sup> Michael J. Mauboussin, "Revisiting Market Efficiency: The Stock Market as a Complex Adaptive System," *Journal of Applied Corporate Finance*, Vol. 14, No. 4, Winter 2002, 47-55.

<sup>93</sup> Blake LeBaron, "Financial Market Efficiency in a Coevolutionary Environment," *Proceedings of the Workshop on Simulation of Social Agents: Architectures and Institutions*, Argonne National Laboratory and University of Chicago, October 2000, Argonne 2001, 33-51. For a model that explains fragility that relaxes the assumption of uninformed investors, see Pawel Maryniak, "The Impact of Passive Investing on Market Fragility," *Working Paper*, November 1, 2016.

<sup>94</sup> Yakov Amihud, Haim Mendelson, and Lasse Heje Pedersen, "Liquidity and Asset Prices," *Foundation and Trends® in Finance*, Vol. 1, No. 4, 2005, 269-364.

<sup>95</sup> Doron Israeli, Charles M.C. Lee, and Suhas Sridharan, "Is There a Dark Side to Exchange Traded Funds (ETFs)? An Information Perspective," *Stanford University Graduate School of Business Research Paper No. 15-42*, November 28, 2016. Sophia J.W. Hamm, "The Effect of ETFs on Stock Liquidity," *Working Paper*. April 23, 2014.

<sup>96</sup> Nan Qin and Vijay Singal, "Indexing and Stock Price Efficiency," *Financial Management*, Vol. 44, No. 4, Winter 2015, 875-904; Eric Belasco, Michael Finke, and David Nanigian, "The Impact of Passive Investing on Corporate Valuations," *Managerial Finance*, Vol. 38, No. 11, November 2012, 1067-1084; Randall Morck and Fan Yang, "The Mysterious Growing Value of S&P 500 Membership," *NBER Working Paper No. 8654*, December 2001; and Russ Wermers and Tong Yao, "Active vs. Passive Investing and the Efficiency of Individual Stock Prices," *Working Paper*, May 2010.

<sup>97</sup> Dennis K. Berman and Jamie Heller, "Wall Street's 'Do-Nothing' Investing Revolution: A Series Exploring the Rise of Passive Investing," *Wall Street Journal*, October 17, 2016.

<sup>98</sup> Rodney N. Sullivan and James X. Xiong, "How Index Trading Increases Market Vulnerability," *Financial Analysts Journal*, Vol. 68, No. 2, March/April 2012, 70-84 and Jeffrey Wurgler, "On the Economic Consequences of Index-Linked Investing," in *Challenges to Business in the Twenty-First Century: The Way Forward*, Gerald Rosenfeld, Jay W. Lorsch, and Rakesh Khurana, eds. (Cambridge, Mass: American Academy of Arts and Sciences, 2011).

<sup>99</sup> Richard G. Sloan and Haifeng You, "Wealth Transfers via Equity Transactions," *Journal of Financial Economics*, Vol. 118, No. 1, October 2015, 93-112.

<sup>100</sup> These assumptions include: the payments occur at the same time, all shareholders sell shares to the company in a proportion equivalent to what they own, the tax rates for capital gains (short- or long-term) and dividends are identical, and the stock is at fair price.

<sup>101</sup> See exhibit 39 in Michael J. Mauboussin, Dan Callahan, and Darius Majd, "Capital Allocation: Evidence, Analytical Methods, and Assessment Guidance," *Credit Suisse Global Financial Strategies*, October 19, 2016.

<sup>102</sup> Robin Greenwood and Samuel G. Hanson, "Share Issuance and Factor Timing," *Journal of Finance*, Vol. 67, No. 2, April 2012, 761-798; Ming Dong, David Hirshleifer, Siew Hong Teoh, "Overvalued Equity and Financing Decisions," *Review of Financial Studies*, Vol. 25, No. 12, December 2012, 3645-3683; and Yi Jiang, Mark Stohs, and Xiaoying Xie, "Do Firms Time Seasoned Equity Offerings? Evidence from SEOs Issued Shortly after IPOs," *Working Paper*, October 2013.

<sup>103</sup> Gregor Stuart Hunter and Kosaku Narioka, "There's a Big New Investor in Stock Markets: the State," *Wall Street Journal*, December 5, 2016.

- <sup>104</sup> Jones and Wermers, 2011. Also, Russ Wermers, "Performance Measurement of Mutual Funds, Hedge Funds, and Institutional Accounts," *Annual Review of Financial Economics*, Vol. 3, 2011, 537-574. There is little evidence that investment consultants are skillful at performance measurement. See Tim Jenkinson, Howard Jones, and Jose Vicente Martinez, "Picking Winners? Investment Consultants' Recommendations of Fund Managers," *Journal of Finance*, Vol. 71, No. 5, October 2016, 2333-2369.
- <sup>105</sup> Judith Chevalier and Glenn Ellison, "Are Some Mutual Fund Managers Better Than Others? Cross-Sectional Patterns in Behavior and Performance," *Journal of Finance*, Vol. 54, No. 3, June 1999, 875-899 and Oleg Chuprinin and Denis Sosyura, "Family Descent as a Signal of Managerial Quality: Evidence from Mutual Funds," *NBER Working Paper No. 22517*, December 2016.
- <sup>106</sup> Cremers and Petajisto, (2009) and Kelsey D. Wei, Russ Wermers, and Tong Yao, "Uncommon Value: The Characteristics and Investment Performance of Contrarian Funds," *Management Science*, Vol. 61, No. 10, October 2015, 2394-2414.
- <sup>107</sup> Andrew W. Lo, "What Is an Index?" *Journal of Portfolio Management*, Vol. 42, No. 2, Winter 2016, 21-36.
- <sup>108</sup> Antti Ilmanen, "Who Is On the Other Side?" *Presentation at Q Group Fall Conference*, October 2016.
- <sup>109</sup> Cremers, Ferreira, Matos, and Starks, (2016).
- <sup>110</sup> Randolph B. Cohen, Christopher Polk, and Bernhard Silli, "Best Ideas," *Working Paper*, May 1, 2010.
- <sup>111</sup> Jussi Keppo and Antti Petajisto, "What Is the True Cost of Active Management? A Comparison of Hedge Funds and Mutual Funds," *Journal of Alternative Investments*, Vol. 17, No. 2, Fall 2014, 9-24.
- <sup>112</sup> Maryam Farboodi and Laura Veldkamp, "The Long-Run Evolution of the Financial Sector," *Working Paper*, June 24, 2016.
- <sup>113</sup> Martijn Cremers and Ankur Pareek, "Patient Capital Outperformance: The Investment Skill of High Active Share Managers Who Trade Infrequently," *Journal of Financial Economics*, Vol. 122, No. 2, November 2016, 288-306.
- <sup>114</sup> Kent Daniel, David Hirshleifer, and Lin Sun, "Short and Long Horizon Behavioral Factors," *Working Paper*, November 24, 2016.
- <sup>115</sup> Daniel Kahneman, *Thinking, Fast and Slow* (New York: Farrar, Straus and Giroux, 2011). Also, Michael J. Mauboussin, Dan Callahan, and Darius Majd, "The Base Rate Book: Integrating the Past to Better Anticipate the Future," *Credit Suisse Global Financial Strategies*, September 26, 2016.
- <sup>116</sup> World Federation of Exchanges, Bank for International Settlements, and Credit Suisse.
- <sup>117</sup> Harry M. Markowitz, "Portfolio Selection," *Journal of Finance*, Vol. 7, No. 1, March 1952, 77-91.
- <sup>118</sup> William F. Sharpe, "Capital Asset Prices: A Theory of Market Equilibrium Under Conditions of Risk," *Journal of Finance*, Vol. 19, No. 3, September 1964, 425-442.
- <sup>119</sup> Peter L. Bernstein, *Capital Ideas: The Improbable Origins of Modern Wall Street* (New York: Free Press, 1992), 246-248.
- <sup>120</sup> Jason Zweig, "Birth of the Index Mutual Fund: 'Bogle's Folly' Turns 40," *Wall Street Journal*, August 31, 2016.
- <sup>121</sup> Rolf W. Banz, "The Relationship Between Return and Market Value of Common Stocks," *Journal of Financial Economics*, Vol. 9, No. 1, March 1981, 3-18.
- <sup>122</sup> Stephen A. Ross, "The Arbitrage Theory of Capital Asset Pricing," *Journal of Economic Theory*, Vol. 13, No. 3, December 1976, 341-360.
- <sup>123</sup> Eugene F. Fama and Kenneth R. French, "The Cross-Section of Expected Stock Returns," *Journal of Finance*, Vol. 47, No. 2, June 1992, 427-465.
- <sup>124</sup> Eugene F. Fama and Kenneth R. French, "Capital Asset Pricing Model: Theory and Evidence," *Journal of Economic Perspectives*, Vol. 18, No. 3, Summer 2004, 25-46.
- <sup>125</sup> Mark M. Carhart, "On Persistence in Mutual Fund Performance," *Journal of Finance*, Vol. 52, No. 1, March 1997, 57-82; Robert Novy-Marx, "The Other Side of Value: The Gross Profitability Premium," *Journal of Financial Economics*, Vol. 108, No. 1, April 2013, 1-28; and Michael J. Cooper, Huseyin Gulen, and Michael J. Schill, "Asset Growth and the Cross-Section of Stock Returns," *Journal of Finance*, Vol. 63, No. 4, August 2008, 1609-1651.

<sup>126</sup> Eugene F. Fama and Kenneth R. French, "A Five-Factor Asset Pricing Model," *Journal of Financial Economics*, Vol. 116, No. 1, April 2015, 1-22.

<sup>127</sup> Kent Daniel, David Hirshleifer, and Siew Hong Teoh, "Investor Psychology in Capital Markets: Evidence and Policy Implications," *Journal of Monetary Economics*, Vol. 49, No. 1, January 2002, 139-209 and Kent Daniel and David Hirshleifer, "Overconfident Investors, Predictable Returns, and Excessive Trading," *Journal of Economic Perspectives*, Vol. 29, No. 4, Fall 2015, 61-88.

<sup>128</sup> Josef Lakonishok, Andrei Shleifer, and Robert Vishny, "Contrarian Investment, Extrapolation, and Risk," *Journal of Finance*, Vol. 49, No. 5, December 1994, 1541-1578; Chi F. Ling and Simon G. M. Koo, "On Value Premium, Part II: The Explanations," *Journal of Mathematical Finance*, Vol. 2, No. 1, February 2012, 66-74.

<sup>129</sup> Clifford S. Asness, "The Siren Song of Factor Timing aka 'Smart Beta Timing' aka 'Style Timing'," *Journal of Portfolio Management*, Vol. 42, No. 5, Special Issue 2016, 1-6.

<sup>130</sup> Paul A. Gompers and Andrew Metrick, "Institutional Investors and Equity Prices," *Quarterly Journal of Economics*, Vol. 116, No. 1, February 2001, 229-259.

<sup>131</sup> Rob Arnott, Noah Beck, Vitali Kalesnik, and John West, "How Can 'Smart Beta' Go Horribly Wrong?" *Research Affiliates*, February 2016.

## References

### Books

Anderson, Seth, and Parvez Ahmed, *Mutual Funds: Fifty Years of Research Findings* (New York: Springer, 2005).

Arnott, Robert D., Jason C. Hsu, and John M. West, *The Fundamental Index: A Better Way to Invest* (Hoboken, NJ: John Wiley & Sons, 2008).

Baumol, William J., Stephen M. Goldfeld, Lilli A. Gordon, and Michael F. Koehn, *The Economics of Mutual Fund Markets: Competition Versus Regulation* (Norwell, MA: Kluwer Academic Publishers, 1990).

Bernstein, Peter L., *Capital Ideas: The Improbable Origins of Modern Wall Street* (New York: Free Press, 1992).

Ellis, Charles D., *The Index Revolution: Why Investors Should Join It* (Hoboken, NJ: John Wiley and Sons, 2016).

Fink, Matthew P., *The Rise of Mutual Funds: An Insider's View* (Oxford, UK: American Oxford University Press, 2008).

Greenblatt, Joel, *You Can Be a Stock Market Genius (Even if you're not too smart!): Uncover the Secret Hiding Places of Stock Market Profits* (New York: Fireside, 1997).

Grinold, Richard C., and Ronald N. Kahn, *Active Portfolio Management: A Quantitative Approach for Producing Superior Returns and Controlling Risk, Second Edition* (New York: McGraw Hill, 2000).

Hubbard, R. Glenn, Michael F. Koehn, Stanley I. Ornstein, Marc van Van Audenrode, and Jimmy Royer, *The Mutual Fund Industry: Competition and Investor Welfare* (New York: Columbia Business School Publishing, 2010).

Mauboussin, Michael J., *The Success Equation: Untangling Skill and Luck in Business, Sports, and Investing* (Boston, MA: Harvard Business Review Press 2012).

Pedersen, Lasse Heje, *Efficiently Inefficient: How Smart Money Invests & Market Prices Are Determined* (Princeton, NJ: Princeton University Press, 2015).

Swensen, David F., *Pioneering Portfolio Management: An Unconventional Approach to Institutional Management* (New York: Free Press, 2000).

## Articles and Papers

Ahoniemi, Katja, and Petri Jylhä, "Flows, Price Pressure, and Hedge Fund Returns," *Financial Analysts Journal*, Vol.70, No. 5, September/October 2014, 73-93.

Akbas, Ferhat, Will J. Armstrong, Sorin Sorescu, Avanidhar Subrahmanyam, "Smart Money, Dumb Money, and Capital Market Anomalies," *Journal of Financial Economics*, Vol. 118, No. 2, November 2015, 355-382.

Allen, Edward D., "Study of a Group of American Management-Investment Companies, 1930-1936" *Journal of Business*, Vol. 11, No. 3, July 1938, 232-257.

Amihud, Yakov, Haim Mendelson, and Lasse Heje Pedersen, "Liquidity and Asset Prices," *Foundation and Trends® in Finance*, Vol. 1, No. 4, 2005, 269-364.

Angel, James J., Lawrence E. Harris, and Chester S. Spatt, "Equity Trading in the 21st Century: An Update," *Quarterly Journal of Finance*, Vol. 5, No. 1, March 2015.

Arthur, W. Brian, "Inductive Reasoning and Bounded Rationality," *American Economic Review*, Vol. 84, No. 2, May, 1994, 406-411.

Asness, Clifford S., "The Siren Song of Factor Timing aka 'Smart Beta Timing' aka 'Style Timing'," *Journal of Portfolio Management*, Vol. 42, No. 5, Special Issue 2016, 1-6.

Azar, José, Martin C. Schmalz, Isabel Tecu, "Anti-Competitive Effects of Common Ownership," *Ross School of Business Working Paper Working Paper No. 1235*, July 2016.

Banz, Rolf W., "The Relationship Between Return and Market Value of Common Stocks," *Journal of Financial Economics*, Vol. 9, No. 1, March 1981, 3-18.

Barber, Brad M., Terrance Odean, and Lu Zheng, "Out of Sight, Out of Mind: The Effects of Expenses on Mutual Fund Flows," *Journal of Business*, Vol. 78, No. 6, November 2005, 2095-2119.

Barber, Brad M., Yi-Tsung Lee, Yu-Jane Liu, and Terrance Odean, "Just How Much Do Individual Investors Lose by Trading?" *Review of Financial Studies*, Vol.2, No. 2, February 2009, 609-632.

Barber, Brad M., and Terrance Odean, "The Behavioral of Individual Investors," in George Constantinides, Milton Harris, and Rene M. Stulz, eds., *Handbook of the Economics of Finance* (Amsterdam: Elsevier, 2013), 1533-1570.

Barber, Brad M., Xing Huang, and Terrance Odean, "Which Factors Matter to Investors? Evidence from Mutual Fund Flows," *Review of Financial Studies*, Vol. 29, No. 10, October 2016, 2600-2642.

Barberis, Nicholas, and Richard H. Thaler, "A Survey of Behavioral Finance" in in George Constantinides, Milton Harris, and Rene M. Stulz, eds., *Handbook of the Economics of Finance* (Amsterdam: Elsevier, 2003), 1053-1128.

Barras, Laurent, Olivier Scaillet, and Russ Wermers, "False Discoveries in Mutual Fund Performance: Measuring Luck in Estimated Alpha," *Journal of Finance*, Vol. 65, No. 1, February 2010, 179-216.

Belasco, Eric, Michael Finke, and David Nanigian, "The Impact of Passive Investing on Corporate Valuations," *Managerial Finance*, Vol. 38, No. 11, November 2012, 1067-1084.

Ben-David, Itzhak, Francesco Franzoni, and Rabih Moussawi, "Exchange Traded Funds (ETFs)," *Annual Review of Financial Economics*, Vol. 9, 2017.

Ben-Rephael, Azi, Shmuel Kandel, and Avi Wohl, "Measuring Investor Sentiment with Mutual Fund Flows," *Journal of Financial Economics*, Vol. 104, No. 2, May 2012, 363-382.

Berk, Jonathan B., "Five Myths of Active Portfolio Management," *Journal of Portfolio Management*, Spring 2005, 27-31.

Berk, Jonathan B., and Richard C. Green, "Mutual Fund Flows and Performance in Rational Markets," *Journal of Political Economy*, Vol. 112, No. 6, December 2004, 1269-1295.

Berk, Jonathan B., and Jules H. van Binsbergen, "Measuring Skill in the Mutual Fund Industry," *Journal of Financial Economics*, Vol. 118, No. 1, October 2015, 1-20.

Berman, Dennis K., and Jamie Heller, "Wall Street's 'Do-Nothing' Investing Revolution: A Series Exploring the Rise of Passive Investing," *Wall Street Journal*, October 17, 2016.

Bernstein, Peter L., "Where, Oh Where Are the .400 Hitters of Yesteryear?" *Financial Analysts Journal*, Vol. 54, No. 6, November-December 1998, 6-14.

Bhojraj, Sanjeev, Young Juncho, and Nir Yehuda, "Mutual Fund Family Size and Mutual Fund Performance: The Role of Regulatory Changes," *Journal of Accounting Research*, Vol. 50, No. 3 June 2012, 647-684.

Bhootra, Ajay, Zvi Drezner, Christopher Schwarz, and Mark Hoven Stohs, "Mutual Fund Performance: Luck or Skill?" *International Journal of Business*, Vol. 20, No. 1, Winter 2015.

Black, Fischer, "Noise," *Journal of Finance*, Vol. 41, No. 3, July 1986, 529-543.

Boehmer, Ekkehart, and Eric K. Kelley, "Institutional Investors and the Informational Efficiency of Prices," *Review of Financial Studies*, Vol. 22, No. 9, September 2009, 3563-3594.

Bogle, John C., "The Arithmetic of 'All-In' Investment Expenses," *Financial Analysts Journal*, Vol. 70, No. 1, January/February 2014, 13-21.

-----, "The Mutual Fund Industry Today: 'Conflicts, Conflicts Everywhere'," *United States Securities And Exchange Commission Asset Management Unit*, April 28, 2015.

-----, "The Index Mutual Fund: 40 Years of Growth, Change, and Challenge," *Financial Analysts Journal*, Vol. 72, No. 1, January/February 2016, 9-13.

-----, "The Lessons We Must Take from ETFs," *Financial Times—Age of the ETF Series*, December 12, 2016.

Brogaard, Jonathan, Matthew C. Ringgenberg, David Sovich, "The Economic Impact of Index Investing," *WFA-Center for Finance and Accounting Research Working Paper No. 15/06*, May 2016.

- Buffett, Warren E., "Letter to Shareholders," *1987 Berkshire Hathaway Annual Report*.
- Burton, Katherine, "Inside a Moneymaking Machine Like No Other," *Bloomberg Markets*, November 21, 2016.
- Busse, Jeffrey A., Amit Goyal, and Sunil Wahal, "Investing in a Global World," *Review of Finance*, Vol. 18, No. 2, April 2014, 561-590.
- Carhart, Mark M., "On Persistence in Mutual Fund Performance," *Journal of Finance*, Vol. 52, No. 1, March 1997, 57-82.
- Chen, Joseph, Harrison Hong, Ming Huang, and Jeffrey D. Kubik, "Does Fund Size Erode Mutual Fund Performance? The Role of Liquidity and Organization," *American Economic Review*: Vol. 94, No. 5, December 2004, 1276-1302.
- Chen, Joseph, Samuel Hanson, Harrison Hong, and Jeremy C. Stein, "Do Hedge Funds Profit From Mutual-Fund Distress?" *NBER Working Paper No. 13786*, February 2008.
- Chevalier, Judith, and Glenn Ellison, "Are Some Mutual Fund Managers Better Than Others? Cross-Sectional Patterns in Behavior and Performance," *Journal of Finance*, Vol. 54, No. 3, June 1999, 875-899.
- Chuprinin, Oleg, and Denis Sosyura, "Family Descent as a Signal of Managerial Quality: Evidence from Mutual Funds," *NBER Working Paper No. 22517*, December 2016.
- Clarke, Roger, Harindra de Silva, and Steven Thorley, "The Fundamental Law of Active Portfolio Management," *Journal of Investment Management*, Vol. 4, No. 3, Third Quarter 2006, 54-72.
- Cochrane, John H., "Finance: Function Matters, Not Size," *Journal of Economic Perspectives*, Vol. 27, No. 2, Spring 2013, 29-50.
- Cohen, Randolph B., Paul A. Gompers, and Tuomo Vuolteenaho, "Who Underreacts to Cash-Flow News? Evidence from Trading between Individuals and Institutions" *NBER Working Paper No. 8793*, February 2002.
- Cohen, Randolph B., Christopher Polk, and Bernhard Silli, "Best Ideas," *Working Paper*, May 1, 2010.
- Cooper, Michael J., Huseyin Gulen, and Michael J. Schill, "Asset Growth and the Cross-Section of Stock Returns," *Journal of Finance*, Vol. 63, No. 4, August 2008, 1609-1651.
- Cooper, Michael, Michael Halling and Wenhao Yang, "The Mutual Fund Fee Puzzle," *Working Paper*, October, 2016.
- Coval, Joshua, and Erik Stafford, "Asset Fire Sales (and Purchases) in Equity Markets," *Journal of Financial Economics*, Vol. 86, No. 2, November 2007, 479-512.
- Cremers, Martijn, "Active Share and the Three Pillars of Active Management: Skill, Conviction and Opportunity," *Working Paper*, August 2016.
- Cremers, K. J. Martijn, and Antti Petajisto, "How Active Is Your Fund Manager? A New Measure That Predicts Performance," *Review of Financial Studies*, Vol. 22, No. 9, September 2009, 3329-3365.

Cremers, Martijn, Miguel A. Ferreira, Pedro Matos, and Laura Starks, "Indexing and Active Fund Management: International Evidence," *Journal of Financial Economics*, Vol. 120, No. 3, June 2016, 539-560.

Cusatis, Patrick J., James A. Miles, and Randall Woolridge, "Restructuring through Spinoffs: The Stock Market Evidence," *Journal of Financial Economics*, Vol. 33, No. 3, June 1993, 293-311.

Daniel, Kent, and David Hirshleifer, "Overconfident Investors, Predictable Returns, and Excessive Trading," *Journal of Economic Perspectives*, Vol. 29, No. 4, Fall 2015, 61-88.

Daniel, Kent, David Hirshleifer, and Lin Sun, "Short and Long Horizon Behavioral Factors," *Working Paper*, November 24, 2016.

D'Avolio, Gene, Efi Gildor, and Andrei Shleifer, "Technology, Information Production, and Market Efficiency," in *Economic Policy for the Information Economy*, Federal Reserve Board of Kansas City, 2002.

Del Guercio, Diane, and Jonathan Reuter, "Mutual Fund Performance and the Incentive to Generate Alpha," *Journal of Finance*, Vol. 69, No. 4, August 2014, 1673-1704.

Desai, Hemang, and Prem C. Jain, "Firm Performance and Focus: Long-Run Stock Market Performance Following Spinoffs," *Journal of Financial Economics*, Vol. 54, No. 1, October 1999, 75-101.

Dichev, Iliia D., "What Are Stock Investors' Actual Historical Returns? Evidence from Dollar-Weighted Returns," *American Economic Review*, Vol. 97, No. 1, March 2007, 386-401.

Dichev, Iliia D., and Gwen Yu, "Higher Risk, Lower Returns: What Hedge Fund Investors Really Earn," *Journal of Financial Economics*, Vol. 100, No 2, May 2011, 248-263.

Dittmar, Amy, and Laura Casares Field, "Can Managers Time the Market? Evidence Using Share Repurchase Data," *Journal of Financial Economics*, Vol. 115, No. 2, February 2015, 261-282.

Dong, Ming, David Hirshleifer, Siew Hong Teoh, "Overvalued Equity and Financing Decisions," *Review of Financial Studies*, Vol. 25, No. 12, December 2012, 3645-3683.

Dyck, Alexander, Karl V. Lins, and Lukasz Pomorski, "Does Active Management Pay? New International Evidence," *Review of Asset Pricing Studies*, Vol. 3, No. 2, December 2013, 200-228.

Edelen, Roger M., "Investor Flows and the Assessed Performance of Open-End Mutual Funds," *Journal of Financial Economics*, Vol. 53, No. 3, September 1999, 439-466.

Ellis, Charles D., "Will Business Success Spoil the Investment Management Profession?" *Journal of Portfolio Management*, Vol. 27, No. 3, Spring 2001, 11-15.

Evans, Richard B., and Rüdiger Fahlenbrach, "Institutional Investors and Mutual Fund Governance: Evidence from Retail-Institutional Fund Twins," *Review of Financial Studies*, Vol. 25, No. 12, December 2012, 3530-3571.

Fama, Eugene F., and Kenneth R. French, "The Cross-Section of Expected Stock Returns," *Journal of Finance*, Vol. 47, No. 2, June 1992, 427-465.

-----, "Capital Asset Pricing Model: Theory and Evidence," *Journal of Economic Perspectives*, Vol. 18, No. 3, Summer 2004, 25-46.

-----, "Luck versus Skill in the Cross-Section of Mutual Fund Returns," *Journal of Finance*, Vol. 65, No. 5, October 2010, 1915-1947.

-----, "A Five-Factor Asset Pricing Model," *Journal of Financial Economics*, Vol. 116, No. 1, April 2015, 1-22.

Ferreira, Miguel A., Aneel Keswani, Antonio F. Miguel, and Sofia B. Ramos, "Testing the Berk and Green Model Around the World," *Working Paper*, May 19, 2016.

Fichtner, Jan, Eelke M. Heemskerk, and Javier Garcia-Bernardo, "Hidden Power of the Big Three? Passive Index Funds, Re-Concentration of Corporate Ownership, and New Financial Risk," *Working Paper*, October 28, 2016.

Field, Laura Casares, and Michelle Lowry, "Institutional versus Individual Investment in IPOs: The Importance of Firm Fundamentals," *Journal of Financial and Quantitative Analysis*, Vol. 44, No. 3, June 2009, 489-516.

Frazzini, Andrea, and Owen A. Lamont, "Dumb Money: Mutual Fund Flows and the Cross-Section of Stock Returns," *Journal of Financial Economics*, Vol. 88, No. 2, May 2008, 299-322.

French, Kenneth R., "Presidential Address: The Cost of Active Investing," *Journal of Finance*, Vol. 63, No. 4, August 2008, 1537-1573.

Gallagher, David R., Graham Harman, Camille H. Schmidt, and Geoffrey J. Warren, "Global Equity Fund Performance: An Attribution Approach," *Financial Analysts Journal*, Vol. 73, No. 1, January/February 2017.

Gârleanu, Nicolae, and Lasse Heje Pedersen, "Efficiently Inefficient Markets for Assets and Asset Management," *Working Paper*, February 10, 2016.

Geanakoplos, John, "The Leverage Cycle," in *NBER Macroeconomics Annual 2009, Volume 24*, Daron Acemoglu, Kenneth Rogoff, and Michael Woodford, eds. (Chicago, IL: The University of Chicago Press, 2010), 1-65.

Gerakos, Joseph, Juhani T. Linnainmaa, and Adair Morse, "Asset Managers: Institutional Performance and Smart Betas," *Working Paper*, November 30, 2016.

Glushkov, Denys, "How Smart Are Smart Beta Exchange-Traded Funds: Analysis of Relative Performance and Factor Exposure," *Journal of Investment Consulting*, Vol 17, No. 1, 2016, 50-74.

Gompers, Paul A., and Andrew Metrick, "Institutional Investors and Equity Prices," *Quarterly Journal of Economics*, Vol. 116, No. 1, February 2001, 229-259.

Gould, Stephen Jay, "Entropic Homogeneity Isn't Why No One Hits .400 Any More," *Discover*, Vol. 7, No. 8, August 1986, 60-66.

Greenwood, Robin, and Samuel G. Hanson, "Share Issuance and Factor Timing," *Journal of Finance*, Vol. 67, No. 2, April 2012, 761-798.

Grinold, Richard C., "The Fundamental Law of Active Management," *Journal of Portfolio Management*, Vol. 15, No. 3, Spring 1989, 30-37.

Grossman, Sanford J., and Joseph E. Stiglitz, "On the Impossibility of Informationally Efficient Markets," *American Economic Review*, Vol. 70, No. 3, June 1980, 393-408.

Hakes, Jahn K., and Raymond D. Sauer, "An Economic Evaluation of the *Moneyball* Hypothesis," *Journal of Economic Perspectives*, Vol. 20, No. 3, Summer 2006, 173-185.

Hamm, Sophia J.W., "The Effect of ETFs on Stock Liquidity," *Working Paper*. April 23, 2014.

Hendershott, Terrence, Charles M. Jones, and Albert J. Menkveld, "Does Algorithmic Trading Improve Liquidity?" *Journal of Finance*, Vol. 66, No. 1, February 2011, 1-33.

Hirota, Shinichi, and Shyam Sunder, "Price Bubbles Sans Dividend Anchors: Evidence from Laboratory Stock Markets," *Journal of Economic Dynamics and Control*, Vol. 31, No. 6, June 2007, 1875-1909.

Hirshleifer, David, and Siew Hong Teoh, "Investor Psychology in Capital Markets: Evidence and Policy Implications," *Journal of Monetary Economics*, Vol. 49, No. 1, January 2002, 139-209.

Ilmanen, Antti, "Who Is On the Other Side?" *Presentation at Q Group Fall Conference*, October 2016.

Investment Company Institute, "2016 Investment Company Fact Book."

Israeli, Doron, Charles M.C. Lee, and Suhas Sridharan, "Is There a Dark Side to Exchange Traded Funds (ETFs)? An Information Perspective," *Stanford University Graduate School of Business Research Paper No. 15-42*, November 28, 2016.

Jenkinson, Tim, Howard Jones, and Jose Vicente Martinez, "Picking Winners? Investment Consultants' Recommendations of Fund Managers," *Journal of Finance*, Vol. 71, No. 5, October 2016, 2333-2369.

Jensen, Michael C., "The Performance of Mutual Funds in the Period 1945-1964," *Journal of Finance*, Vol. 23, No. 2, May 1968, 389-416.

-----, "Some Anomalous Evidence Regarding Market Efficiency," *Journal of Financial Economics*, Vol. 6, Nos. 2/3, June-September 1978, 95-101.

Jiang, Yi, Mark Stohs, and Xiaoying Xie, "Do Firms Time Seasoned Equity Offerings? Evidence from SEOs Issued Shortly after IPOs," *Working Paper*, October 2013.

Jones, Charles M., "A Century of Stock Market Liquidity and Trading Costs," *Working Paper*, May 22, 2002.

Jones, Robert C., and Russ Wermers, "Active Management in a Mostly Efficient Market," *Financial Analysts Journal*, Vol. 67, No. 6, November/December 2011, 29-45.

Kahn, Ronald N., and J. Scott Shaffer, "The Surprisingly Small Impact of Asset Growth on Expected Alpha," *Journal of Portfolio Management*, Fall 2005, 49-60.

Keppo, Jussi, and Antti Petajisto, "What Is the True Cost of Active Management? A Comparison of Hedge Funds and Mutual Funds," *Journal of Alternative Investments*, Vol. 17, No. 2, Fall 2014, 9-24.

Khandani, Amir E., and Andrew W. Lo, "What Happened to the Quants in August 2007?" *Journal of Investment Management*, Vol. 5, No. 4, Fourth Quarter 2007, 29-78.

Khorana, Ajay, and Henri Servaes, "What Drives Market Share in the Mutual Fund Industry?" *Review of Finance*, Vol. 16, No. 1, January 2012, 81-113.

Lakonishok, Josef, Andrei Shleifer, and Robert Vishny, "Contrarian Investment, Extrapolation, and Risk," *Journal of Finance*, Vol. 49, No. 5, December 1994, 1541-1578.

LeBaron, Blake, "Financial Market Efficiency in a Coevolutionary Environment," *Proceedings of the Workshop on Simulation of Social Agents: Architectures and Institutions*, Argonne National Laboratory and University of Chicago, October 2000, Argonne 2001, 33-51.

Ledbetter, James, "Is Passive Investment Actively Hurting the Economy?" *New Yorker*, March 9, 2016.

Ling, Chi F., and Simon G. M. Koo, "On Value Premium, Part II: The Explanations," *Journal of Mathematical Finance*, Vol. 2, No. 1, February 2012, 66-74.

Malkiel, Burton G., "Returns from Investing in Equity Mutual Funds 1971-1991," *Journal of Finance*, Vol 50, No. 2, June 1995, 549-572.

-----, "Asset Management Fees and the Growth of Finance," *Journal of Economic Perspectives* Vol. 27, No. 2, Spring 2013, 97-108.

Markowitz, Harry M., "Portfolio Selection," *Journal of Finance*, Vol. 7, No. 1, March 1952, 77-91.

Maryniak, Pawel, "The Impact of Passive Investing on Market Fragility," *Working Paper*, November 1, 2016.

Mauboussin, Michael J., "Revisiting Market Efficiency: The Stock Market as a Complex Adaptive System," *Journal of Applied Corporate Finance*, Vol. 14, No. 4, Winter 2002, 47-55.

Mauboussin, Michael J., Dan Callahan, "Lessons from Freestyle Chess: Merging Fundamental and Quantitative Analysis," *Credit Suisse Global Financial Strategies*, September 10, 2014.

Mauboussin, Michael J., Dan Callahan, and Darius Majd, "What Makes for a Useful Statistic: Not All Numbers Are Created Equally," *Credit Suisse Global Financial Strategies*, April 5, 2016.

-----, "The Base Rate Book: Integrating the Past to Better Anticipate the Future," *Credit Suisse Global Financial Strategies*, September 26, 2016.

-----, "Capital Allocation: Evidence, Analytical Methods, and Assessment Guidance," *Credit Suisse Global Financial Strategies*, October 19, 2016.

Monk, Ashby H.B., and Daniel Nadler, "The Rise of the Tech Model May Soon Make You Obsolete," *Institutional Investor*, March 25, 2015.

Morck, Randall, and Fan Yang, "The Mysterious Growing Value of S&P 500 Membership," *NBER Working Paper No. 8654*, December 2001.

Novy-Marx, Robert, "The Other Side of Value: The Gross Profitability Premium," *Journal of Financial Economics*, Vol. 108, No. 1, April 2013, 1-28.

O'Hara, Maureen, "Presidential Address: Liquidity and Price Discovery," *Journal of Finance*, Vol. 58, No. 4, August 2003, 1335-1354.

Pástor, Ľuboš, and Robert F. Stambaugh, "Liquidity Risk and Expected Stock Returns," *Journal of Political Economy*, Vol. 111, No. 3, June 2003, 642-685.

-----, "On the Size of the Active Management Industry," *Journal of Political Economy*, Vol. 120, No. 4, August 2012, 740-781.

Pástor, Ľuboš, Robert F. Stambaugh, Lucian A. Taylor, "Scale and Skill in Active Management," *Journal of Financial Economics*, Vol. 116, No. 1, April 2015, 23-45.

Pedersen, Lasse Heje, "Sharpening the Arithmetic of Active Management," *Working Paper*, November 2016.

Perold, André F., "Fundamentally Flawed Indexing," *Financial Analysts Journal*, Vol 63, No. 6, November/December 2007, 31-37.

Petajisto, Antti, "Active Share and Mutual Fund Performance," *Financial Analysts Journal*, Vol. 69, No. 4, July/August 2013, 73-93.

Posner, Eric A., Fiona Scott Morton, and E. Glen Weyl, "A Proposal to Limit the Anti-Competitive Power of Institutional Investors," *Working Paper*, November 28, 2016.

Qin, Nan, and Vijay Singal, "Indexing and Stock Price Efficiency," *Financial Management*, Vol. 44, No. 4, Winter 2015, 875-904.

Reuter, Jonathan, and Eric Zitzewitz, "How Much Does Size Erode Mutual Fund Performance? A Regression Discontinuity Approach," *Working Paper*, March 2013.

Ross, Stephen A., "The Arbitrage Theory of Capital Asset Pricing," *Journal of Economic Theory*, Vol. 13, No. 3, December 1976, 341-360.

Rowley Jr., James J., Jonathan R. Kahler, and Todd Schlanger, "Explaining the Differences in Funds' Securities Lending Returns," *Vanguard Research*, May 2016.

Sharpe, William F., "Capital Asset Prices: A Theory of Market Equilibrium Under Conditions of Risk," *Journal of Finance*, Vol. 19, No. 3, September 1964, 425-442.

-----, "The Arithmetic of Active Management," *Financial Analysts Journal*, Vol. 47, No. 1, January/February 1991, 7-9.

Sloan, Richard G., and Haifeng You, "Wealth Transfers via Equity Transactions," *Journal of Financial Economics*, Vol. 118, No. 1, October 2015, 93-112.

Soe, Aye M., "SPIVA® U.S. Scorecard: Year End 2015," *S&P Dow Jones Indices Research*, March 11, 2016.

Soe, Aye M., and Ryan Poirier, "SPIVA® U.S. Scorecard: Mid-Year 2016," *S&P Dow Jones Indices Research*, September 15, 2016.

Stambaugh, Robert F., "Presidential Address: Investment Noise and Trends," *Journal of Finance*, Vol. 69, No. 4, August 2014, 1415-1453.

Stein, Jeremy C., "Presidential Address: Sophisticated Investors and Market Efficiency," *Journal of Finance*, Vol. 64, No. 4, August 2009, 1517-1548.

Sullivan, Rodney N., and James X. Xiong, "How Index Trading Increases Market Vulnerability," *Financial Analysts Journal*, Vol. 68, No. 2, March/April 2012, 70-84.

Tergesen, Anne, and Jason Zweig, "The Dying Business of Picking Stocks," *Wall Street Journal*, October 17, 2016.

Van Binsbergen, Jules H., and Christian C. Opp, "Real Anomalies," *Working Paper*, October 6, 2016.

Vardi, Nathan, "Rich Formula: Math And Computer Wizards Now Billionaires Thanks To Quant Trading Secrets," *Forbes*, Sep 29, 2015.

Veld, Chris, and Yulia V. Veld-Merkoulova, "Value Creation through Spinoffs: A Review of the Empirical Evidence," *International Journal of Management Reviews*, Vol. 11, No. 4, December 2009, 407-420.

Wei, Kelsey D., Russ Wermers, and Tong Yao, "Uncommon Value: The Characteristics and Investment Performance of Contrarian Funds," *Management Science*, Vol. 61, No. 10, October 2015, 2394-2414.

Wermers, Russ, "Performance Measurement of Mutual Funds, Hedge Funds, and Institutional Accounts," *Annual Review of Financial Economics*, Vol. 3, 2011, 537-574.

Wermers, Russ, and Tong Yao, "Active vs. Passive Investing and the Efficiency of Individual Stock Prices," *Working Paper*, May 2010.

Woolley, Paul, and Ron Bird, "Economic Implications of Passive Investing," *Journal of Asset Management*, Vol. 3, No. 4, March 2003, 303-312.

Wurgler, Jeffrey, "On the Economic Consequences of Index-Linked Investing," in *Challenges to Business in the Twenty-First Century: The Way Forward*, Gerald Rosenfeld, Jay W. Lorsch, and Rakesh Khurana, eds. (Cambridge, Mass: American Academy of Arts and Sciences, 2011).

Yan, Xuemin, "Liquidity, Investment Style, and the Relation between Fund Size and Fund Performance," *Journal of Financial and Quantitative Analysis*, Vol. 43, No. 3, September 2008, 741-767.

Zweig, Jason, "Birth of the Index Mutual Fund: 'Bogle's Folly' Turns 40," *Wall Street Journal*, August 31, 2016.

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