Min(d)ing the Opportunity

Excess Returns Require the Chance to Apply Skill
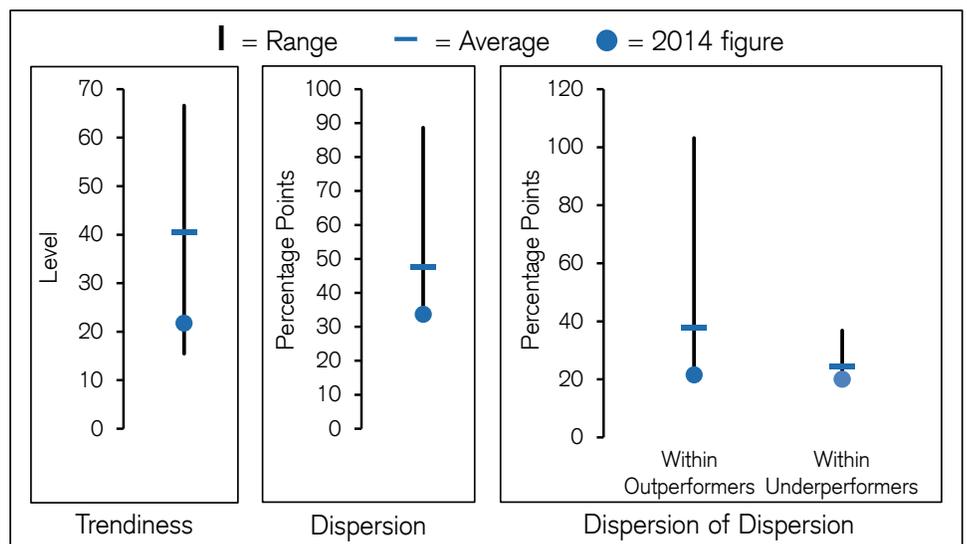
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"Ability is nothing without opportunity."

Napoleon[1]

- The fundamental law of active management separates the sources of excess return into two parts: skill and opportunity.

- While the investment industry is in constant pursuit of skill, having lots of skill doesn't pay off if opportunity is poor, and modest skill can yield attractive results if opportunity is rich.

- We examine three ways that investors can express skill: market timing, security selection, and portfolio construction.

- There is a strong correlation between years when active managers do well, measured as the percentage that beat their benchmark, and the relative performance of small versus large capitalization stocks. This reflects exposure to the factor "Small Minus Big."

- Measures of opportunity show that 2014 was a particularly challenging year. For example, the dispersion of stock returns was unusually narrow, creating a very inhospitable environment for active managers.

- Pockets of inefficiency always exist in markets and investors should be explicit in seeking them.

FOR DISCLOSURES AND OTHER IMPORTANT INFORMATION, PLEASE REFER TO THE BACK OF THIS REPORT.

Introduction

In the quest for market-beating returns, investors seek money managers who are skillful. But what if skill isn't the only key to success?

More than 25 years ago, Richard Grinold, the former global director of research at Barclays Global Investors, developed what he called "the fundamental law of active management:"[2]

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

In words, it says that the information ratio equals the information coefficient times the square root of breadth.[3] If you are not a quant, don't worry, there's an even simpler way to convey the law:

Excess returns = skill * opportunity

The point of this report is that all of the skill in the world is for naught if you don't have attractive opportunities. While the investment industry is focused on ways to ferret out skill, there is less discussion about where and how investors should apply their skill.

There are two basic conditions that present a challenge for skillful investors. The first is where the payoffs are potentially attractive but all of the competitors are very skillful. In this case, the skills of the players are offsetting and luck plays a large role in determining the outcome.[4] For example, a good poker player who wants to make money should seek games with weaker players. Playing in highly competitive events may reveal prowess but is a tough way to make a living.

The second condition is when the payoffs are meager. You can be the most skillful person playing, but there's not much to play for. Consider the draft in sports, the primary way that professional sports leagues assign amateur players to its teams. In some years the draft is rich with great players. But in other years there is a dearth of talented players. You can have the most skillful scouting and draft strategy around but your skill won't pay off if the pool of players is poor.

In assessing the results of investment managers, it is useful to consider both skill and opportunity. In 2014, the opportunities were particularly limited, contributing to the relatively poor performance of active mutual fund and hedge fund managers.[5]

Exhibit 1 shows the percentage of equity mutual funds that have beat the S&P 500 Index in each year since 1970. The average rate of outperformance during this 45-year period was 40 percent (less than 50 percent because of fees), and the standard deviation was 19 percent. Only one in seven of U.S. large capitalization equity managers beat their benchmark in 2014.

Exhibit 1: Percentage of Equity Mutual Funds Beating the S&P 500, 1970-2014
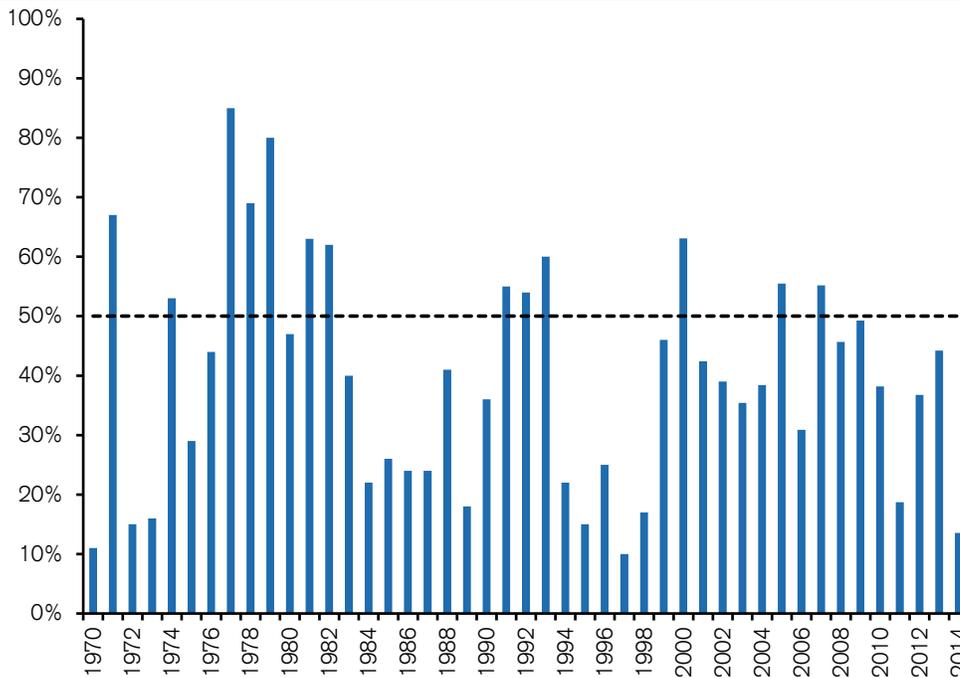
Source: John C. Bogle (1970-1999) and "SPIVA® U.S. Scorecard: Year End 2014," S&P Dow Jones Indices Research *(2000-2014).*
Note: U.S. general equity funds (1970-1999) and U.S. large capitalization equity funds (2000-2014).

We now examine some measures of opportunity and briefly offer ideas about how to find attractive opportunities.

How Portfolio Managers Express Skill

There are three ways that a portfolio manager can express skill. The first is through market timing, the ability to buy low and sell high. The second is through security selection, a talent for identifying securities that generate returns that beat the market after adjusting for risk. The final way is through portfolio construction, the aptitude to make each holding the proper size so as to earn the highest excess returns possible for a given level of risk.

Market timing. There is little evidence that mutual fund and hedge fund managers can time the market. That said, it is hard to directly measure that ability. For mutual funds, a logical approach is to compare the level of cash as a percentage of assets to subsequent market returns.[6] For hedge funds, we can examine the exposure to the market and future market moves.

The idea is when the market's valuation is high and hence the expected return on equities is low, mutual funds should hold substantial cash. And when the market is cheap, funds should deploy that available cash to buy bargains.

Exhibit 2 compares the average level of cash for equity mutual funds from 1990-2013 to the total shareholder return (TSR) for the S&P 500 in the subsequent year. Were mutual funds good at timing, you would expect to see high returns following periods of low cash balances, and low returns following high cash balances. We see the opposite pattern. One academic researcher studying the issue concluded that "equity funds as a whole do not have market timing skills."[7]

Exhibit 2: Mutual Fund Cash Balances and Total Shareholder Return for the S&P 500, 1990-2014
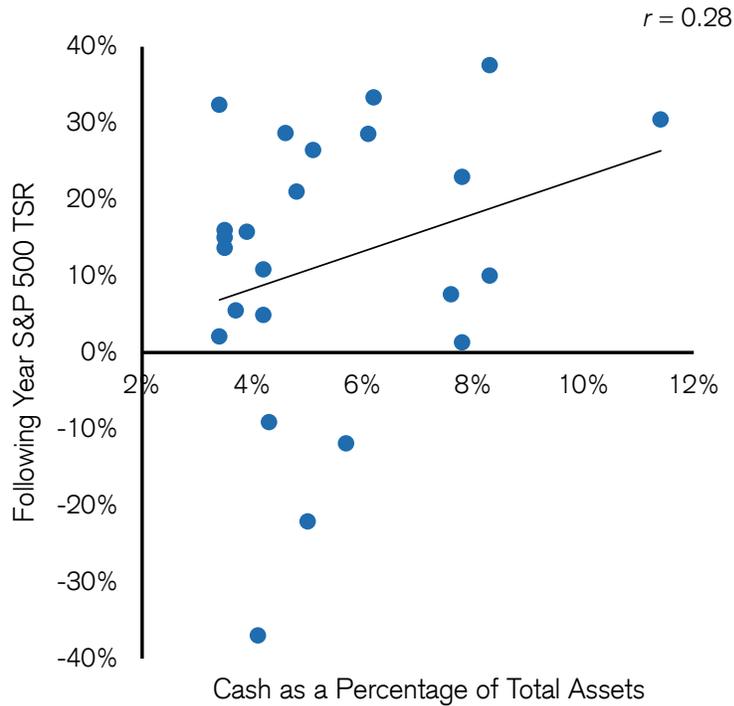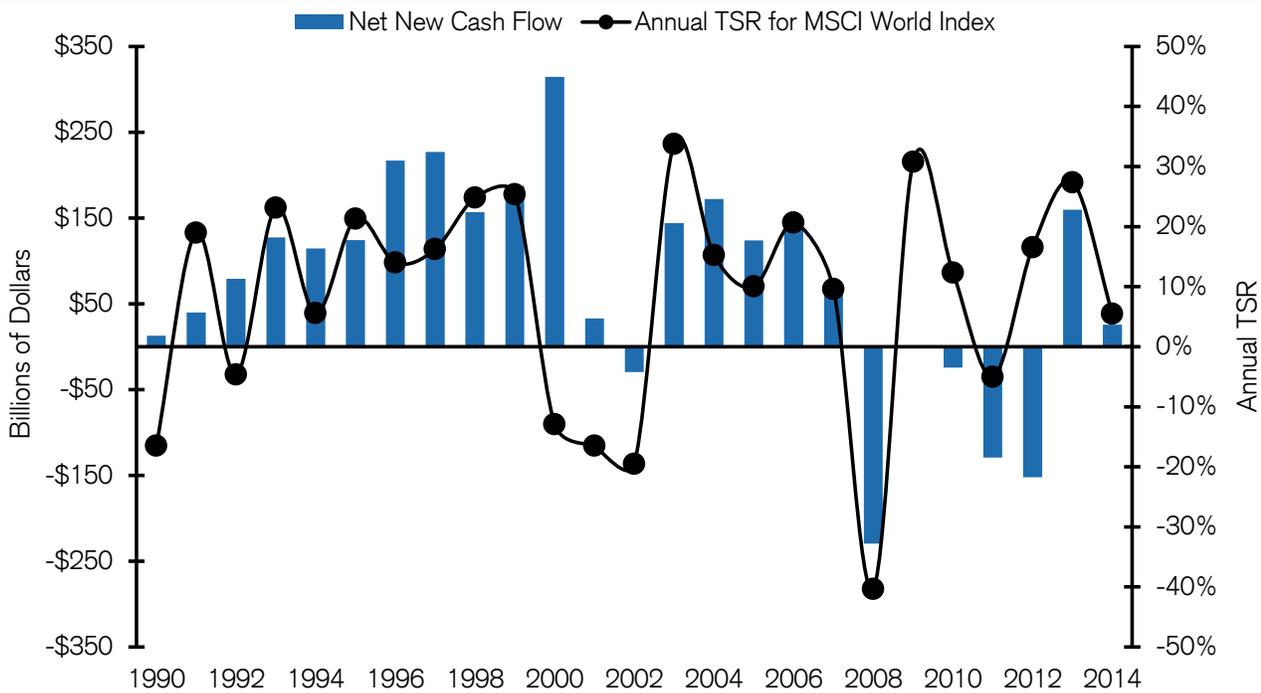

Source: Investment Company Institute and Credit Suisse.

Cash as a percentage of assets may not reveal an ability to time the market because factors other than a view of the market play a large part in determining cash holdings. For example, funds that hold small capitalization or volatile stocks tend to hold more cash than average to compensate for liquidity or to dampen risk.

Fund flows, the sum that investors add or withdraw from mutual funds, also have a large impact on the levels of cash. Fund flows are highly correlated with the results of the market. Exhibit 3 shows that investors tend to withdraw funds in down markets and add funds in up markets. As a result, high cash balances may simply reflect substantial flows. For instance, funds that anticipate outflows keep cash balances high to accommodate the expected requests, and funds receiving inflows invest the cash with a lag.

Exhibit 3: Buy High and Sell Low: Mutual Fund Flows and Market Returns, 1990-2014


Source: Investment Company Institute.

The average cash balance was 5.4 percent from 1990-2014, and was 3.6 percent at the end of 2014. The median cash balance was closer to 3.5 percent for the full period, suggesting that the distribution is substantially skewed. Since index funds are basically fully invested and the market tends to go up over time, holding cash creates a modest performance drag for active managers.[8]

The results for equity hedge funds that use a long-short strategy are no more encouraging. These funds go long stocks (own them) and simultaneously go short stocks (sell them for repurchase in the future). One measure of a fund's exposure to the market is the long/short ratio, which is the total long exposure divided by the short exposure. For example, a fund that is long $400 million in equities and short $285 million will have a long/short ratio of 1.4. We translate the ratio into a percentage by subtracting one. So in this case, the long/short ratio is 40 percent.[9]

The long/short ratio reflects how much the market will influence a fund's results. If hedge funds are good at market timing, a low long/short ratio should precede poor returns and a high long/short ratio should foreshadow stronger markets.

Exhibit 4 shows the long/short ratio (five-day moving average) of global long-short equity hedge funds and the TSR for the MSCI World Index for the subsequent 30, 60, and 90 trading days. These data are from January 2009 through February 2015 and represent more than 1,500 data points. None of the correlations are very strong, and for each period the relationship is the opposite of what you would expect if the managers were skillful at timing.

Exhibit 4: Hedge Fund Long/Short Ratios and Subsequent Market Returns, 2009-February 2015
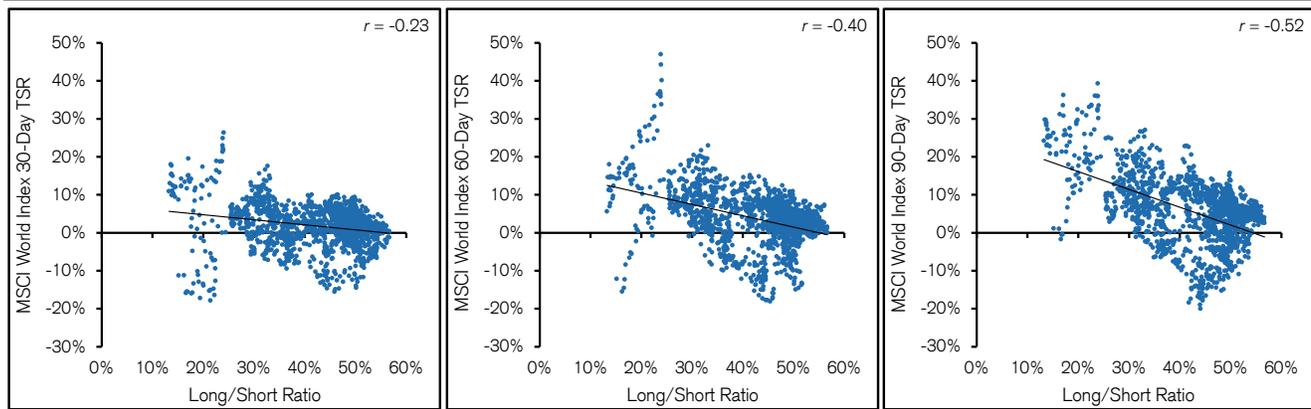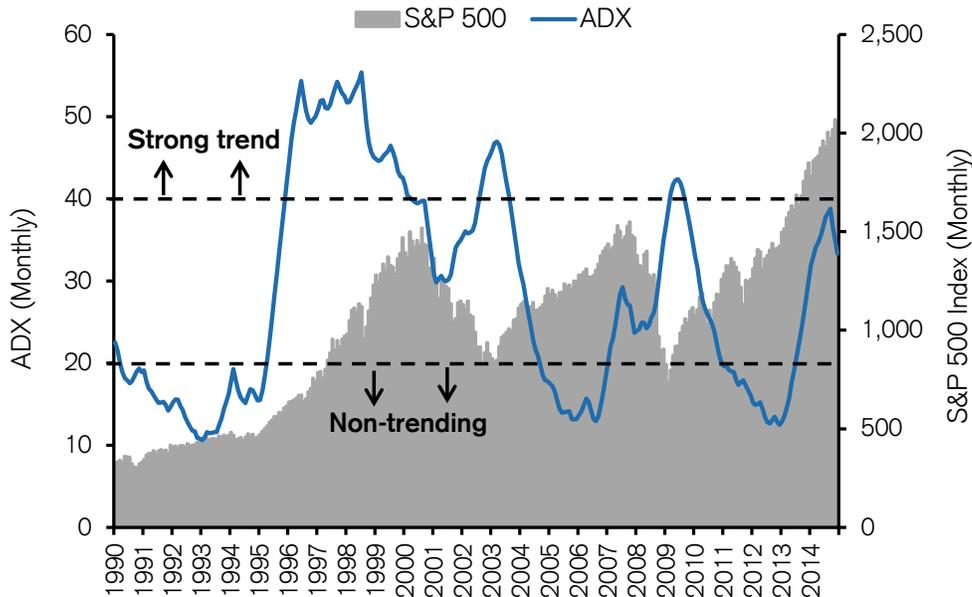

Source: Credit Suisse.

There is limited evidence that investors have skill in timing the market or that rules exist allowing one to do so.[10] But some evidence does exist. For instance, there is research that shows that equity funds with above-average levels of cash outperform the funds with below-average levels of cash as the result of superior stock picking.[11] Further, some fund managers appear to have the ability to pick stocks in good economic environments and time effectively when recessions strike.[12]

The opportunity to time the market is to some degree related to how much the market moves in trends. Think of it this way: If stocks go higher in a zigzag pattern, it is very difficult to move in and out successfully and outwit the market. On the other hand, it's a lot easier to make money if stocks move in a long upward or downward trend.

One measure of the market's trendiness is the average directional movement index, or ADX.[13] The ADX does not specify direction, only trend strength. The index has a range from 0 to 100. Readings below 20 indicate trend weakness, and readings above 40 indicate a strong trend.

Exhibit 5 shows monthly ADX readings for the S&P 500 from 1990 through 2014 along with the index's price. Note the very strong trends in the late 1990s, coming out of the bear market in the early 2000s, and for a brief period during the financial crisis in 2008-2009. Non-trending markets have characterized most of the rally following the financial crisis, making timing a challenge.

Exhibit 5: Monthly Average Directional Movement Index (ADX) and S&P 500 Price, 1990-2014
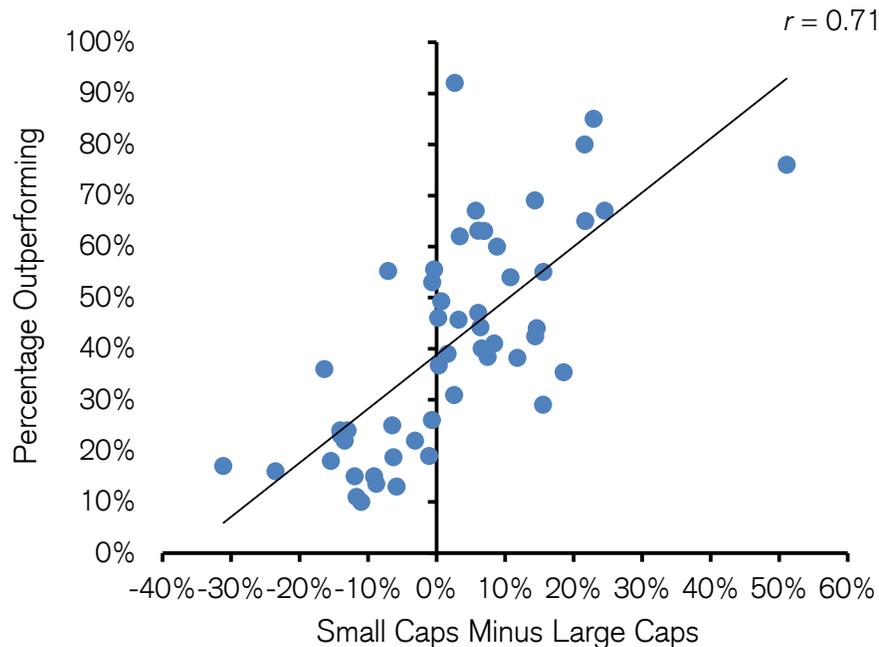

Source: Credit Suisse.

While some fund managers may have skill in market timing, that skill is not pervasive. George Soros, chairman of Soros Fund Management, used his theory of reflexivity to time markets and skillfully generate excess returns.[14] But without some trendiness in the market, opportunity is limited.

Security Selection. Fund managers can show skill by selecting stocks that outperform the benchmark index. Before we turn to the topic of measuring opportunity with regard to security selection, here's a quiz: Measured as the percentage of funds that beat the market, which decades—of the 1970s, 1980s, 1990s, and 2000s—were the two best and the two worst for active management?

The best decades were the 1970s and 2000s. In the 1970s, 47 percent of active funds beat the market and in the 2000s, 45 percent did so. The worst decades were the 1990s, with 34 percent beating the benchmark, and the 1980s at 37 percent. Many investors get the answer wrong because the 1980s and 1990s were good decades for the market overall, whereas the 1970s and 2000s were poor. What's going on?

The explanation is that funds using the S&P 500 as a benchmark generally hold stocks with an average market capitalization that is less than that of the benchmark.[15] Exhibit 6 shows the relationship between the difference in small and large capitalization results (x-axis) and the percentage of funds that beat the benchmark (y-axis) from 1963 through 2014. When large capitalization stocks outperform small capitalization stocks, as they did in the 1980s and 1990s, active managers do relatively poorly. In contrast, when small caps beat large caps, active management does well.

In other words, part of the explanation for mutual fund results is that portfolio managers own more small cap stocks than the index does, and over time small cap stocks have earned higher returns than large cap stocks have.[16]

Exhibit 6: Small Minus Large Cap Stocks and Percentage of Funds Beating the Market, 1963-2014

Source: Credit Suisse.
Note: Small Minus Big Fama/French Factor (1963-1979) and Russell 2000 TSR minus S&P 500 TSR (1980-2014).

Another way to look at opportunity for stock selection is market diversity, a measure of the distribution of market capitalizations in an index. If a large percentage of the market capitalization is in a handful of stocks, the diversity of the index is low. If the capitalizations are spread evenly, diversity is high.

Research shows that changes in market diversity correlate highly with the relative returns for large capitalization investment strategies. For example, 58 stocks represented 50 percent of the market capitalization of the S&P 500 at year-end 1995 versus just 33 stocks at the peak of the market in March 2000. Consistent with the notion that falling diversity creates a headwind for active managers, the late 1990s were a very trying period for the relative results of active managers.[17] Diversity rebounded through 2005, with 54 stocks making up half the market, and active management fared relatively well.[18]

Dispersion is the main way to measure how much skill a portfolio manager can reveal through stock selection. Stated simply, dispersion captures the range of returns for a given group of stocks. The link between dispersion and opportunity is intuitive. Say you are examining 20 stocks. During the year the average return for the group is 10 percent, with the best stock up 12 percent, the worst stock down 8 percent, and the rest with returns in between. Call this the boring group. It is hard to build a portfolio that does much better than that collective group of stocks.

Now imagine 20 stocks where the best one doubles, the worst one goes to zero, and the others fall in between those extremes. The average return is also 10 percent. Call this the exciting group. The exciting group has the same average return as the boring group, but it's easy to see that stock selection is going to be a lot more important.

Here's one way to measure dispersion.[19] Start with the median return for the stocks within the index for a given year. For the S&P 500 in 2014, that number was 15.6 percent. You then calculate the average total shareholder returns (TSR) of the top half, which was 32.1 percent, and the average return for the bottom half,

which was -1.6 percent. The difference between the two, 33.7 percentage points (32.1 minus -1.6), is a measure of dispersion. Dispersion is similar to the standard deviation of returns within the index. Exhibit 7 summarizes the figures for 2014.

Exhibit 7: Dispersion of Returns for the S&P 500 in 2014

	TSR (%)
Median return	15.6
Average return of outperformers	32.1
Average return of underperformers	-1.6
Average outperformer minus average underperformer	**33.7**

Source: Credit Suisse.

Exhibit 8 shows the dispersion of returns for the S&P 500 from 1990-2014. Academic research shows that dispersion is a reasonable proxy for breadth.[20] And since the fundamental law of active management says that excess returns are a function of skill and breadth, more breadth leads to higher returns for a given level of skill. The research supports this conclusion.[21]

Exhibit 8: Dispersion of Returns for the S&P 500, 1990-2014
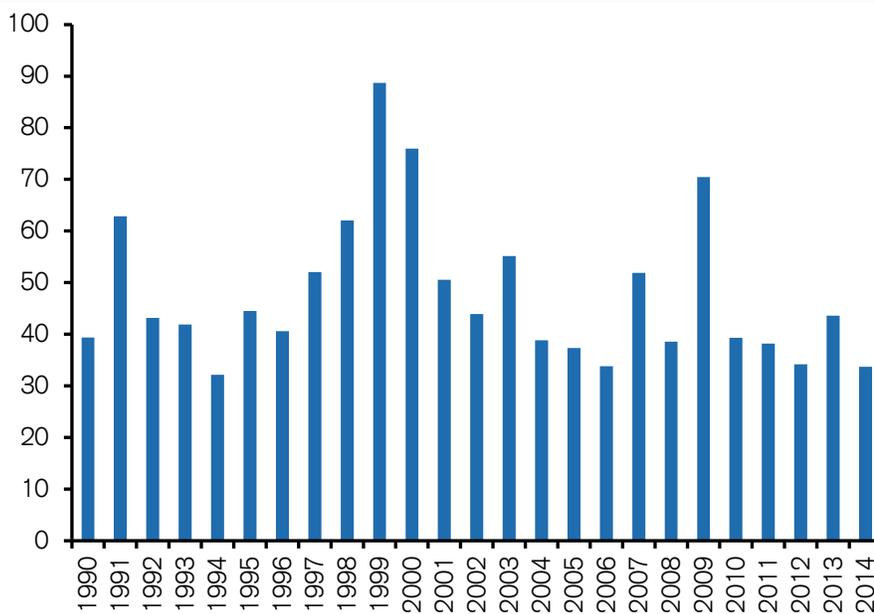
Source: Credit Suisse.

The point of this discussion is your skill in security selection only shines if there is a wide range of outcomes across the securities you are selecting. Low dispersion limits breadth, which blunts the opportunity for excess return even in the presence of skill.

Portfolio Construction. The final way that portfolio managers can demonstrate skill is through position sizing. The basic idea is straightforward: You want your best ideas, those with the highest risk-adjusted expected returns, to have the greatest weights in the portfolio.

Here's a simple example of the importance of position sizing. Say you have three securities—A, B, and C—that you expect to have a positive excess return. But, in fact, after one year security A is up 50 percent, security B is flat, and security C is down 20 percent.

If you had given each security an equal weight at the beginning of the year, your portfolio would be up 10 percent. This is simply the average return of the securities. Now consider the case where you put 10 percent into securities A and B and 80 percent into C. This portfolio would be down 11 percent for the year.

Alternatively, if you placed 80 percent of the portfolio into A and split the balance between B and C, the portfolio would be up 38 percent. The returns of the portfolio reflect not just the securities you select but also the way you weight them.

We have already seen that dispersion is a useful way to gauge opportunity for security selection. We can now extend the analysis of dispersion to assess the opportunity for portfolio construction. The idea is to examine the dispersion of the dispersion.[22]

Think about it this way: Say that all stocks in a given year were evenly split between outperformers (up 20 percent) and underperformers (down 10 percent). If your portfolio is filled with mostly outperformers, you have skill in security selection. But if every outperformer is up the exact same amount, there's no way to add value through portfolio construction.

So for opportunity to exist, you need dispersion of dispersion. Your security selection directs you to good excess returns, and your portfolio construction leads you to make the securities with the highest excess return the largest positions in your portfolio.

Let's look at some numbers to make this more concrete. In 2014, the top half of the stocks in the S&P 500 had an average TSR of 32.1 percent. The average return of the top half of this group (in other words, the top quarter within the S&P 500), had a TSR of 42.9 percent while the bottom half earned a TSR of 21.3 percent. So the spread between the top half and the bottom half was 21.6 percentage points. Exhibit 9 shows these figures. Lower numbers for the dispersion of dispersion mean less opportunity to express skill through portfolio construction.
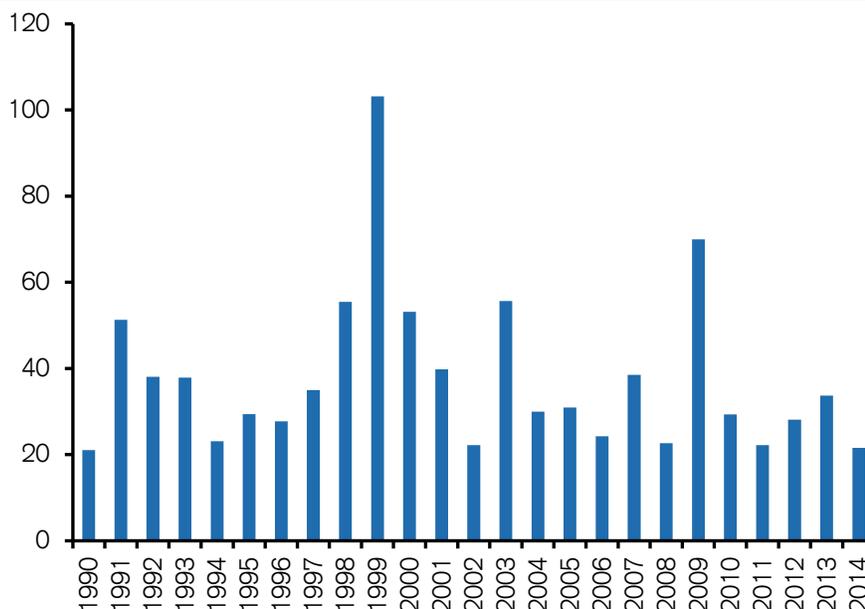
Exhibit 9: Dispersion of Dispersion for S&P 500 Winners in 2014

Outperformers	TSR (%)
Average return	32.1
Average return of top half of outperformers	42.9
Average return of bottom half of outperformers	21.3
Top half minus bottom half	**21.6**

Source: Credit Suisse.

Exhibit 10 shows the dispersion of dispersion for the winners from 1990 through 2014. The most extreme year in recent history was 1999, which coincides with the largest standard deviation of excess returns for mutual funds during the same time period.

Exhibit 10: Dispersion of Dispersion for S&P 500 Winners, 1990-2014

We can do the same exercise for the losers in the S&P. (See Exhibit 11.) The average loser was down 1.6 percent, while the worse half of that group declined 11.6 percent and the better half was up 8.4 percent. That spread was 20.0 percentage points.

Exhibit 11: Dispersion of Dispersion for S&P 500 Losers in 2014

Underperformers	TSR (%)
Average return	-1.6
Average return of top half of underperformers	8.4
Average return of bottom half of underperformers	-11.6
Top half minus bottom half	**20.0**

Exhibit 12 shows the dispersion of dispersion for the losers from 1990 through 2014. This dispersion is very important for short sellers. Again, the peak was around the dot-com era and the numbers remained elevated through the bear market of 2000-2002. The scale for underperformers is shorter than that for outperformers because stocks can't go down more than 100 percent.

Exhibit 12: Dispersion of Dispersion for S&P 500 Losers, 1990-2014
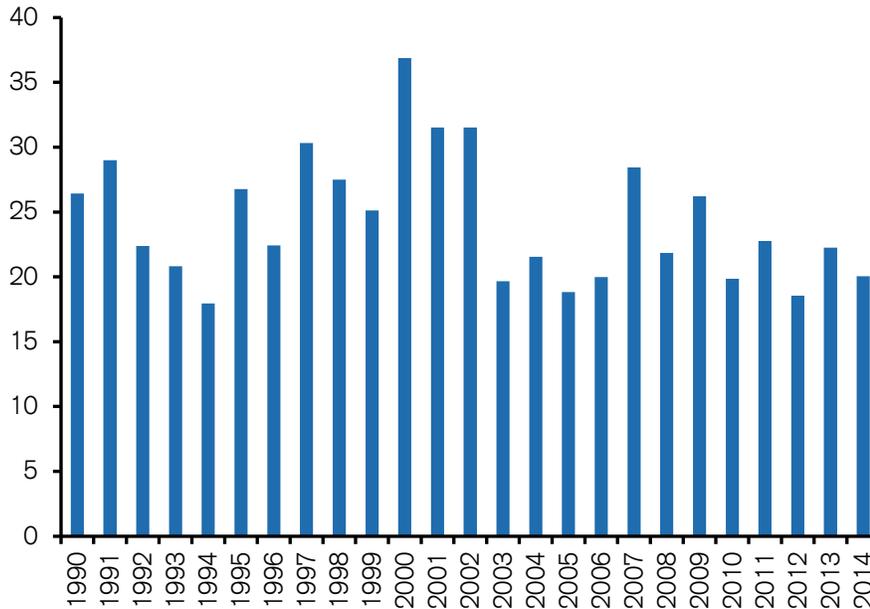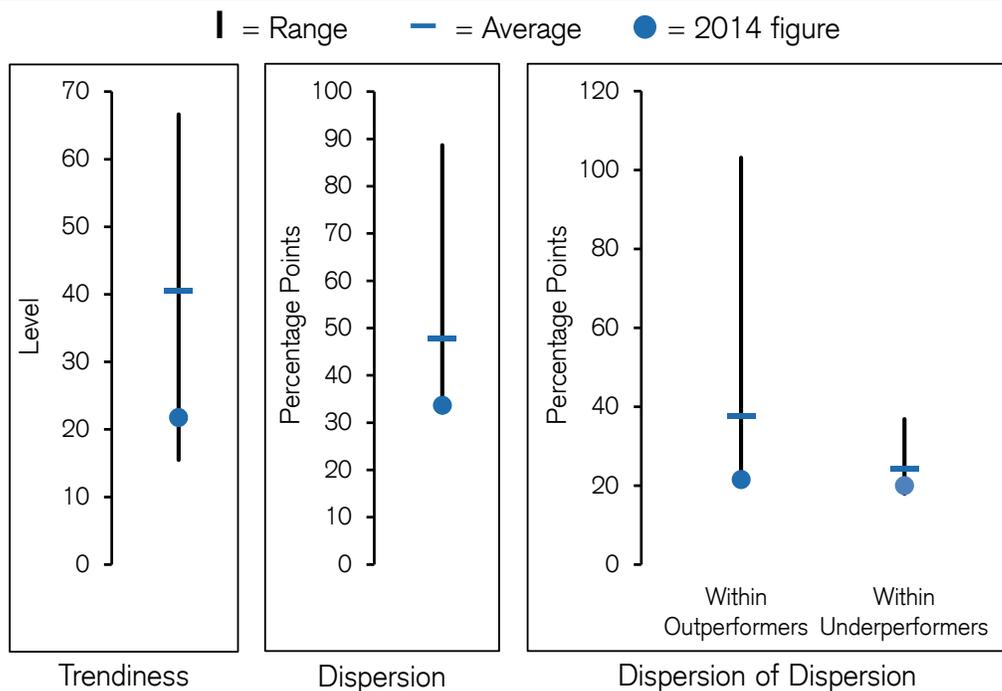

Source: Credit Suisse.

Why 2014 Was a Tough Year

Mutual fund and hedge fund managers struggled versus popular benchmarks such as the S&P 500 in 2014. Was that because of a lack of skill or a lack of opportunity? Certainly, absolute skill in the investment industry continues to rise while relative skill continues to decline. In other words, it's harder to find markets or securities that are mispriced.

But by the metrics we used here, opportunities in 2014 were unusually limited. Exhibit 13 shows the proxies we used to measure market timing, security selection, and portfolio construction.

On the left, we see that the "trendiness" of the S&P 500, as measured by the average quarterly ADX, was below average. This made market timing particularly hard. In the middle, we see that dispersion was at a 25-year low, creating a substantial challenge for security selection. Finally, on the right we look at dispersion of dispersion for winners and losers. Again, the figures for 2014 were near quarter-century lows, which created difficulty in constructing portfolios on both the long and short side.

Exhibit 13: Limited Opportunities in 2014

Source: Credit Suisse.

Further, in 2014 large capitalization stocks delivered much higher returns than small capitalization stocks, creating a challenging environment for active managers. For instance, the TSR for the S&P 500 was 13.7 percent versus 4.9 percent for the Russell 2000, a proxy for small capitalization stocks. This was the largest gap of underperformance for the Russell 2000 since 1998. Given the bias for small capitalization stocks in the portfolios of most active managers who use the S&P 500 as a benchmark, the relatively weak results for small capitalization stocks provided a stiff headwind.

Opportunities do exist, and they tend to lie in pockets of market inefficiency. In the past, we have discussed three broad areas where you might look for these inefficiencies. They include:[23]

■ **Diversity breakdowns**. Markets tend to arrive at efficient prices when investors hold diverse views.[24] However, when the views of investors correlate to be either bullish or bearish, market efficiency is compromised and opportunity arises. The key is to be a contrarian in cases when the market reflects unrealistic expectations about future results.

■ **Institutions versus individuals**. For the most part, institutions trade with other institutions. But in cases when institutions can compete with individual investors, institutions have been shown to generate superior results. Frenzied retail activity at the top of the dot-com bubble is one example.

■ **Forced selling or buying**. There are times when portfolio managers buy or sell for reasons that are not fundamental. Examples include spin-offs, sales to accommodate margin calls, or even portfolio adjustments to hew to new regulations. It's frequently an opportunity if the person on the other side of the trade is doing something he or she doesn't want to do.

Summary

The fundamental law of active management reminds us that success requires both skill and opportunity. While researchers have spent a great deal of time dwelling on assessing skill, they have paid less attention to opportunity. Skill does not pay off unless it is paired with opportunity.

Investment results were particularly challenging in 2014. Part of this, no doubt, reflects the steady rise in skill of active managers. But part of it also reflects a dearth of opportunity for active managers to show their skill. As history shows that opportunity ebbs and flows, it is reasonable to expect that we will see better opportunity in the future. One interesting line of inquiry is whether the rise in passive investing, through index funds and exchange-traded funds, is having an impact on opportunity. Early evidence suggests that after a stock enters the S&P 500, its correlation with the index rises. This dampens dispersion and limits opportunity. [25]

Appendix

Here's the fundamental law of active management again:

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

The law solves for the information ratio (IR), which is a measure of the return of a portfolio adjusted for risk.

More formally, the information ratio reflects the portfolio's return in excess of the benchmark return, divided by the tracking error. A measure of how closely the portfolio follows the benchmark, tracking error is the standard deviation of the difference between the portfolio and benchmark returns. Here is the equation for the expected information ratio:

$$IR = \frac{\mathrm{E}[Rp - Rb]}{\sigma} = \frac{\alpha}{\omega} = \frac{\mathrm{E}[Rp - Rb]}{\sqrt{var[Rp - Rb]}}$$

The numerator captures how well the portfolio does versus its benchmark, and the denominator suggests how much risk the manager took to achieve those returns. So industry experts generally consider high information ratios to be an indication of skill.

The information coefficient (IC) is the average correlation between forecasts and outcomes. A high correlation (something near 1.0) indicates skill, and a low correlation (something close to zero) indicates no skill.

Here's a simple way to think about it. Say you are shooting free throws in a basketball game. When you shoot, you predict the shot will go in. That's the forecast. Whether it's a make or a miss is the outcome. You are skillful if lots of your shots go in (forecast matches outcome) and you are unskillful if they don't.

The final part of the equation is breadth (BR). Breadth is the number of independent, excess-return opportunities predicted to be available during some period of time, usually one year.

So for a given level of skill, the information ratio rises as a function of the square root of breadth. More opportunities lead to more excess return. To show the relationship between breadth and the information ratio, Grinold and Kahn offer the example of a casino with a roulette wheel that has 18 red slots, 18 black slots, and 1 green slot. (American roulette wheels commonly have two green slots.)

Assume a player places $1 on black. The casino's expected return, or "skill," is 2.7 percent (19/37 * 100% + 18/37 * -100%). But the information ratio is only 0.027 since the standard deviation is very large, 99.96 percent, as the result of spinning the wheel only once. We can solve for the information ratio using the equation: 0.027 (IR) = 0.027 (IC) * $\sqrt{1}$ (BR).

Now assume 1 million bets of $1, closer to what casinos experience in the real world. The expected return remains the same, but the standard deviation plummets to 0.09996 percent. This drives the information ratio up to 27.027. We can also determine for the information ratio using these assumptions: 27.027 (IR) = 0.027 (IC) * $\sqrt{1,000,000}$ (BR).

Other researchers have refined and augmented the fundamental law of active management. For example, some academics have added the idea of constraints, suggesting that there is slippage between theory and practice.[26] But the central notion for our purpose is the distinction between skill and opportunity.

Endnotes

[1] Attributed to Napoleon Bonaparte. We could not find an original source. The quotation has also appeared on the paper label of Salada tea bags.

[2] 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.

[3] See the appendix.

[4] Michael J. Mauboussin, *The Success Equation: Untangling Skill and Luck in Business, Sports, and Investing* (Boston, MA: Harvard Business Review Press, 2012), 53-58.

[5] Aye M. Soe, "SPIVA® U.S. Scorecard: Year End 2014," *S&P Dow Jones Indices Research*, March 12, 2015. See http://www.spindices.com/documents/spiva/spiva-us-year-end-2014.pdf. Also, "A 25% Chance of Success," *Economist - Buttonwood Blog*, February 13, 2015. See www.economist.com/blogs/buttonwood/2015/02/mutual-fund-investing. And, Joe Peta, "The Worst Year Ever for Hedge Funds," *Novus Research*, January 2015.

[6] What we call cash, the Investment Company Institute calls "liquid assets." Liquid assets are defined as cash, U.S. Treasuries, and other securities with short-term maturities. We examine liquid assets as a percentage of total assets.

[7] Xuemin (Sterling) Yan, "The Determinants and Implications of Mutual Fund Cash Holdings: Theory and Evidence," *Financial Management*, Vol. 35, No. 2, June 2006, 67-91.

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

[9] "Net exposure" is a related but distinct concept. Net exposure is the percentage difference between a fund's long and short exposure. Say a long-short equity hedge fund has $100 million in assets. If it owns $60 million of stocks, it has a long exposure of 60 percent ($60 million/$100 million = 60 percent). If it is short $20 million of stocks it has a short exposure of 20 percent ($20 million/$100 million = 20 percent). The fund's net exposure is 40 percent (60 percent – 20 percent = 40 percent).
Net exposure doesn't capture risk because funds can use leverage. For instance, a fund that is 140 percent long and 100 percent short will also have a 40 percent net exposure but would clearly be riskier than the fund above. To better capture risk, you can examine gross exposure, which is the sum of the long and short exposure. So the gross exposure in the first example is 80 percent (60 percent long + 20 percent short) while the gross exposure in the second example is 240 percent (140 percent long and 100 percent short).

[10] Andreas Neuhierl and Bernd Schlusche, "Data Snooping and Market-Timing Rule Performance," *Journal of Financial Econometrics*, Vol. 9, No. 3, Summer 2011, 550-587.

[11] Mikhail Simutin, "Cash Holdings and Mutual Fund Performance," *Review of Finance*, Vol. 18, No. 4, July 2014, 1425-1464.

[12] Marcin Kacperczyk, Stijn Van Nieuwerburgh, and Laura Veldkamp, "Time-Varying Fund Manager Skill," *Journal of Finance*, Vol. 69, No. 4, August 2014, 1455-1484.

[13] J. Welles Wilder, Jr., *New Concepts in Technical Trading Systems* (Greensboro, NC: Trend Research, 1978).

[14] George Soros, "Soros: General Theory of Reflexivity," *Financial Times*, October 26, 2009.

[15] Frank J. Fabozzi, ed., *Active Equity Portfolio Management* (New Hope, PA: Frank J. Fabozzi Associates, 1998), 305.

[16] Fama and French discuss a three-factor model, which includes beta (the slope of the regression of a security's excess return versus that of the market), size, and valuation. See 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. Today, academics prefer models with four (momentum) and even five (profitability) factors.

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