Every presentation of investment performance should brandish a “past returns do not guarantee future results” disclaimer, one that an intelligent investor would be wise to acknowledge. Yet, with a recent flood of momentum-oriented strategies hitting the marketplace, one must question whether in fact the past can provide some indication of the future. Are these strategies simply “hot” due to their recent success avoiding market meltdowns which are still engrained in the minds of advisors? In this paper we will explore the history and logic behind momentum investing, as well as whether an investor is able to benefit from its existence or should avoid the hype.

At Odds with Accepted Theory

Many wealth managers use imagery of “smooth sailing” to describe the market, but the reality is that the market’s behavior is quite the opposite. We find that an analogy often used by the famed investor Howard Marks is much more apt at describing market action: Mr. Marks describes the market as a pendulum which spends very little time at the midpoint; instead swinging back and forth from one extreme to the other. In terms of this metaphor, a momentum investor may believe they can beat the market by holding equities when the pendulum swings up and selling them once it reverses direction. Broadly defined, momentum investing is the process of investing in securities that have outperformed their peers over a recent time frame in hopes that they will continue to do so. Our task as researchers is to determine whether such a momentum based strategy can be successful despite what Modern Portfolio Theory would lead us to believe.

Modern Portfolio Theory dictates that markets are efficient and that all relevant information is incorporated in the current market price of a security. Similarly, the theory suggests that investors have the opportunity to hold a diversified portfolio, and that they are therefore only compensated, through positive market performance, for accepting systematic (market) risk. If this is truly the case, momentum as an isolated factor should not produce return in excess of broad market performance over long periods of time. Furthermore, market efficiency dictates that if momentum investing was a winning strategy in the past, the collective actions of investors seeking to exploit this advantage would eliminate the advantage going forward. Despite this, there are a number of prolific research papers which argue to the contrary, concluding that momentum is both significant and has persisted through time.

Proof in Academia

While momentum investing has been used for centuries, academic interest in it is a somewhat recent phenomenon. One of the first notable instances came in 1993 when Jegadeesh and Titman published “Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency.” Jegadeesh and Titman exhibited that strategies which were long stocks that had performed well in the past and short stocks that had performed poorly generated statistically significant positive returns over three- to twelve-month holding periods. However, theory dictates that such a diverse group of longs and shorts should not provide a statistically significant return in excess of zero. This contradiction between theory and reality birthed the modern theory of momentum investing.
As the awareness of the momentum phenomenon spreads, it is natural to wonder whether or not a momentum based strategy will continue to produce excess returns going forward. Many investors have fallen prey to the common misconceptions that momentum strategies are unreliable and cease to be effective over the long term; that the outperformance of the strategies is too insignificant to hurdle the trading costs necessary to implement them; or that momentum is only effective for use in small-cap equity markets, which are generally accepted as less efficient than large-cap equity markets.

In a recent paper entitled “Fact, Fiction and Momentum Investing”, Asness, Frazzini, Israel and Moskowitz review these and other common misconceptions. The paper compares the returns of a “momentum factor” to those of two other academically accepted risk factors: the small-cap factor and the value factor. The market risk factor, which is simply the return of equities above the risk free rate of return, is also included in the study for reference. These risk factor portfolios are created in the same way as the aforementioned momentum factor. The strategy is long securities exhibiting a particular factor, for example small capitalization or low price-to-book value, and short securities exhibiting the longs’ counterpart (large capitalization or high price to book value). A factor portfolio exhibiting statistically significant returns in excess of zero is evidence that a return premium may exist for the isolated factor. As you can see in the example below, the momentum factor exhibited positive returns, in addition to outperforming the other non-market factors for each period.

On a risk-adjusted basis, as illustrated by the Sharpe Ratio, momentum still appears to be the most attractive, although by a narrower margin. This tells us that the returns of this momentum strategy can exhibit more volatility than small-cap and value risk factors, but that investors have been commensurately rewarded for the additional volatility.

The existence of a small-cap factor, in conjunction with the perceived inefficiency of small-cap markets, leads many to conclude that small-cap securities are responsible for a significant portion of the return present in the momentum factor. Therefore, in the interest of a complete analysis, it is prudent to separately examine the isolated momentum factor returns for small-cap and large-cap stocks. This analysis was also conducted by Asness et al., as seen in the table to the right, and concludes that although the excess return attributable to momentum for small-cap equities was greater than that of large-cap momentum-based equities, the large-cap excess returns remain consistent and statistically significant over time.

Now that we have acknowledged the presence of a statistically significant and consistent return premium amongst equities exhibiting momentum, we must explore why this premium could continue to exist. Although momentum investing is a relatively new course of study in the academic world, today there are roughly twenty years of out-of-sample data to explore whether or not the knowledge of momentum’s existence has mitigated its effects. In 2001, Jegadeesh and Titman produced a follow-up to their original paper addressing this exact question, ultimately concluding that the momentum return premium remains. Such persistence seems unlikely to be a coincidence, but why?

<table>
<thead>
<tr>
<th>Sample</th>
<th>Excess Returns by Factor</th>
<th>Sharpe Ratios</th>
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<tbody>
<tr>
<td></td>
<td>Market</td>
<td>Small-Cap</td>
</tr>
<tr>
<td>1927 - 2013</td>
<td>7.7%</td>
<td>2.9%</td>
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<tr>
<td>1963 - 2013</td>
<td>6.0%</td>
<td>3.1%</td>
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<tr>
<td>1991 - 2013</td>
<td>8.2%</td>
<td>3.3%</td>
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<th>Sample</th>
<th>Momentum Factor Excess Returns</th>
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<tr>
<td></td>
<td>Small-Cap</td>
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<td>1927 - 2013</td>
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<tr>
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<td>1991 - 2013</td>
<td>8.1%</td>
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Momentum as a Result of Investor Behavior

Theory dictates that there are two possible explanations for momentum’s existence: risk-based factors and behavioral factors. These factors need not be mutually exclusive; in all likelihood both contribute to the existence of a momentum premium. We will focus primarily on behavioral factors, which suggest that behavioral biases of market participants are responsible for these premiums.

One behavioral factor that is particularly prevalent is herding, which is also commonly observed in social settings outside of financial markets. Imagine a portfolio manager who thinks the market is far overvalued but cannot sell for fear of missing out on continued positive performance. If the manager does sell these overvalued securities early and the market continues upward, their decision could result in significant short-term underperformance. Many fund manager’s compensation structures are peer-focused, or are based on relative performance to a benchmark, thus reinforcing such behavior. Therefore, staying close to the herd and remaining in the market even with the belief that it is over-valued minimizes the risk that is specific to the portfolio manager. It may be the case that massive market bubbles are not a result of natural market behavior but of human behavior tied to outside factors such as personal income.

Academic studies such as one conducted by Smith, Williams and Arlington entitled, “Bubbles, Crashes, and Exogenous Expectations” found market bubble type behavior exists in fictitious proxy markets as well. In these investment “games”, participants consistently overpaid for a good even when the price was easily knowable and commonly accepted, expecting to sell it to someone else who might be willing to pay even more. This notion is appropriately called the “Greater Fool Theory” and may partially explain the momentum factor as well as the boom and bust nature of equity, real estate and other markets as a whole. Other commonly observed behavioral biases can be seen below:

- Extrapolation – the belief that a past trend will continue into the future
- Regret Aversion – individuals fear “missing out” and will regret not participating in an upward market
- Hindsight Bias – the belief that past events could have been easily anticipated
- Confirmation Bias – the tendency to overweight supportive information and underweight contradictory information

It is easy to imagine how any one of these factors could lead to behavior that contributes to the existence of a momentum factor. In fact, all factors considered, it is hard to imagine a situation in which a momentum factor is not present. At the end of the day, the market is run by individuals, and the evidence has shown that, at least in regards to human behavior, history has often repeated.

Capitalizing on Momentum

Now that we’re comfortable with the existence of a momentum factor through time, the obvious question is “How can I, as an investor, benefit from momentum?” One answer, which requires some simplifying assumptions, is through the use of moving averages. In a moving-average-based investment strategy, as depicted by the graphic on the following page, an investor chooses a moving average as a point of reference: they will buy or own securities with prices above the moving average (“the winners”), and sell or avoid securities with prices below the moving average (“the losers”). Furthermore, the strategy is more realistic for the average investor since it does not require any short sales and capitalizes on the premium for a long-only investor.
To examine the validity of this type of investment strategy at a cursory level, we tested the strategy mentioned above and applied it to the S&P 500® Index. The example strategy bought or continued to own the S&P 500 when it was trading above the aforementioned long-term moving average and sold the S&P 500 when it was trading below this moving average. It is important to note that the analysis below does not take taxes, management fees, or trading costs into account, therefore likely overstating returns. Despite this, the characteristics of these returns and the sheer magnitude of outperformance are certainly worth further examination.

The table below represents the average return and standard deviation of the simple moving average strategy applied to a random sample of one-year returns within each decade. The strategy, on average, outperformed the unmanaged index in every period with the exception of the 1990’s and with lower standard deviation in all periods. Additionally, the outperformance often exceeded 200 basis points per year, even exceeding 1000 basis points during the ten years beginning in 2000.

<table>
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<tr>
<th>Hypothetical 1-Year Average Returns by Period</th>
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<tr>
<td><strong>Simple Moving Average Strategy</strong></td>
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<tr>
<td>Return</td>
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<tr>
<td>1950 - 1959</td>
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<td>1960 - 1969</td>
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<td>2000 - 2009</td>
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<td>2010 - 2014</td>
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In addition to sampling random one-year returns from within each sample time period, we also sampled three- and five-year returns. The purpose of sampling one-, three-, and five-year returns was to create cumulative return distribution charts for each time period, seen directly above.

The key takeaway from these charts is the shape of each return distribution. Over a one-year period, a moving average strategy provided loss avoidance, visible by the absence of strategy returns present in the left-tail of the distribution. However, the probability of excess return, visible by the significant overlap on the right side of the distribution, was low. This is because in a down market the theoretical strategy will hold cash, avoiding large losses, and in an up market the strategy will own the market and, by definition, capture market performance. As the time period lengthens, the market exhibits more cyclicality, moving up and down, allowing the strategy to avoid loss and capture gains within the same time period. Over three- and five-year periods the strategy continued to provide a degree of loss avoidance while the probability of excess return increased. These cumulative return distributions indicate that the value of a momentum-based strategy over time is its avoidance of large market drawdowns, a reality that contradicts most investors’ perception of momentum. There is the possibility that a strategy could seek to take advantage of dispersion within the constituents of the market (as represented by an index), but that is beyond the scope of this analysis.

The evidence we have outlined clearly supports the premise that over long periods of time a momentum-based strategy has the ability to provide performance in excess of the market’s. The “Hit Chart”, pictured above, illustrates the years in which the strategy matched the performance of, exceeded the performance of, and lagged the performance of the S&P 500 benchmark on one-, three-, five- and ten-year rolling bases. While such consistency over ten-year periods is academically intriguing, many investors have a much shorter investment horizon. As you can see in the first row on the “Hit Chart”, over shorter periods of time the excess return was spotty at best; not nearly as consistent as it was over longer durations. Examples of when the strategy underperformed that can be confirmed via the “Hypothetical Hit Chart” are long bull markets and periods following large drawdowns during which the strategy was slow to reinvest.
On the chart seen above each point represents the annualized trailing 10-year return for the simple moving average strategy and the S&P 500. Further illustrating the point that the strategy’s effectiveness relative to the S&P 500 changes depending on the characteristics of the time period, with relative outperformance being most prevalent surrounding bear markets.

Where Do We Go From Here?

In the future we will seek to further expand upon this primitive model by investigating some additional enhancements which could potentially improve the strategy’s relative performance over shorter periods of time. It is our belief that a dynamic and investor-friendly strategy can help provide the stable long-term returns that are key to successful investing. We hope this general demonstration of momentum investing has given potential investors some comfort when evaluating it as a piece of their investment toolkit. Education and examination are the hallmarks of a successful investment strategy, and we hope we have helped to shed light on some simple ideas to aid in that process.

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Tuesday June 30th, 2015

References

Disclosures:

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The Standard & Poor’s (S&P) 500® Index is an unmanaged index that tracks the performance of 500 widely held, large-capitalization U.S. stocks. Indices are not managed and do not incur fees or expenses. “S&P 500®” is a registered mark of Standard & Poor’s Financial Services, LLC a division of McGraw Hill Financial, Inc.

Small/Large-Cap: Fama, E.F. and K.R. French (1993). “Common Risk Factors in the Returns on Stocks and Bonds.” Journal of Financial Economics 33, 3-56: “In June of each year t from 1963 to [2013], all NYSE stocks on [The Center for Research in Security Prices] are ranked on size (price times shares). The median NYSE size is then used to split NYSE, Amex, and (after 1972) NASDAQ stocks into two groups, small and big (S and B). Our portfolio [small-cap] (small minus big), meant to mimic the risk factor in returns related to size, is the difference, each month, between the simple average of the returns on three small-stock portfolios [small low book-to-market equity, small medium book-to-market equity, and small high book-to-market equity] and the simple average of the returns on the three big-stock portfolios [big divided by low book-to-market equity, big divided by medium book-to-market equity, and big divided by high book-to-market equity]. Thus, [small-cap] is the difference between the returns on small- and big-stock portfolios with about the same weighted-average book-to-market equity. This difference should be largely free of the influence of [book-to-market equity], focusing instead on the different return behaviors of small and big stocks.”

Value: Fama, E.F. and K.R. French (1993). “Common Risk Factors in the Returns on Stocks and Bonds.” Journal of Financial Economics 33, 3-56: “We also break NYSE, Amex, and NASDAQ stocks into three book-to-market equity groups based on the breakpoints for the bottom 30% (Low), middle 40% (Medium), and top 30% (High) of the ranked values of [book-to-market equity] for NYSE stocks. We define book common equity, [book value of equity], as the COMPSTAT book value of stockholders’ equity, plus balance-sheet deferred taxes and investment tax credit (if available), minus the book value of preferred stock. Depending on availability, we use the redemption, liquidation, or par value (in that order) to estimate the value of preferred stock. Book-to-market equity, [book-to-market equity], is then book common equity for the fiscal year ending in calendar year t – 1, divided by market equity at the end of December of t – 1. We do not use negative-[book value of equity] firms, which are rare before 1980, when calculating the breakpoints for [book-to-market equity].... The portfolio [Value] (high minus low), meant to mimic the risk factor returns related to book-to-market equity, is defined similarly. [Value] is the difference, each month, between the simple average of the returns on the two high-[book-to-market equity] portfolios [small high book-to-market equities, and big high book to market equities] and the average of the returns on the two low-
[book-to-market equity] portfolios [small low book-to-market equities, and big low book to market equities]. The two components of [small-cap] are returns on high- and low-[book-to-market equity] portfolios with about the same weighted-average size. Thus the difference between the two returns should be largely free of the size factor in returns, focusing instead on the difference return behaviors of high- and low-[book-to-market equity] firms.”


**Hypothetical 1-Year Average Returns by Period:** the sample period consisted of the S&P 500 daily closing prices between January 3rd, 1950 and March 9th, 2015. The period returns and standard deviations were constructed by generating two-thousand random dates and applying the simple moving average strategy to the one-year periods (calculated as 252 trading days) preceding each date. The S&P 500 return and standard deviation for each period was also recorded. Returns were aggregated by period and included only returns where both the start date and the end date were within the indicated period.

**Hypothetical Cumulative Return Distribution:** the sample period consisted of the S&P 500 daily closing prices between January 3rd, 1950 and March 9th, 2015. The cumulative return distribution charts were constructed by generating six-thousand random dates (two-thousand for each chart) and applying the simple moving average strategy to the one-, three-, or five-year periods (calculated as 252, 756, 2625 trading days) preceding each date. The S&P 500 cumulative return for each period was also recorded.

**Standard deviation:** a widely used measure of variability or diversity used in statistics and probability theory. It shows how much variation or “dispersion” exists from the average (mean, or expected value). A low standard deviation indicates that the data points tend to be very close to the mean, whereas high standard deviation indicates that the data points are spread out over a large range of values.

**Sharpe ratio:** a measure of the excess return (or risk premium) per unit of deviation in an investment asset or a trading strategy, typically referred to as risk (and is a deviation risk measure).

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