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## MOMENTUM: DOES ADJUSTING BY RISK MATTER?



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*Momentum, despite a 200+ year history, is still misunderstood. Aye Soe discusses how adjusting for risk in momentum strategies could potentially impact results across markets and asset classes.*

Among all the widely known and accepted systematic sources of return in modern investment theory, momentum is the longest standing<sup>1</sup> and, perhaps, most pervasive factor of all. The tendency for stocks to exhibit persistence in their relative performance—for winning stocks to continue performing well and for losing stocks to continue performing poorly—in the near-to-medium-term has been thoroughly researched, debated, and written about in financial literature. In addition, the evidence and efficacy of the momentum effect has been documented across different markets and time periods, and it has extended beyond equities into other asset classes such as fixed income, commodities, and currencies.

Over the past two decades, momentum has gained widespread acceptance in the investment management industry. It is often incorporated in quantitative stock selection models, and many investment strategies are focused primarily on momentum. Based on the publicly available monthly return data from January 1934<sup>2</sup> to October 2014 for the four Fama-French factors (value, size, market, and momentum) momentum<sup>3</sup> has the second-highest annualized return, after the market itself, and the highest Sharpe ratio (0.244) after adjusting for risk.

Despite widespread acceptance and a record of strong historical performance, momentum is not free of controversy. Earlier criticisms of momentum focused on the ability of such a simple strategy to generate abnormal returns, with skeptics attributing such results to data mining. In recent years, momentum studies have highlighted

the significant drawdown experienced by equity momentum strategies following the 2008 financial crisis, leading many skeptics to conclude that gains from a momentum strategy could be wiped out by market volatility. This has led to a search for improved momentum strategies that can withstand market volatility.

In an upcoming research paper to be published by S&P Dow Jones Indices, we examine the momentum effect across four major global equity markets. We find that incorporating a stock's risk profile in rank order for portfolio selection, such as using volatility-adjusted momentum, can potentially improve the risk/return profile of a momentum strategy and possibly provide better downside protection, as well as increase the potential predictive power of the factor. The finding is consistent across all the markets studied. While there are research studies showing that adjusting the momentum value of a security by its idiosyncratic or residual risk provides superior risk-adjusted returns, we show that using even a simple measure of risk, such as standard deviation, can potentially enhance the consistency of performance and result in a higher fractile hit rate.

In our analysis of the momentum effect, we follow the widely accepted method of ranking securities based on their  $n^{\text{th}}$ -month local currency price return, excluding the most recent month to account for short-term reversals. For risk-adjusted momentum, the momentum value or the price return of each security for each  $n$  month is further scaled by its volatility, which is computed as the standard deviation of the daily price changes over the same measurement period.

<sup>1</sup> Geczy and Samanov (2013) noted the evidence of momentum in the U.S. market from 1801-2012.

<sup>2</sup> We start in January 1934 due to the limitation in availability of three-month Treasury bill returns in computation of Sharpe ratio.

<sup>3</sup> Data based on monthly returns in Kenneth French data library. Momentum is based on the stock return from 12 months prior, excluding the recent past month.

In this article, using three momentum definitions ranging from short- to longer-term (three-, six-, and twelve-month momentum) and a six-month holding period assumption<sup>4</sup>, we summarize the results for the U.S. and for global markets. Every month, we rank the securities in each universe based on the  $n^{\text{th}}$  month momentum value, or the risk-adjusted momentum value, as described above. The universe is then fractiled into five groups. Each ranked-quintile portfolio is held for a six-month period following the portfolio formation. Each portfolio is equal weighted and the returns are calculated in USD.

Exhibit 1 shows that, compared to simple momentum, the highest risk-adjusted momentum portfolio (Q1) generated higher average excess returns over the investable universe and over those in the bottom quintile (Q5). This finding is consistent regardless of the momentum term structure definition or the holding period. The higher average excess returns exhibited by risk-adjusted momentum portfolios are not entirely unexpected. Barroso and Santa-Clara<sup>5</sup> studied volatility-sorted momentum portfolios and saw that lower values performed better, and they noted the negative relationship between risk and return for the portfolios.

Exhibit 2 compares the quintile hit rate results of simple momentum strategies to those of risk-adjusted momentum strategies for the U.S. and global markets. During up market periods, both types of strategies have outperformed the market 60%-70% of the time. However, the simple momentum strategy appears to have higher upside

participation than its risk-adjusted counterpart when the momentum term is six months. This behavior is not surprising given that higher volatility stocks tend to have higher returns in up markets.

The results paint a decisive picture for the quintile hit rate in down markets. For both U.S. and global markets, we observed the average quintile hit rates of the risk-adjusted momentum portfolios to be unanimously higher than those of the simple momentum portfolios. The higher fractile hit rate of risk-adjusted momentum strategies over simple momentum strategies in an overall market environment and during down periods highlight the benefits of scaling momentum by risk.

Exhibit 3 presents the risk/return profile of the stylized simple momentum and risk-adjusted momentum strategies for the U.S. and global markets. Based on the 25 years of back-tested data, risk-adjusted momentum strategies have higher risk-adjusted returns across all the time periods studied compared with their simple counterparts.

As we stated earlier, momentum, despite being one of the longest-standing and most researched factors, remains misunderstood. Much of the criticism relates to the factor's tendency to experience significant drawdowns, which makes the strategy unappealing to risk-adverse investors. Our research shows that momentum can potentially be risk managed. Incorporating a stock's volatility profile, such as standard deviation, into the ranking order process, thereby forming risk-adjusted momentum portfolios, could result in higher risk-adjusted returns and superior downside protection.

<b>EXHIBIT 1: RISK-ADJUSTED MOMENTUM PORTFOLIOS HAVE SHOWN HIGHER AVERAGE EXCESS RETURNS</b>				
<b>Q1-Q5 AVERAGE EXCESS RETURNS</b>	<b>GLOBAL MOMENTUM</b>	<b>GLOBAL RISK-ADJUSTED MOMENTUM</b>	<b>U.S. MOMENTUM</b>	<b>U.S. RISK-ADJUSTED MOMENTUM</b>
3M MOM	2.3	2.67	2.59	3.2
6M MOM	3.82	4.2	4.25	4.84
12M MOM	1.48	2.89	2.04	3.43
<b>Q1-UNIVERSE AVERAGE EXCESS RETURNS</b>				
3M MOM	1.16	1.39	0.82	1.38
6M MOM	2.06	2.11	1.86	2.22
12M MOM	0.92	1.32	0.77	1.27

Source: S&P Dow Jones Indices LLC. Data from Dec. 31, 1989 to Dec. 31, 2014. MOM: Momentum. Past performance is no guarantee of future results. Charts and tables are provided for illustrative purposes and may reflect hypothetical historical performance. The underlying universe for the global momentum portfolios is the S&P Global LargeMidCap and for the U.S. momentum portfolios is the S&P United States BMI which were launched on Dec. 31, 1992. All information presented prior to these launch dates is back-tested. Back-tested performance is not actual performance, but is hypothetical. The back-test calculations are based on the same methodology that was in effect when the indices were officially launched. Complete index methodology details are available at [www.spdji.com](http://www.spdji.com). It is not possible to invest directly in an index. Please see the Performance Disclosures at the end of the magazine for more information regarding the inherent limitations associated with back-tested performance.

<sup>4</sup> In the research paper, we studied three holding periods: three, six, and twelve months.

<sup>5</sup> Barroso, Pedro and Pedro Santa Clara, *Momentum Has Its Moments*, 2013.

**EXHIBIT 2: QUINTILE HIT RATE OF MOMENTUM STRATEGIES**

QUINTILE HIT RATE—OVERALL MARKET	GLOBAL MOMENTUM	GLOBAL RISK-ADJUSTED MOMENTUM	U.S. MOMENTUM	U.S. RISK-ADJUSTED MOMENTUM
3M MOM	57	64.51	58.36	67.24
6M MOM	70.31	71.33	68.26	72.7
12M MOM	60.41	64.51	65.19	65.87
QUINTILE HIT RATE—UP MARKET				
3M MOM	62.07	62.56	61.61	65.88
6M MOM	72.41	69.46	72.04	70.14
12M MOM	61.08	62.07	67.30	66.35
QUINTILE HIT RATE—DOWN MARKET				
3M MOM	45.56	68.89	50.00	70.73
6M MOM	65.56	75.56	58.54	79.27
12M MOM	58.89	70.00	59.76	64.63

Source: S&P Dow Jones Indices LLC. Data from Dec. 31, 1989 to Dec. 31, 2014. MOM: Momentum. Past performance is no guarantee of future results. Charts and tables are provided for illustrative purposes and may reflect hypothetical historical performance. The underlying universe for the global momentum portfolios is the S&P Global LargeMidCap and for the U.S. momentum portfolios is the S&P United States BMI which were launched on Dec. 31, 1992. All information presented prior to these launch dates is back-tested. Back-tested performance is not actual performance, but is hypothetical. The back-test calculations are based on the same methodology that was in effect when the indices were officially launched. Complete index methodology details are available at [www.spdji.com](http://www.spdji.com). It is not possible to invest directly in an index. Please see the Performance Disclosures at the end of the magazine for more information regarding the inherent limitations associated with back-tested performance.

**EXHIBIT 3: RISK/RETURN PROFILES OF MOMENTUM STRATEGIES**

ANNUALIZED RETURN	GLOBAL MOMENTUM	GLOBAL RISK-ADJUSTED MOMENTUM	U.S. MOMENTUM	U.S. RISK-ADJUSTED MOMENTUM
3 Year (%)	13.14	13.87	22.37	20.97
5 Year (%)	9.96	11.75	18.84	18.92
10 Year (%)	9.15	10.24	6.85	7.39
20 Year (%)	9.48	10.70	11.97	13.34
25 Year (%)	9.05	10.21	12.58	13.84
ANNUALIZED RISK				
3 Year (%)	11.47	11.06	13.48	11.94
5 Year (%)	17.47	15.91	20.27	17.36
10 Year (%)	20.79	19.56	20.65	19.02
20 Year (%)	18.76	17.47	21.41	18.86
25 Year (%)	17.98	16.76	20.56	18.40
RISK/REWARD RATIO				
3 Year	1.15	1.25	1.66	1.76
5 Year	0.57	0.74	0.93	1.09
10 Year	0.44	0.52	0.33	0.39
20 Year	0.51	0.61	0.56	0.71
25 Year	0.50	0.61	0.61	0.75

Source: S&P Dow Jones Indices LLC. Data from Dec. 31, 1989 to Dec. 31, 2014. MOM: Momentum. Past performance is no guarantee of future results. Charts and tables are provided for illustrative purposes and may reflect hypothetical historical performance. The underlying universe for the global momentum portfolios is the S&P Global LargeMidCap and for the U.S. momentum portfolios is the S&P United States BMI which were launched on Dec. 31, 1992. All information presented prior to these launch dates is back-tested. Back-tested performance is not actual performance, but is hypothetical. The back-test calculations are based on the same methodology that was in effect when the indices were officially launched. Complete index methodology details are available at [www.spdji.com](http://www.spdji.com). It is not possible to invest directly in an index. Please see the Performance Disclosures at the end of the magazine for more information regarding the inherent limitations associated with back-tested performance.

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Past performance of the Index is not an indication of future results. Prospective application of the methodology used to construct the Index may not result in performance commensurate with the back-test returns shown. The back-test period does not necessarily correspond to the entire available history of the Index. Please refer to the methodology paper for the Index, available at [www.spdji.com](http://www.spdji.com) for more details about the index, including the manner in which it is rebalanced, the timing of such rebalancing, criteria for additions and deletions, as well as all index calculations.

Another limitation of using back-tested information is that the back-tested calculation is generally prepared with the benefit of hindsight. Back-tested information reflects the application of the index methodology and selection of index constituents in hindsight. No hypothetical record can completely account for the impact of financial risk in actual trading. For example, there are numerous factors related to the equities (or fixed income, or commodities) markets in general which cannot be, and have not been accounted for in the preparation of the index information set forth, all of which can affect actual performance.

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