Journal of Financial Economics 116 (2015) 111–120

Contents lists available at ScienceDirect

Journal of Financial Economics

journal homepage: www.elsevier.com/locate/jfec

Momentum has its moments ☆

Pedro Barroso [a,*], Pedro Santa-Clara [b,c,d]

[a] University of New South Wales, Australia
[b] Nova School of Business and Economics, Portugal
[c] NBER, United States
[d] CEPR, United Kingdom

ARTICLE INFO

Article history:
Received 14 May 2013
Received in revised form
9 December 2013
Accepted 20 January 2014
Available online 29 November 2014

JEL classification:
G11
G12
G17

Keywords:
Anomalies
Momentum
Time-varying risk
Transaction costs of momentum

ABSTRACT

Compared with the market, value, or size factors, momentum has offered investors the highest Sharpe ratio. However, momentum has also had the worst crashes, making the strategy unappealing to investors who dislike negative skewness and kurtosis. We find that the risk of momentum is highly variable over time and predictable. Managing this risk virtually eliminates crashes and nearly doubles the Sharpe ratio of the momentum strategy. Risk-managed momentum is a much greater puzzle than the original version.

1. Introduction

Momentum is a pervasive anomaly in asset prices. Jegadeesh and Titman (1993) find that previous winners in the US stock market outperform previous losers by as much as 1.49% a month. The Sharpe ratio of this strategy exceeds the Sharpe ratio of the market itself, as well as the size and value factors. Momentum returns are even more of a puzzle because they are negatively correlated to those of the market and value factors. From 1927 to 2011, momentum had a monthly excess return of 1.75%, controlling for the Fama and French factors.[1] Moreover, momentum is not just a US stock market anomaly. Momentum has been shown in European equities, emerging markets, country stock indices, industry portfolios, currency markets, commodities, and across asset classes.[2] Grinblatt and Titman (1989, 1993) find most mutual fund

☆ We thank an anonymous referee, Abhay Abhyankar, Eduardo Schwartz, David Lando, Denis Chaves, James Sefton, José Filipe Corrêa Guedes, Kent Daniel, Kristian Miltersen, Lasse Pederson, Nigel Barradale, Pasquale Della Corte, Robert Kosowski, Soeren Hvidkjaer, and numerous seminar participants at BI Norwegian Business School, Copenhagen Business School, CUNEF (Colegio Universitario de Estudios Financieros), Imperial College London, Lubrafin (Luso-Brazilian Finance Meeting), Nova School of Business and Economics, National University of Singapore, Rotterdam School of Management, Universidad Carlos III de Madrid, University of Exeter, and University of New South Wales for their helpful comments and suggestions. A previous version of this paper circulated with the title "Managing the Risk of Momentum." Pedro Santa-Clara is supported by a grant from the Fundação para a Ciência e Tecnologia (PTDC/EGE-GES/101414/2008).

* Corresponding author.
E-mail addresses: p.barroso@unsw.edu.au (P. Barroso), psc@novasbe.pt (P. Santa-Clara).

http://dx.doi.org/10.1016/j.jfineco.2014.11.010
0304-405X/

[1] This result has led researchers to use momentum as an additional risk factor (Carhart, 1997).

[2] See Rouwenhorst (1998, 1999) for international evidence, Asness, Liew, and Stevens (1997) for country stock indices, Moskowitz and Grinblatt (1999) for industry portfolios, Okunev and White (2003) and Menkhof, Sarno, Schmeling, and Schrimpf (2012) for currency markets,

managers incorporate momentum of some sort in their investment decisions, so relative strength strategies are widespread among practitioners.

But the remarkable performance of momentum comes with occasional large crashes.[3] In 1932, the winners-minus-losers (WML) strategy delivered a −91.59% return in just two months.[4] In 2009, momentum experienced a crash of −73.42% in three months. Even the large returns of momentum do not compensate an investor with reasonable risk aversion for these sudden crashes that take decades to recover from.

The two most expressive momentum crashes occurred as the market rebounded following large previous declines. One explanation for this pattern is the time-varying systematic risk of the momentum strategy. Grundy and Martin (2001) show that momentum has significant negative beta following bear markets.[5] They argue that hedging this time-varying market exposure produces stable momentum returns, but Daniel and Moskowitz (2012) show that using betas in real time does not avoid the crashes.

In this work we propose a different method to manage the risk of the momentum strategy. We estimate the risk of momentum by the realized variance of daily returns and find that it is highly predictable. An autoregression of monthly realized variances yields an out-of-sample (OOS) *R*-square of 57.82%. This is 19.01 percentage points higher than a similar autoregression for the variance of the market portfolio, which is already famously predictable.[6]

Managing the risk of momentum leads to substantial economic gains. We simply scale the long-short portfolio by its realized volatility in the previous six months, targeting a strategy with constant volatility.[7] Scaling the portfolio to have constant volatility over time is a more natural way of implementing the strategy than having a constant amount in the long and short leg with varying volatility. This is widely accepted in industry, and targeting ex ante volatility is more common in practice than running constant leverage.[8] The Sharpe ratio improves from 0.53 for unmanaged momentum to 0.97 for its risk-managed version. But the most important benefit comes from a reduction in crash risk. The excess kurtosis drops from 18.24 to 2.68, and the left skew improves from −2.47 to −0.42. The minimum one-month return for raw momentum is −78.96%; for risk-managed momentum, −28.40%. The maximum drawdown of raw momentum is −96.69% versus −45.20% for its risk-managed version.

The performance of scaled momentum is robust in subsamples and in international data. Managing the risk of momentum not only avoids its worse crashes but also improves the Sharpe ratio in the months without crashes. Risk management also improves the Sharpe ratio of momentum in all the major markets we examine: France, Germany, Japan, and the UK. When compared with plain momentum, risk management achieves a reduction in excess kurtosis and a less pronounced left skew in all of these markets.

Debate is ongoing about whether plain momentum per se is economically exploitable after transaction costs. For example, Lesmond, Schill, and Zhou (2004) infer costs indirectly from observed trading behavior and find that momentum is not exploitable. We do not address this debate directly, but we assess the impact of our risk management approach on transaction costs. Although the volatility scaling approach implies changes in leverage from month to month, we find that the turnover of the risk-managed strategy is very close to the turnover of the raw momentum strategy, so the transaction costs of both strategies are very similar. Given the much higher profitability of our strategy, transaction costs are less of a concern than for raw momentum.

One pertinent question is: Why does managing risk with realized variances work but using time-varying betas does not? To answer this question we decompose the volatility of momentum into a component related to the market (with time-varying betas) and a specific component. We find that the market component is only 23% of total risk on average, so most of the risk of momentum is specific to the strategy.[9] This specific risk is more persistent and predictable than the market component. The OOS *R*-square of predicting the specific component is 47.06% versus 20.87% for the market component. This is why hedging with time-varying betas fails. It focuses on the smaller and less predictable part of risk.

The research that is most closely related to ours is Grundy and Martin (2001) and Daniel and Moskowitz (2012). But their work studies the time-varying systematic risk of momentum, while we focus on momentum's specific risk. Our results have the distinct advantage of offering investors using momentum strategies an effective way to manage risk without forward-looking bias. The resulting risk-managed strategy deepens the puzzle of momentum.

After the dismal performance of momentum in the last ten years, some could argue it is a dead anomaly. Our results indicate that momentum is not dead. It just so happens that the last ten years were rich in the kind of high-risk episodes that lead to bad momentum performance. Our paper is related to the recent literature that proposes alternative versions of momentum. Blitz, Huij, and Martens (2011) show that sorting stocks according to

(*footnote continued*)
Erb and Harvey (2006) for commodities, and Asness, Moskowitz, and Pederson (2013) for momentum across asset classes.

[3] See Daniel and Moskowitz (2012).

[4] Unless otherwise noted, by the performance of momentum we mean the return of the winners minus the return of the losers. The winners portfolio consists of those stocks in the top decile according to the distribution of cumulative returns from month $t-12$ to $t-2$. The losers portfolio is the group of stocks in the bottom decile of the same distribution. These returns can be found at Kenneth French's website: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french.

[5] Following negative returns for the overall market, winners tend to be low-beta stocks and the reverse for losers. Therefore, the winner-minus-losers strategy has a negative beta.

[6] See Engle and Bollerslev (1986) and Schwert (1989).

[7] This approach relies only on past data and thus does not suffer from look-ahead bias.

[8] We thank an anonymous referee for this insight.

[9] By momentum-specific risk we do not mean firm-specific risk or idiosyncratic risk. Momentum is a well-diversified portfolio and all its risk is systematic.