Factor Momentum Everywhere

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1 Data

The study uses data from a variety of countries including the United States, Europe, Pacific region countries (Australia, Hong Kong, Japan, New Zealand, and Singapore), and Canada. The study aims to cover the expanse of factors proposed in the academic literature that studies the cross section of stock returns, and forms 65 characteristic-based factor portfolios. The factors are constructed beginning in the 1960s. However, due to data limitations, only 62 of the original 65 factors are studied in the international sample.

2 Summary

The research paper "Factor Momentum Everywhere" by Tarun Gupta and Bryan Kelly of AQR Capital Management LLC explores the momentum behavior in a large collection of 65 widely studied characteristic-based equity factors globally. The authors propose a time series "factor momentum" portfolio that combines timing strategies of all factors, earning an annual Sharpe ratio of 0.84, indicating a good return for the level of risk taken.

The paper demonstrates that factor momentum significantly enhances the performance of investment strategies that employ traditional momentum, industry momentum, value, and other commonly studied factors. This suggests that incorporating factor momentum into investment strategies can boost returns. The authors challenge the traditional view that momentum is primarily driven by individual stock performance, arguing instead that the momentum phenomenon is largely driven by persistence in common return factors.

The authors introduce a time series factor momentum (TSFM) strategy and a cross section factor momentum (CSFM) strategy. The TSFM strategy performs well with longer formation windows, and its performance is largely unexplained by other well-known sources of excess returns. The CSFM strategy, while highly correlated with TSFM, has generally negative alphas when controlling for TSFM, suggesting that TSFM provides a purer measure of expected factor returns.

The paper concludes that factor momentum is a global phenomenon, robust in international equity markets, and outperforms traditional stock momentum strategies even when transaction costs are considered. The authors argue that factor momentum captures variation in expected factor returns of similar magnitude as stock-level momentum, despite being devoid of idiosyncratic returns. They conclude that combining factor momentum, stock momentum, and value in the same portfolio can yield significant benefits.

The authors also provide a more expansive view of factor momentum, studying a more comprehensive collection of US equity factors, and are the first to document factor momentum in international equity markets. They construct 65 characteristic-based factor portfolios, covering the most well cited and robust factors, and focus on factors that can be constructed beginning in the 1960s.

The authors also delve into the primary statistical phenomenon underlying momentum—serial correlation in returns. They report monthly first-order autoregressive coefficients for each factor portfolio along with 95% confidence intervals. The factors with the strongest and most statistically reliable performance are the best known usual suspects, such as betting against beta, stock momentum, industry momentum, and valuation ratios.

The authors further explore the benefits of portfolio timing by applying a time series momentum strategy one factor at a time. They focus on one-month holding periods and consider various formation windows of one month up to five years. Their strategy dynamically scales one-month returns, indicating the potential of the time series factor momentum strategy.

The authors also provide a detailed explanation of their TSFM strategy, which involves timing positions in a factor based on the factor's return over a formation period. If formation returns are positive, the strategy buys the factor, if negative, it sells the factor. The performance of time series momentum in individual factors is extraordinarily pervasive, being positive for 61 out of 65 factors, and statistically significant for 47 of these. The overall TSFM strategy combines all individual factor time series momentum strategies into a single portfolio, earning an annualized average return of 12.0%.

The authors further delve into the performance of the TSFM strategy with different implementations. They form the momentum signal using look-back windows of one month up to five years. The 12-month TSFM strategy achieves an impressive annualized Sharpe ratio of 1.07. The portfolio of individual factor momentum strategies generates a highly significant 10.3% alpha after controlling for the average of untimed factors. The combined factor momentum portfolio exceeds the Sharpe ratio of every individual factor momentum strategy, indicating its superior performance.

The authors also compare the performance of TSFM and CSFM with various look-back windows for portfolio formation. The results show that CSFM and TSFM have similar behavior. The Sharpe ratios of CSFM are slightly inferior to TSFM, and it has slightly smaller alphas with respect to the equal-weighted portfolio of raw factors, but their performance patterns are otherwise closely aligned. The authors also compare factor momentum (TSFM and CSFM), stock-level momentum (UMD), short-term stock reversal (STR), and industry momentum (INDMOM), showing that factor momentum strategies outperform other momentum strategies.

The new context provides a visual comparison of momentum strategies, highlighting the steep slope of TSFM and the sharp drawdown of UMD and INDMOM during the 2009 momentum crash. In contrast, factor momentum strategies, specifically TSFM and CSFM, avoided the crash and even earned significant returns during the same period. This further underscores the robustness and superior performance of factor momentum strategies.

The authors also provide a detailed analysis of the correlation between different momentum strategies. They find that factor momentum based on an intermediate window of 1-12 months bears a close correlation with UMD and industry momentum. However, with a one-month window, factor momentum behaves strongly opposite of the stock-based STR strategy. This suggests that factor momentum is not simply capturing stock-level persistencies, further highlighting the unique benefits of factor momentum strategies.

The authors also provide a detailed analysis of the correlation between different momentum strategies, showing an extremely high correlation between time series and cross section approaches to factor momentum. They also regress TSFM and CSFM on momentum alternatives to understand if these strategies subsume factor momentum. The results show that controlling for UMD only explains the performance of the 2-12 TSFM strategy. For all other look-back windows, TSFM has a significant alpha of at least 2% per year versus UMD. For one-month TSFM in particular, UMD has no explanatory power as the alpha and raw average returns are essentially the same. Alphas relative to INDMOM show a similar pattern as those relative to UMD, but are somewhat larger. Controlling for STR in fact raises TSFM's alpha above its raw average return, which is perhaps expected given their strong negative correlation. Despite nearly perfect correlations between them, TSFM's alpha is significantly positive for all formation windows and becomes stronger at long horizons.

The new context further emphasizes the superior performance of the TSFM strategy over the CSFM strategy. The authors show that UMD and INDMOM explain more of CSFM's performance than they do TSFM's performance, and CSFM's alphas on UMD and INDMOM are insignificant for formation windows of a year or more. Furthermore, CSFM has negative and significant alphas when compared to TSFM, further underscoring the superior performance of the

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TSFM strategy.

The authors also reverse their analysis to assess the performance of UMD, IN-DMOM, and STR after controlling for factor momentum. They find that the 1-12, 1-36, and 1-60 TSFM strategies can each individually explain most of the performance of UMD and INDMOM. However, neither TSFM nor CSFM explains short-term reversal. In fact, controlling for factor momentum boosts the performance of STR, suggesting that factor momentum and short-term reversal capture distinct patterns in expected stock returns. The authors also investigate the extent to which various momentum strategies play an incrementally beneficial role in a broader portfolio that includes other common investment factors. They find that the TSFM strategy tends to outperform, and to a large extent accounts for, the returns to UMD.

The new context provided in Exhibit 10 further emphasizes the superior performance of the TSFM strategy. The authors show that the optimal combination of TSFM and CSFM takes a highly levered position in TSFM with a large negative offsetting position in CSFM. This result restates the fact that TSFM and CSFM are highly correlated but have oppositely signed alphas with respect to one another. The authors also show that the optimal combination of TSFM with UMD and the Fama-French factors results in a significantly positive weight on UMD, earning a Sharpe ratio of 1.65. This further underscores the robustness and superior performance of the TSFM strategy.

The new context provided in Exhibit 11 and 12 further emphasizes the correlation between different momentum and value variants. The authors show that the correlation of UMD and HML-Devil is -0.64, while UMD is only -0.18 correlated with Fama-French HML. Likewise, the correlation of 1-12 TSFM drops from -0.02 with HML to -0.37 with HML-Devil. This suggests that the diversification benefits from combining momentum factors with value factors become more pronounced when using the "HML-Devil" refinement of Asness and Frazzini (2013), which incorporates more timely price data in its value signal construction and significantly outperforms the traditional Fama-French HML.

The new context also highlights the impact of replacing HML with HML-Devil in the tangency portfolio analysis. The authors find that factor momentum remains a strong contributor to optimal multi-factor portfolios and that HML-Devil takes a large and statistically significant portfolio weight in all cases. They also find that UMD becomes one of the most important components of the tangency portfolio due to the added diversification benefits of coupling UMD and HML-Devil.

The authors also consider the implementability of momentum strategies, given their high turnover nature. They compare the average annualized turnover of factor momentum with other price trend factors and find that factor momentum turnover is comparable to, but slightly lower than, its stock-level counterpart.

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They also compare the performance of strategies net of transaction costs and find that while trading costs do reduce the performance of factor momentum, its net performance continues to exceed that of UMD, INDMOM, STR, and the Fama-French factors. For example, the net Sharpe ratio of TSFM 1-12 is 0.63, versus 0.70 gross. But the next best net Sharpe ratio among stock-level price trend factors is 0.51 for UMD, while the best among Fama-French factors is 0.45 for RMW. This further underscores the robustness and superior performance of the TSFM strategy.

The new context provided in Exhibit 13 further emphasizes the turnover and net Sharpe ratio of the TSFM and CSFM strategies. It reveals that the strong performance of STR after controlling for factor momentum is illusory, as its performance is entirely wiped out by transaction costs. The authors also extend their analysis to international equity markets, corroborating their main factor momentum conclusions from the US sample in these markets. They find that individual factor returns are highly persistent in international markets, with the average AR(1) coefficient being 0.10 (versus 0.11 in the US), and positive for 51 of 62 factors, and significant for 30 of these. The TSFM portfolio that aggregates individual time series factor momentum strategies has a Sharpe ratio of 0.73 (versus 0.84 in the US) and earns an alpha of 6.6% per year after controlling for the equal-weighted portfolio of raw (untimed) factors. This further emphasizes the global applicability and robustness of the TSFM strategy.

The new context provided in Exhibit 15 compares the performance of TSFM and CSFM strategies in global markets excluding the US. The results further corroborate the superior performance of the TSFM strategy, with the TSFM strategy consistently outperforming the CSFM strategy across different formation windows. This further underscores the robustness and superior performance of the TSFM strategy in a global context.

The new context provided in Exhibit 16 further emphasizes the relative performance of UMD, INDMOM, and STR in global markets excluding the US. The authors show that the TSFM strategy consistently outperforms these other strategies, further underscoring the robustness and superior performance of the TSFM strategy in a global context.

The new context provided in Exhibit 17 shows that the TSFM strategy consistently outperforms other strategies in global markets excluding the US, even after controlling for other varieties of international momentum including UMD, INDMOM, and STR. The authors also highlight that TSFM and CSFM are more than 0.95 correlated for all formation windows, yet TSFM tends to possess positive alpha relative to CSFM, and CSFM earns negative alpha versus TSFM, indicating that TSFM more efficiently captures the benefits of factor momentum. The performance of UMD and INDMOM is explained by factor momentum, with UMD's alpha being essentially zero and INDMOM having a negative alpha after controlling for either TSFM or CSFM. The authors conclude

that factor momentum remains a strong contributor to optimal multi-factor portfolios in international markets, further emphasizing the global applicability and robustness of the TSFM strategy.

The new context also reveals that the majority of the performance of the factor momentum strategy arises from dynamically adjusting factor weights over time, rather than from taking static long/short bets on factors that have higher/lower average returns unconditionally. The performance of factor momentum is not dependent on using dozens of fine-grained factors. Instead, with a set of only six broad "theme" factors, the authors reproduce the same basic factor momentum phenomenon found in the 65 factor data set. The authors conclude that factor momentum is a truly global phenomenon, manifesting equally strongly outside the US, both in a large global (ex. US) sample and finer Europe and Pacific region subsamples. The findings of momentum among equity factors further emphasize the global applicability and robustness of the TSFM strategy.