An Uncharacteristic Breakdown in Equity Factor Diversification

June 2019

- Over the last several quarters, value, momentum, and quality factors have concurrently underperformed, suffering a historic breakdown in equity factor diversification.

- In our view, the simultaneous underperformance of these factors reflects the interaction between reinvigorated preference for growth stocks driven by the Fed's pivot and the path-dependent nature of many momentum signals.

- Despite its severity, we don't interpret this anomalous behavior as evidence that multi-factor quantitative approaches are broken. Rather, we would resist pressures that would result in an unbalanced, one-factor bet on growth.
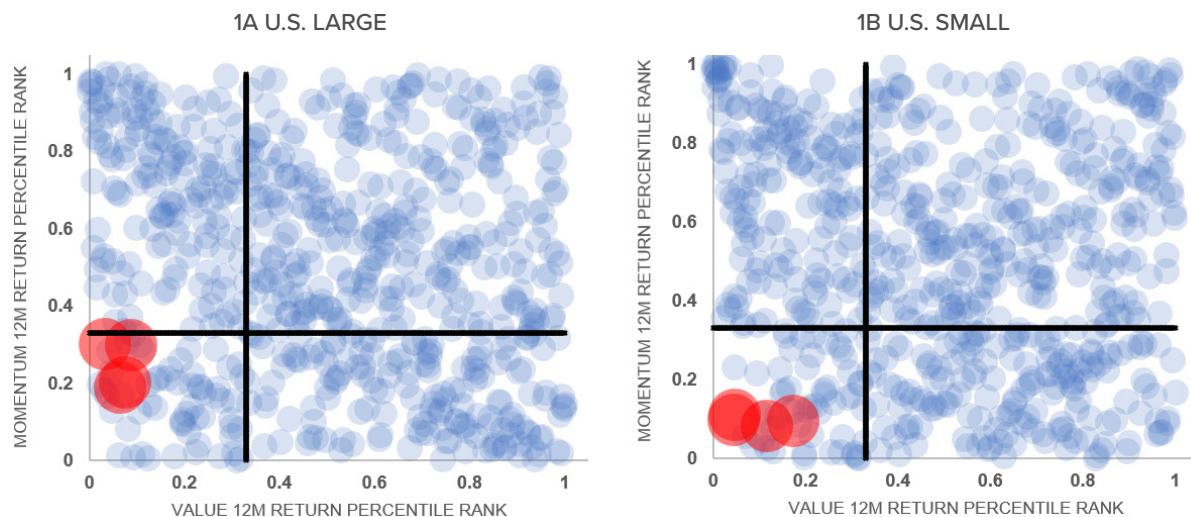
Many multi-factor quantitative equity strategies that incorporate value, quality and momentum signals have struggled over the past year. While certain formulations of value have suffered even more protracted underperformance, momentum and quality had, until recently, helped to offset the impact. That's not surprising—we expect these factors to diversify one another, especially value and momentum, which over the long term have been negatively correlated. Against that historical backdrop, the simultaneous under-performance of these factor groups in recent months is unprecedented.

In this note, we document just how anomalous the breakdown in factor diversification has been. We offer perspective on its causes and the implications for investors.

Context for Recent Factor Performance

Figure 1 provides a compact picture of the recent poor performance of both value and momentum in U.S. equities. Specifically, it shows rolling twelve-month factor portfolio returns expressed as percentile ranks relative to their long-term historical distributions.

Figure 1: Value and Momentum Twelve-Month Returns as Percentile Ranks (Jul 1963-Apr 2019)

Percentile ranks of factor returns based on twelve-month overlapping windows from July 1963-April 2019. Red dots indicate 12m returns for Jan 2019-Apr 2019. Solid dark lines indicate 33rd percentiles. See Appendix A for details on factor construction and returns calculation. Sources: Calculated from monthly factor returns as found in the "6 Portfolios Formed on Size and Book-to-Market (2 x 3)" and "6 Portfolios Formed on Size and Momentum (2 x 3)" files at Kenneth R. French's data library. Copyright 2019 Kenneth R. French. All Rights Reserved. This is meant to be an educational example and does not represent investment returns generated by an actual portfolio. Results do not reflect actual trading or an actual account. Results do not reflect transaction costs or other implementation costs and do not reflect advisory fees or their potential impact. Hypothetical results are not indicative of actual future results. Every investment program has the opportunity for loss as well as profit.

Although we've based the exhibit on simple Fama-French factor specifications, because they're well known and offer extensive returns histories, we believe that the aspects of their recent behavior highlighted in this discussion apply to a wide range of more refined specifications employed in practice by active multi-factor investors.[1]

Highlighting the most recent data points in red, Figure 1A shows that for U.S. large cap stocks, the performance of value over the past twelve months represents a 7th percentile outcome (position on the x-axis).[2] That is, since 1963, we've only seen worse returns from value about 7% of the time. Similarly, momentum's recent performance also hasn't been good, a 19th percentile historical outcome (position on the y-axis). In U.S. small cap stocks, Figure 1B, the most recent value and momentum returns look even more anomalous, ranking as 5th and 10th percentile outcomes, respectively.

The clouds of blue dots in the scatter charts clearly demonstrate the diversification that value and momentum have provided historically: when one factor has performed poorly, the other often has performed well. Appendix B Figures B1 and B2 clearly document the negative relationship between their returns.

But the two factors haven't diversified each other over the past year. In fact, while the recent performances of value and momentum have been unusually poor individually, their simultaneous performance has been especially anomalous. For small cap stocks, in fact, it is unprecedented over the past fifty years. We've never seen worse joint performance of value and momentum than during the past 12 months ending April 2019, as evidenced by the red dot in the bottom-left corner of Figure 1B.

The general picture applies globally, not just to the U.S. Appendix B Figures B3-B5 provide analogous results for Developed Ex-U.S. large- and small-cap stocks.

Extending the analysis to quality, recent factor performance among U.S. small cap stocks looks even more unusual. Within that universe, returns to a generic quality formulation over the past twelve months represent only a 10th percentile historical outcome.[3] To contextualize quality performance in combination with the historically poor returns of value and momentum, since 1963 we've only seen returns of the three factors simultaneously fall into the bottom third of their individual distributions roughly 4% of the time, let alone see concurrent 7th, 19th, and 10th percentile outcomes.

An Interpretation

In the U.S., we view the recent breakdown in factor diversification as the interaction between 1) a reinvigorated preference for growth stocks driven by the Fed's Q1 pivot back towards easing, a continuation of a trend that has been in place since the global financial crisis, and 2) inherently path-dependent behavior of traditional price momentum signals that were whipsawed by the market's Q4 2018 tumble and 2019 recovery.
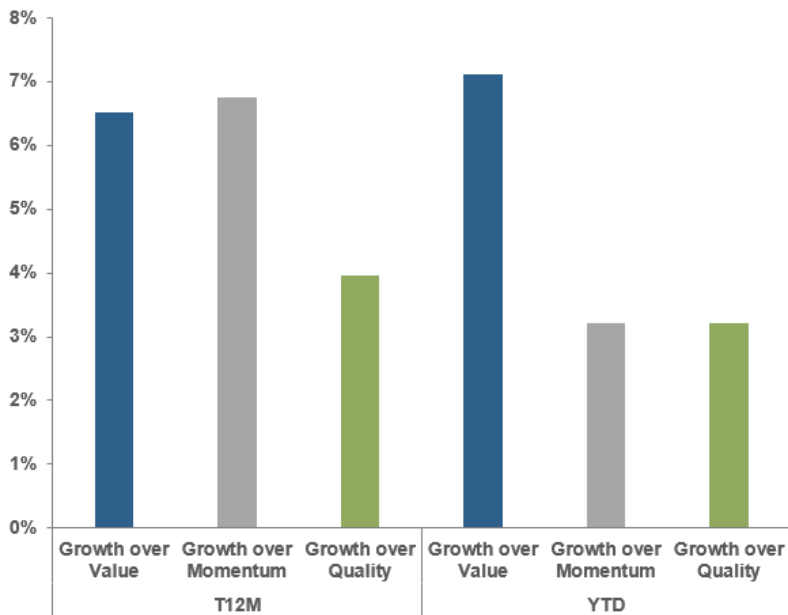
Reflective of the first observation, at the same time that value, momentum, and quality have struggled, investors have favored growth. Figure 2 shows that MSCI's U.S. Growth Index, whose construction incorporates measures of both trailing and forward fundamental growth, has materially outperformed the corresponding definitions of Value, Momentum, and Quality indexes in recent months. Further, Figure 3 shows that over the first few months of the year, P/B valuations of the most expensive U.S. stocks have snapped back close to late 2018 highs. Arguably, the Fed's shift headed off conditions that could have led to a more severe reversion of valuations, and it renewed pressures on investors to target growth opportunities even at expensive valuations by historical standards.

---

[1] See Appendix A for details on calculation methods. In general, we believe that differences in signal/factor definition and implementation matter in terms of exposure to desired returns premia, exposure to unintended risks, and noise. For further discussion, see our prior papers "*Factor Investing: Is Keeping it Simple Shortsighted?*", February 2018 and "*The Evolution of Value*", December 2018.

[2] In the chart, we have highlighted the four most recent observations, i.e., looking back one year from four successive months. Since the data points reflect rolling-12-month windows, there are 10 months of overlap between successive observations.

[3] Fama-French defines "quality" as gross margins relative to book value of common shares. For details, see Appendix A

Figure 2: Recent Returns to Growth in Excess of Other Factors (as of Apr 2019)

USD net total returns to MSCI USA Growth, MSCI USA Value, MSCI USA Momentum, WisdomTree Earnings Weighted Index (to be consistent with Fama-French use of gross margins-based Quality). Sources: Acadian, Bloomberg, MSCI. Copyright MSCI 2019. All Rights Reserved. Unpublished. PROPRIETARY TO MSCI. For illustrative purposes only. It is not possible to invest directly in an index. Every investment program has the opportunity for losses as well as profits. Past results are not indicative of future results.

Figure 3: P/B Spread: Expensive vs. Cheap Terciles
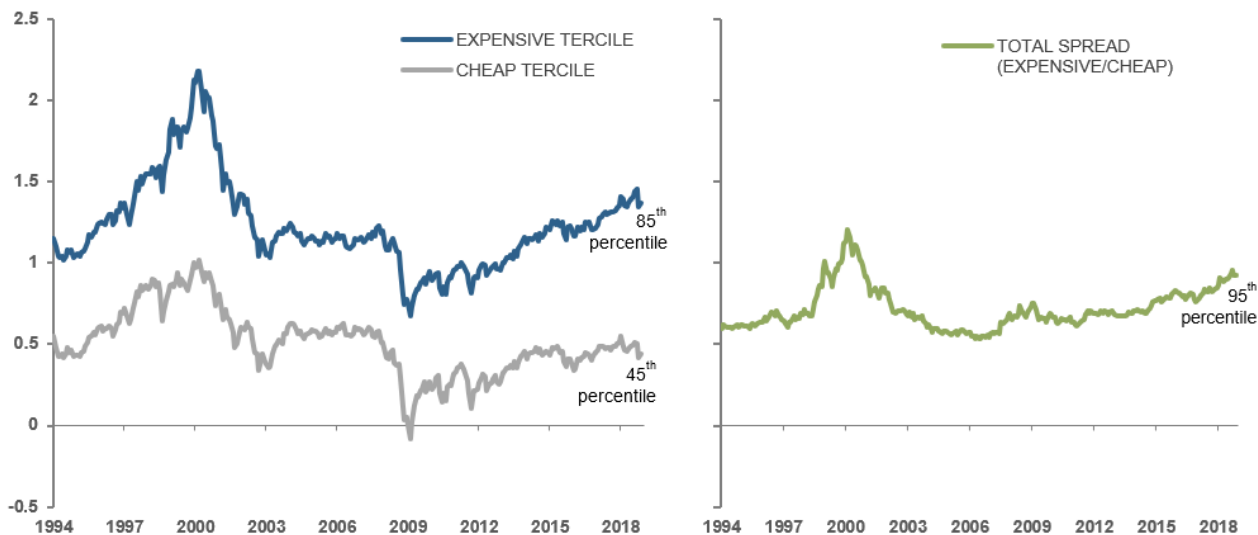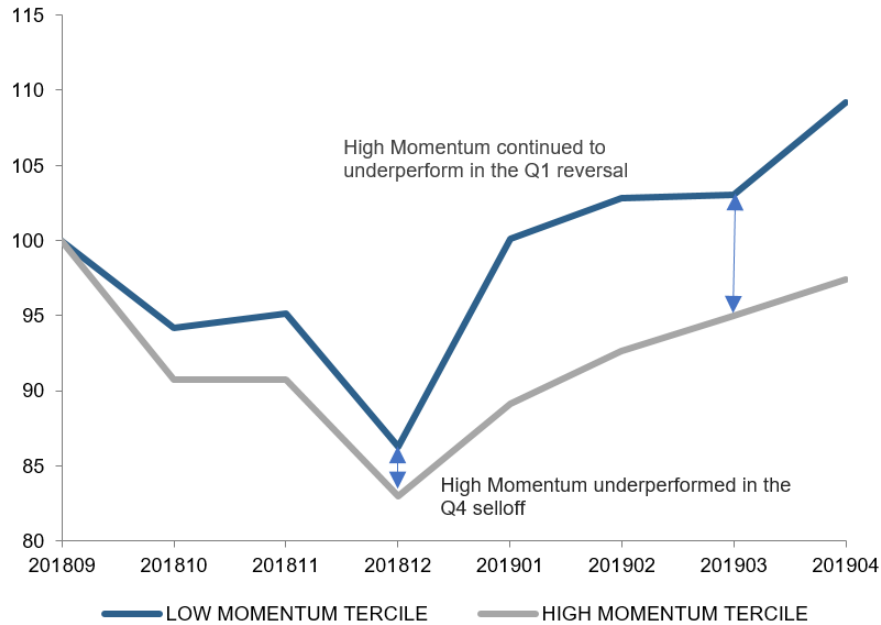

Chart shows P/B of top and bottom tercile stocks in Acadian's North American equity universe. Spread is defined as the ratio between the two measures. Shown on a log scale. Sources: Acadian analysis, Bloomberg, MSCI. Copyright MSCI 2019. All Rights Reserved. Unpublished. PROPRIETARY TO MSCI. For illustrative purposes only. Every investment program has the opportunity for losses as well as profits.

In support of the second observation, regarding the behavior of price momentum, Figure 4 examines the performance of momentum during the Q4 2018 market sell-off and subsequent recovery. Two features stand out. First, during the Q4-Q1 market whipsaw, momentum seems to have been initially stung by an overweight to early 2018 outperformers that suffered during the Q4 sell-off and then hurt again by reduced weighting to these stocks during their recovery in Q1 2019. Second, the Q4 momentum drawdown, while severe, hardly qualifies as a momentum "crash," which we might typically associate with a more pronounced turn in the business cycle and a more significant reversion of valuations that would have been associated with a material payoff to a P/B-based value factor.

For institutional investor use only. Not to be reproduced or disseminated.

3

Figure 4: Cumulative Returns to High- and Low- Momentum Terciles: U.S. Large

High Momentum continued to underperform in the Q1 reversal

High Momentum underperformed in the Q4 selloff

—— LOW MOMENTUM TERCILE ——— HIGH MOMENTUM TERCILE

Data are for stock returns, observed at monthly frequency, over the "modern sample," which is July 1963-April 2019 for the U.S. We use returns for common stocks traded on NYSE, AMEX, and, after 1973, NASDAQ. For illustrative purposes only. Performance rebased to 100 as of September 30th, 2018. Sources: Acadian analysis, the Center for Research in Securities Prices (CRSP) at the University of Chicago, as curated and published by Kenneth R. French. Copyright 2019 Kenneth R. French. All Rights Reserved. For illustrative purposes only. Every investment program has the opportunity for losses as well as profits. Past results are not indicative of future results.

Implications

Based on the above interpretation, we see risk in overreacting to the recent poor simultaneous performance of value, momentum, and quality. Its historical aberrance doesn't indicate that multi-factor quant approaches are broken or that such factors will be highly correlated going forward, as we might expect if quant were overcrowded.

In fact, we currently see wide valuation spreads in the U.S. market, close to those last seen during the Technology, Media, Telecom (TMT) bubble, as a healthy indicator for quant strategies. Although certain economic scenarios could unfold that might justify these wide value spreads ex-post, we do not believe that investors are better now at extrapolating fundamentals than they have been in the past. In other words, we believe that the behavioral biases associated with the existence of a long-term valuation premium continue to persist, and we interpret the valuation spread as a measure of the associated opportunity set.

But investors' behavioral biases are expressed in a complex economic and policy environment, which, among other things, makes factors difficult to time and may cause material and protracted drawdowns in their performance. For certain formulations of value, for example, such drawdowns may be both uncomfortable and inextricably linked with the long-term payoff to the factor. (E.g., value's performance around the TMT bubble.)

Conclusion

Framed with the above interpretation, the key question raised by recent factor performance isn't the long-term sustainability of active multi-factor quant approaches. Rather it's the vulnerability of taking an unbalanced one-factor bet on growth. We see no reason to abandon a dispassionate, systematic investing approach that capitalizes on mispricing created by other investors' persistent behavioral biases. *////*

Appendix A: Factor Specifications

The Kenneth R. French dataset defines "value" as the ratio of book value to market value of common shares at the end of June of each calendar year. It defines "momentum" as the trailing returns over the prior twelve months, excluding the most recent month; this characteristic is updated monthly. It defines "quality" at the end of each June as gross margins (revenue less costs of goods sold; sales, general, and administrative expenses; and interest) relative to book value of common

shares. In the case of value and quality, the dataset uses relevant accounting data from the latest available annual report with fiscal year end in the prior calendar year.

Factor returns sourced from the Center for Research in Securities Prices (CRSP) at the University of Chicago, as curated and published by Kenneth R. French. Returns are monthly frequency are from July 1963-April 2019 for the U.S. and July 1990-April 2019 for Developed ex-U.S. For the U.S., we use returns for common stocks traded on NYSE, AMEX, and, after 1973, NASDAQ.
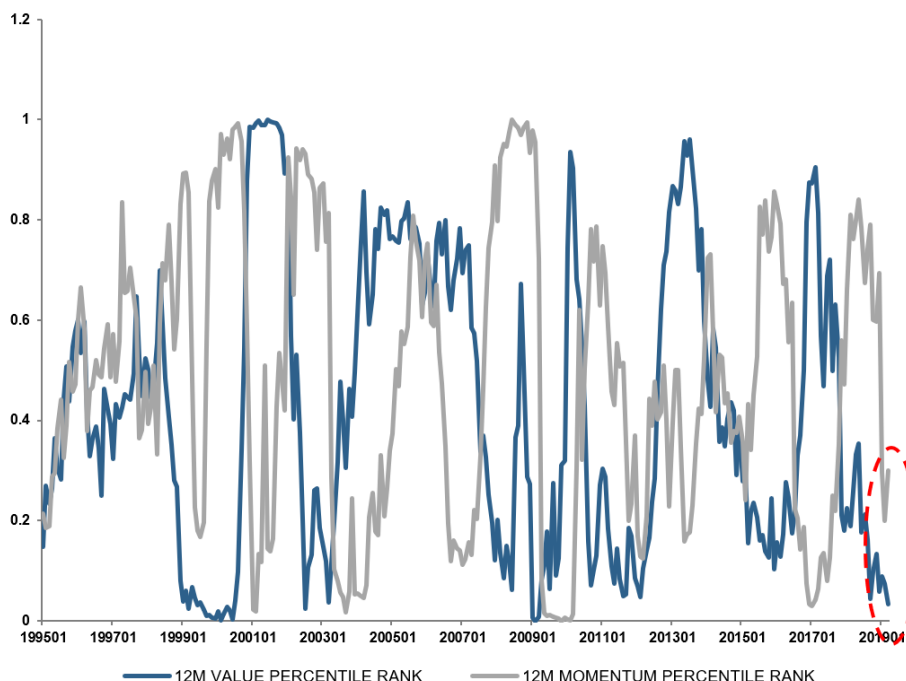
Appendix B: Additional Results

Figure B1: Joint Distribution of Twelve-Month Returns: Value and Momentum (Jul 1963-Apr 2019)

U.S. LARGE

		VALUE DISTRIBUTION		
		Low 1/3	Mid 1/3	High 1/3
MOMENTUM DISTRIBUTION	High 1/3	15%	10%	9%
	Mid 1/3	9%	15%	10%
	Low 1/3	10%	9%	15%

U.S. SMALL

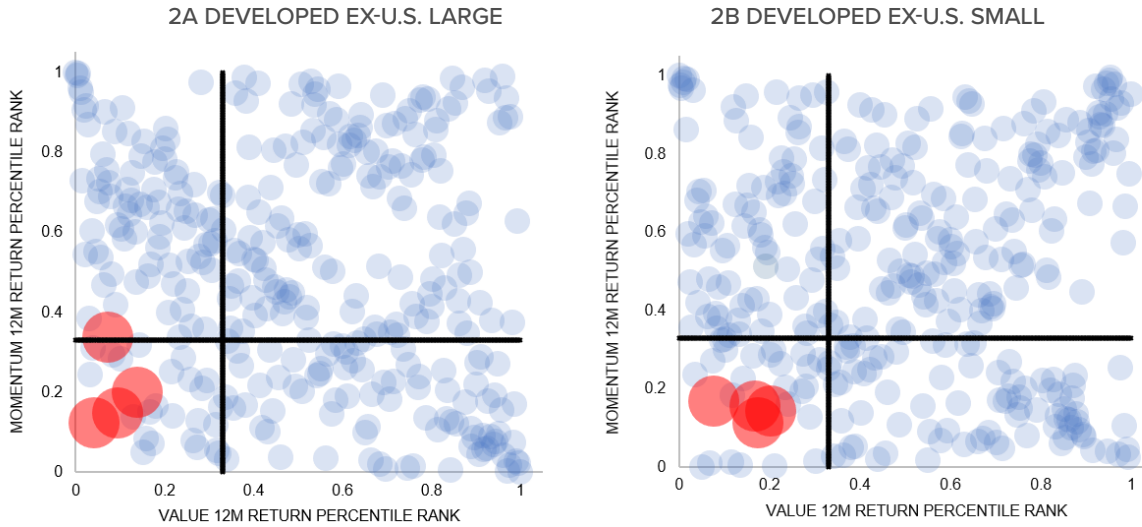|		VALUE DISTRIBUTION		
		Low 1/3	Mid 1/3	High 1/3
MOMENTUM DISTRIBUTION	High 1/3	12%	9%	12%
	Mid 1/3	12%	13%	7%
	Low 1/3	9%	11%	14%

Joint frequencies of factor returns based on twelve-month overlapping windows from July 1963-April 2019. See Appendix A for details on factor construction and returns calculation. Sources: Calculated from monthly factor returns as found in the "6 Portfolios Formed on Size and Book-to-Market (2 x 3)" and "6 Portfolios Formed on Size and Momentum (2 x 3)" files at Kenneth R. French's data library. Copyright 2019 Kenneth R. French. All Rights Reserved. This is meant to be an educational example and does not represent investment returns generated by an actual portfolio. Results do not reflect actual trading or an actual account. Results do not reflect transaction costs or other implementation costs and do not reflect advisory fees or their potential impact. Hypothetical results are not indicative of actual future results. Every investment program has the opportunity for loss as well as profit.

Figure B2: U.S. Large: Twelve-Month Percentile Ranks for Value and Momentum Factors

Percentile ranks of factor returns based on twelve-month overlapping windows using U.S. Large stocks. Sources: Acadian analysis, the Center for Research in Securities Prices (CRSP) at the University of Chicago, as curated and published by Kenneth R. French. Copyright 2019 Kenneth R. French. All Rights Reserved. For illustrative purposes only. Every investment program has the opportunity for losses as well as profits. Past results are not indicative of future results.

Figure B3: Developed Markets ex-U.S.: Twelve-Month Percentile Ranks (Jul 1990-Apr 2019)
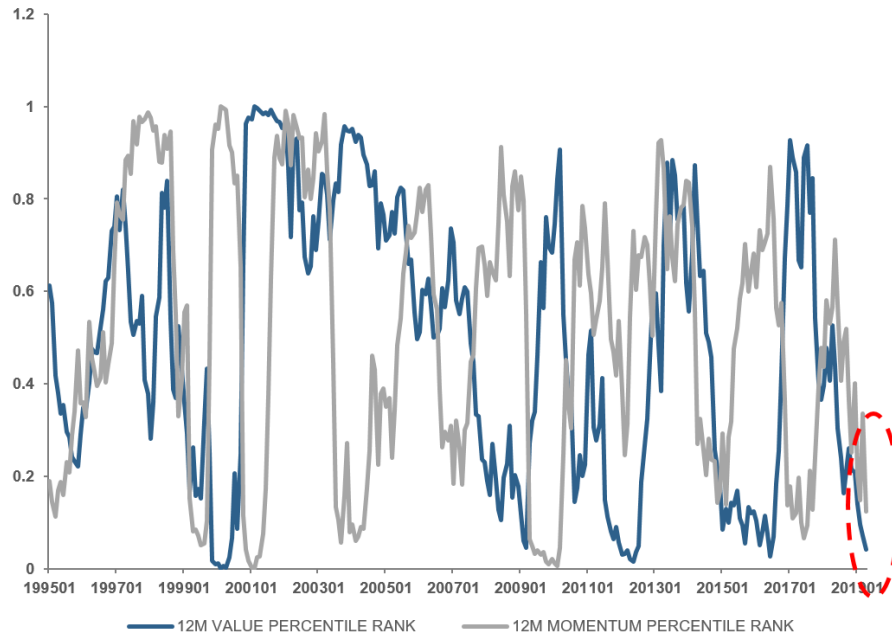

Percentile ranks of factor returns based on twelve-month overlapping windows from July 1990-April 2019. Red dots indicate 12m returns for Jan 2019-Apr 2019. Solid dark lines indicate 33rd percentiles. See Appendix A for details on factor construction and returns calculation. Sources: Calculated from monthly factor returns as found in the "6 Global ex US Portfolios Formed on Size and Book-to-Market (2 x 3)" and "6 Global ex US Portfolios Formed on Size and Momentum (2 x 3)" files at Kenneth R. French's data library. Copyright 2019 Kenneth R. French. All Rights Reserved. This is meant to be an educational example and does not represent investment returns generated by an actual portfolio. Results do not reflect actual trading or an actual account. Results do not reflect transaction costs or other implementation costs and do not reflect advisory fees or their potential impact. Hypothetical results are not indicative of actual future results. Every investment program has the opportunity for loss as well as profit.

Figure B4: Joint Distribution of Twelve-Month Returns: Value and Momentum (Jul 1990-Apr 2019)

DEVELOPED EX-U.S. LARGE

		VALUE DISTRIBUTION		
		Low 1/3	Mid 1/3	High 1/3
MOMENTUM DISTRIBUTION	High 1/3	15%	9%	11%
	Mid 1/3	11%	11%	11%
	Low 1/3	8%	13%	12%

DEVELOPED EX-U.S. SMALL

		VALUE DISTRIBUTION		
		Low 1/3	Mid 1/3	High 1/3
MOMENTUM DISTRIBUTION	High 1/3	13%	7%	14%
	Mid 1/3	12%	13%	8%
	Low 1/3	9%	13%	11%

Joint frequencies of factor returns based on twelve-month overlapping windows from July 1990-April 2019. See Appendix A for details on factor construction and returns calculation. Sources: Calculated from monthly factor returns as found in the "6 Global ex US Portfolios Formed on Size and Book-to-Market (2 x 3)" and "6 Global ex US Portfolios Formed on Size and Momentum (2 x 3)" files at Kenneth R. French's data library. Copyright 2019 Kenneth R. French. For further details on factor definitions, please see Appendix A. This is meant to be an educational example and is not intended to represent investment returns generated by an actual portfolio. Results do not reflect actual trading or an actual account. Results do not reflect transaction costs or other implementation costs and do not reflect advisory fees or their potential impact. Hypothetical results are not indicative of actual future results. Every investment program has the opportunity for loss as well as profit.

Figure B5: Developed Ex-U.S. Large: Twelve-Month Percentile Ranks for Value and Momentum Factors

Percentile ranks of factor returns based on twelve-month overlapping windows using Developed Ex-U.S. Large stocks. Sources: Acadian analysis, the Center for Research in Securities Prices (CRSP) at the University of Chicago, as curated and published by Kenneth R. French. Copyright 2019 Kenneth R. French. All Rights Reserved. For illustrative purposes only. Every investment program has the opportunity for losses as well as profits. Past results are not indicative of future results.

Biographies

Ryan Taliaferro, Ph.D.

SENIOR VICE PRESIDENT, DIRECTOR, EQUITY STRATEGIES

Ryan joined Acadian in 2011 and currently serves as director of equity strategies. Previously, he was the lead portfolio manager for Acadian's Managed Volatility strategies. Prior to joining Acadian, Ryan was a faculty member in the finance unit at Harvard Business School, where he taught corporate finance and asset pricing. Earlier, he was a consultant at the Boston Consulting Group. Ryan earned a Ph.D. in business economics (finance) from Harvard University and an M.B.A. in finance and economics from the University of Chicago. He also holds an A.M. in economics, and an A.M. and A.B. in physics from Harvard University.

Ram Thirukkonda, CFA

VICE PRESIDENT, INVESTMENT STRATEGIST, CLIENT ADVISORY

Ram joined Acadian in 2018 and is an investment strategist on the Client Advisory Team, aligned closely with Acadian's Global Client Group and Investment Teams. Prior to joining Acadian, Ram was a quantitative research analyst on the Asset Allocation team at GMO LLC, focused on portfolio construction, risk models, and signals. Ram also previously worked as a quantitative analyst at Batterymarch Financial Management, where he conducted research on quantitative equity portfolios. Ram holds an M.S. specializing in financial engineering from MIT; an M.S. in transportation engineering/operations research from MIT; and a B.Tech. in civil engineering from Indian Institute of Technology, India. He is a CFA charterholder and a member of CFA Society Boston.

Seth Weingram, Ph.D

SENIOR VICE PRESIDENT, DIRECTOR, CLIENT ADVISORY

Seth heads Acadian's Client Advisory function, which is closely aligned with both the Investment Team and the Global Client Group. Prior to joining Acadian in 2014, Seth was a managing director in Equity Derivatives Trading at UBS. Previously, he was a researcher at Barclays Global Investors, focusing on options and volatility. He also helped to establish and later ran Deutsche Bank's award-winning Equity Derivatives Strategy Group. Seth holds a Ph.D. in economics from Stanford University and a B.A. in economics from the University of Chicago.

Hypothetical Legal Disclaimer

The hypothetical examples provided in this presentation are provided as illustrative examples only. Hypothetical performance results have many inherent limitations, some of which are described below. No representation is being made that any account will or is likely to achieve profits or losses similar to those shown. In fact, there are frequently sharp differences between hypothetical performance results and the actual performance results subsequently achieved by any particular trading program.

One of the limitations of hypothetical performance results is that they are generally prepared with the benefit of hindsight. In addition, hypothetical trading does not involve financial risk, and no hypothetical trading record can completely account for the impact of financial risk in actual trading. For example, the ability to withstand losses or to adhere to a particular trading program in spite of trading losses are material points which can also adversely affect actual trading results. There are numerous other factors related to the markets in general or to the implementation of any specific trading program which cannot be fully accounted for in the preparation of hypothetical performance results and all of which can adversely affect actual trading results.

General Legal Disclaimer

Acadian provides this material as a general overview of the firm, our processes and our investment capabilities. It has been provided for informational purposes only. It does not constitute or form part of any offer to issue or sell, or any solicitation of any offer to subscribe or to purchase, shares, units or other interests in investments that may be referred to herein and must not be construed as investment or financial product advice. Acadian has not considered any reader's financial situation, objective or needs in providing the relevant information.

The value of investments may fall as well as rise and you may not get back your original investment. Past performance is not necessarily a guide to future performance or returns. Acadian has taken all reasonable care to ensure that the information contained in this material is accurate at the time of its distribution, no representation or warranty, express or implied, is made as to the accuracy, reliability or completeness of such information.

This material contains privileged and confidential information and is intended only for the recipient/s. Any distribution, reproduction or other use of this presentation by recipients is strictly prohibited. If you are not the intended recipient and this presentation has been sent or passed on to you in error, please contact us immediately. Confidentiality and privilege are not lost by this presentation having been sent or passed on to you in error.

Acadian's quantitative investment process is supported by extensive proprietary computer code. Acadian's researchers, software developers, and IT teams follow a structured design, development, testing, change control, and review processes during the development of its systems and the implementation within our investment process. These controls and their effectiveness are subject to regular internal reviews, at least annual independent review by our SOC1 auditor. However, despite these extensive controls it is possible that errors may occur in coding and within the investment process, as is the case with any complex software or data-driven model, and no guarantee or warranty can be provided that any quantitative investment model is completely free of errors. Any such errors could have a negative impact on investment results. We have in place control systems and processes which are intended to identify in a timely manner any such errors which would have a material impact on the investment process.

Acadian Asset Management LLC has wholly owned affiliates located in London, Singapore, Sydney, and Tokyo. Pursuant to the terms of service level agreements with each affiliate, employees of Acadian Asset Management LLC may provide certain services on behalf of each affiliate and employees of each affiliate may provide certain administrative services, including marketing and client service, on behalf of Acadian Asset Management LLC.

Acadian Asset Management LLC is registered as an investment adviser with the U.S. Securities and Exchange Commission. Registration of an investment adviser does not imply any level of skill or training.

Acadian Asset Management (Japan) is a Financial Instrument Operator (Discretionary Investment Management Business). Register Number Director-General Kanto Local Financial Bureau (Kinsho) Number 2814. Member of Japan Investment Advisers Association.

Acadian Asset Management (Singapore) Pte Ltd, (Registration Number: 199902125D) is licensed by the Monetary Authority of Singapore.

Acadian Asset Management (Australia) Limited (ABN 41 114 200 127) is the holder of Australian financial services license number 291872 ("AFSL"). Under the terms of its AFSL, Acadian Asset Management (Australia) Limited is limited to providing the financial services under its license to wholesale clients only. This marketing material is not to be provided to retail clients.

Acadian Asset Management (UK) Limited is authorized and regulated by the Financial Conduct Authority ('the FCA') and is a limited liability company incorporated in England and Wales with company number 05644066. Acadian Asset Management (UK) Limited will only make this material available to Professional Clients and Eligible Counterparties as defined by the FCA under the Markets in Financial Instruments Directive.

ACADIAN

GLOBAL AFFILIATES

Boston   London   Singapore   Sydney   Tokyo

ACADIAN-ASSET.COM