

# Factor and style model performance: 2018 in review

December 2018

## Research Signals

Major global equity markets came close to or entered bear territory in 2018, as many regional benchmarks posted their worst annual declines since the financial crisis or longer. Markets succumbed to slowing economic growth and trade tensions, especially between the US and China. The resulting increased volatility lent support to the risk-off trade, as demonstrated by outperformance of 60-Month Beta across all our coverage universes in 2018 (Table 1). The economic outlook for the coming year may well reflect divergent regional growth trends which developed over the course of 2018, undoing the strong, synchronized growth which the global economy began the year with. One major risk to the global economy in the coming year is further contraction in world trade, as manifested by the December J.P.Morgan Global Composite Index which eased to a 27-month low.

- US: 60-Month Beta outperformed in 2018, supported by a cumulative spread of 24.5% over the last three months, while Price Momentum measures such as Industry-adjusted 12-month Relative Price Strength were key among small caps
- Developed Europe: While risk-off was a dominant trade in European markets throughout 2018, the multifactor construction of the Price Momentum Model, combining price changes with several risk factors, supported a cumulative decile spread of 7.0% for the year
- Developed Pacific: In markets outside Japan, signals from the securities lending market were successful strategies for the year, as gauged by Demand Supply Ratio and Implied Loan Rate, proprietary measures categorizing stocks that are heavily borrowed in the market relative to the lendable inventory and the respective cost of borrowing which is indicative of the shorting flow
- Emerging markets: Our style models were particularly effective at distinguishing winners from losers, with strong cumulative spreads for year across each category, led by Price Momentum (25.0%)

## Contacts

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Table 1

## Global factor average monthly quantile return spread performance snapshot, Jan 2018 - Dec 2018

| Factor   | Factor Group           | US Large Cap | US Small Cap | Developed Europe | Developed Pacific ex Japan | Japan Standard Cap | Emerging Markets |
|--|------------------------|--------------|--------------|------------------|----------------------------|--------------------|------------------|
| Book-to-Market                                     |                        | -1.27        | -0.96        | -0.81            | -0.16                      | -0.41              | 0.37             |
| Forward 12-M EPS-to-Enterprise Value               | Deep Value             | -1.08        | 0.32         | -0.12            | 0.17                       | -0.82              | 0.77             |
| TTM EBITDA-to-Enterprise Value                     |                        | -1.41        | -0.33        | -0.17            | 1.05                       | -0.49              | 0.62             |
| TTM Free Cash Flow-to-Enterprise Value             |                        | 0.18         | 0.89         | -0.35            | 1.07                       | -0.22              | 1.05             |
| Industry Relative Leading 4-QTRs EPS to Price      | Relative Value         | -0.41        | 0.71         | -0.02            | -0.01                      | -0.66              | 0.68             |
| Industry Relative TTM Dividend Yield               |                        | 0.79         | 0.19         | 0.06             | 0.72                       | 0.20               | 1.24             |
| Fixed Assets Turnover Ratio                        |                        | 0.21         | 0.48         | -0.64            | -0.82                      | -1.49              | -0.03            |
| Inventory Turnover Ratio                           | Management Quality     | 0.05         | -0.02        | -0.29            | 0.23                       | 0.15               | -0.09            |
| Net Operating Asset Turnover                       |                        | 0.89         | 0.79         | -0.89            | -0.70                      | -0.65              | -0.11            |
| Change in Accruals to Assets                       |                        | 0.51         | 0.33         | 0.06             | -0.41                      | 0.86               | 0.18             |
| Change in TTM COGS vs. Inventory Level             | Earnings Quality       | 0.70         | 0.25         | -0.05            | 0.33                       | 0.33               | 0.93             |
| Change in TTM Sales vs. Accounts Receivable        |                        | -0.97        | -0.50        | -0.33            | 0.32                       | 0.16               | -0.15            |
| Working Capital Accruals                           |                        | -0.57        | -0.26        | -0.72            | -0.09                      | -0.48              | -0.33            |
| 1-yr Growth in TTM Free Cash Flow                  | Historical Growth      | 0.45         | 0.31         | 0.00             | 0.27                       | -0.09              | 0.75             |
| Reinvestment Rate                                  |                        | -0.10        | 0.12         | 0.48             | 0.28                       | -1.40              | 0.19             |
| Average Monthly Trading Volume-to-Market Cap       |                        | -0.37        | -2.32        | -0.92            | -1.13                      | -2.20              | -1.31            |
| 60-Month Beta                                      | Liquidity, Risk & Size | 2.15         | 1.49         | 1.78             | 0.76                       | 2.19               | 0.62             |
| Asset Quality Index                                |                        | 0.11         | -0.61        | 0.08             | -1.06                      | -0.43              | -0.17            |
| Operating Leverage                                 |                        | -0.12        | 0.06         | 0.26             | -0.12                      | -0.14              | -0.09            |
| Natural Logarithm of Market Capitalization         |                        | -0.67        | -1.72        | -0.78            | -0.15                      | -1.10              | -0.92            |
| 2-Year Ahead EPS Growth                            | Earnings Momentum      | -1.28        | -1.34        | -1.22            | -1.30                      | -0.84              | -0.57            |
| 3-M Revision in FY2 EPS Forecasts                  |                        | -0.48        | -0.83        | 0.75             | 0.51                       | -0.96              | 0.29             |
| Real Earnings Surprise                             |                        | -0.18        | -0.32        | -0.05            | -0.21                      | -0.40              | 0.44             |
| 24-Month Value at Risk                             |                        | 0.56         | 1.91         | 1.47             | 1.18                       | 2.76               | 0.96             |
| 5-day Industry Relative Return                     | Price Momentum         | 0.56         | -0.41        | 0.88             | -0.11                      | 1.26               | 1.24             |
| Industry-adjusted 12-month Relative Price Strength |                        | 0.09         | 1.49         | 0.21             | 0.63                       | -0.94              | 0.12             |
| Rational Decay Alpha                               |                        | -0.81        | -0.40        | -0.16            | 0.07                       | -0.31              | -0.04            |
| Demand Supply Ratio                                | Short Sentiment        | 0.50         | 1.49         | 0.63             | 1.20                       | 0.04               | 1.01             |
| Implied Loan Rate                                  |                        | 0.31         | 2.14         | 0.12             | 1.54                       | 0.31               | 1.18             |
| <b>Style model</b>                                 |                        |              |              |                  |                            |                    |                  |
| Deep Value   |                        | -0.24        | 0.03         | -0.47            | 1.71                       | 0.28               | 0.93             |
| Earnings Momentum                                  |                        | -0.89        | -1.05        | -0.12            | 0.60                       | -1.43              | 0.36             |
| Price Momentum                                     |                        | -0.39        | -0.94        | 0.59             | 1.71                       | 0.07               | 2.09             |
| Relative Value                                     |                        | -0.31        | 1.27         | -0.56            | 0.70                       | 0.04               | 0.93             |
| Value Momentum                                     |                        | -0.42        | -0.35        | 0.00             | 0.78                       | 0.08               | 1.04             |
| Historical Growth                                  |                        | -0.01        | 0.74         |                  |                            |                    |                  |
| GARP   |                        | -0.33        | 0.81         |                  |                            |                    |                  |

Source: IHS Markit

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## United States

### US Large Cap

US manufacturing and services sectors saw slower, albeit still solid improvement in business conditions, contributing to a Composite PMI of 54.4 in December, down from 54.7 in November. The manufacturing PMI (December: 53.8; November 55.3) registered at a 15-month low as business confidence fell to the lowest since October 2016, inflationary pressures eased and the pace of new order growth was the weakest since September 2017. The Services Business Activity Index (December: 54.4; November 54.7) softened to a three-month low as business confidence dipped to the lowest in a year. Stocks, meanwhile, posted the weakest December return since 1931, capping the biggest annual slide since the financial crisis.

As volatility picked back up at the end of 2018, volatility-based measures dominated factor performance of large caps in the final three months of the year and, in turn, were prominent among the top average performers for the year (Table 2). In fact, 60-Month Beta (2.15%), which topped the list, recorded a 24.5% cumulative spread from October through December. While not reported here due to low universe coverage, we also comment on the Credit Risk factor (a proprietary measure capturing the level of credit risk priced by the credit market) which recorded a 5.17% spread in December, extending its positive performance streak to six months.

The Earnings Momentum Model was particularly hard hit in 2018 as uncertainty struck the markets, in a similar fashion to early 2016 when Chinese economic concerns spooked markets; however, we expect the model to return to its winning ways, as demonstrated by the 65% hit rate (percent of months with positive spreads) over the prior five-year period (Figure 1). Deep Value measures were among the weakest performing factors on average in 2018 (Table 3), including Price-to-Book Return-on-Equity Combination (-1.93%) and Leading 12 Month Cash Yield (-1.77%), in addition to two Macro indicators, Yield Curve Slope Sensitivity (-1.57%) and Oil Prices Sensitivity (-1.55%), reflecting a tough year for banks and energy firms.

Table 2

#### US Large Cap top average monthly decile return spread factor performance, Jan 2018 - Dec 2018

| Factor                                       | Decile spread (%) | Factor group           |
|--|-------------------|------------------------|
| 60-Month Beta                                | 2.15              | Liquidity, Risk & Size |
| Product of Beta and Sigma                    | 1.97              | Liquidity, Risk & Size |
| Std Dev of FY2 EPS Estimates-to-Price        | 1.83              | Earnings Momentum      |
| Sales Growth Rate Standard Deviation         | 1.56              | Historical Growth      |
| Stock Return Volatility                      | 1.51              | Liquidity, Risk & Size |
| 3-Year Trough Gross Margin                   | 1.45              | Management Quality     |
| Std Dev of FY1 EPS Estimates-to-Price        | 1.44              | Earnings Momentum      |
| Stability of 3-yr TTM Sales                  | 1.37              | Historical Growth      |
| Earnings Shortfall                           | 1.31              | Earnings Quality       |
| 20-Day Volume Volatility to Price Volatility | 1.30              | Liquidity, Risk & Size |
| R-Sqr of 3-yr TTM Sales Trend Line           | 1.29              | Historical Growth      |
| Net Debt to EBITDA                           | 1.29              | Management Quality     |
| Sales Surprise                               | 1.29              | Earnings Momentum      |
| Oper Cash Flow Return on Invested Capital    | 1.28              | Management Quality     |
| 1-Month Stock Return Interquartile Range     | 1.26              | Liquidity, Risk & Size |

Source: IHS Markit

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Figure 1

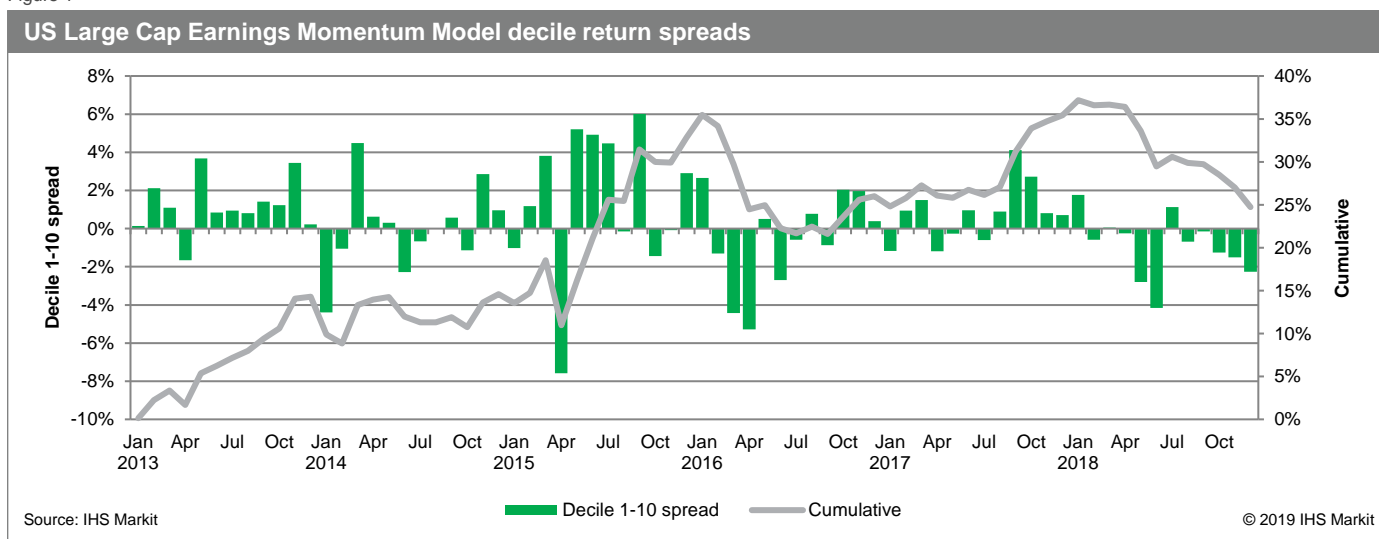


Table 3

| US Large Cap bottom average monthly decile return spread factor performance, Jan 2018 - Dec 2018 |                   |                        |
|--|-------------------|------------------------|
| Factor   | Decile spread (%) | Factor group           |
| Price-to-Book Return-on-Equity Combination   | -1.93             | Deep Value             |
| Leading 12 Month Cash Yield  | -1.77             | Deep Value             |
| Price-to-Total Assets  | -1.77             | Deep Value             |
| Leading 12 Month EBITDA/ EV  | -1.61             | Deep Value             |
| Tobin q  | -1.59             | Liquidity, Risk & Size |
| Yield Curve Slope Sensitivity  | -1.57             | Macro                  |
| Oil Prices Sensitivity   | -1.55             | Macro                  |
| Time Weighted Cash Yield   | -1.52             | Deep Value             |
| Time Weighted EBITDA/ EV   | -1.46             | Deep Value             |
| Leading 12 Month Book Yield  | -1.43             | Deep Value             |

Source: IHS Markit

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## US Small Cap

Price Momentum measures were key among small cap top average performers in 2018 (Table 4), led by metrics such as 50-200 Day Stock Price Ratio (2.78%) and 26-Week Relative Price Strength (2.38%). However, particularly robust style model performance was posted by the Relative Value Model with a 15.3% cumulative spread for the year (Figure 2), followed by GARP (9.7%), Historical Growth (8.8%) and Value Momentum 2 (8.3%). At the opposite extreme, the weakest average factor performance (Table 5) was associated with valuation measures captured by Deep Value (e.g., Price-to-Book Return-on-Equity: -2.54%) and long-term price reversal (e.g., 60-Month Alpha: -2.46%) styles. In a similar vein, underperformance of microcaps on average pushed Natural Logarithm of Closing Price (-2.70%) to the most extreme negative average spread for the year.

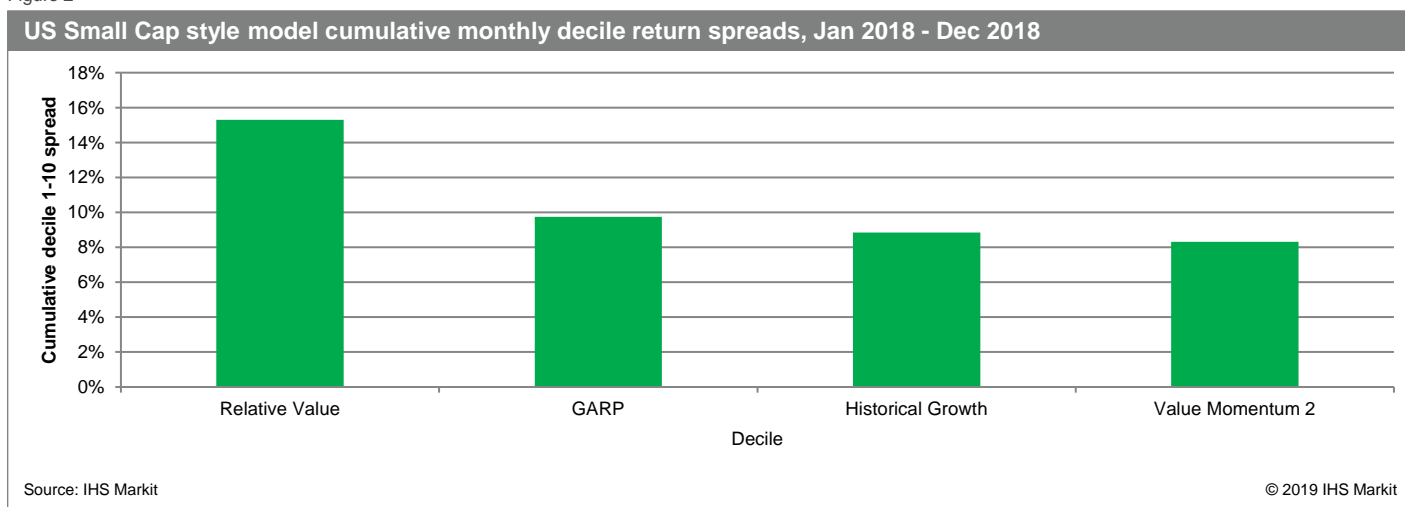
Table 4

| US Small Cap top average monthly decile return spread factor performance, Jan 2018 - Dec 2018 |                   |                        |
|---|-------------------|------------------------|
| Factor  | Decile spread (%) | Factor group           |
| Std Dev of FY2 EPS Estimates-to-Price   | 3.29              | Earnings Momentum      |
| Std Dev of FY1 EPS Estimates-to-Price   | 3.14              | Earnings Momentum      |
| 50-200 Day Stock Price Ratio  | 2.78              | Price Momentum         |
| 4-52 Week Price Oscillator  | 2.70              | Price Momentum         |
| 15/36 Week Stock Price Ratio  | 2.41              | Price Momentum         |
| 26-Week Relative Price Strength   | 2.38              | Price Momentum         |
| 52-Week High  | 2.26              | Price Momentum         |
| 24-Month Residual Return Variance   | 2.21              | Price Momentum         |
| 6-Month Active Return with 1-Month Lag  | 2.21              | Price Momentum         |
| 9-Month Active Return with 1-Month Lag  | 2.20              | Price Momentum         |
| 39-Week Return with 4-week Lag  | 2.20              | Price Momentum         |
| Implied Loan Rate   | 2.14              | Short Sentiment        |
| Market Cap per Analyst  | 2.00              | Liquidity, Risk & Size |
| CV of Prior 90-Day Closing Prices   | 1.98              | Price Momentum         |
| 60-Day Residual Risk  | 1.95              | Liquidity, Risk & Size |

Source: IHS Markit

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Figure 2



Source: IHS Markit

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Table 5

| US Small Cap bottom average monthly decile return spread factor performance, Jan 2018 - Dec 2018 |                   |                        |
|--|-------------------|------------------------|
| Factor   | Decile spread (%) | Factor group           |
| Natural Logarithm of Closing Price (USD)   | -2.70             | Liquidity, Risk & Size |
| Natural Logarithm of Closing Price   | -2.68             | Liquidity, Risk & Size |
| Price-to-Book Return-on-Equity Combination   | -2.54             | Deep Value             |
| 60-Month Alpha   | -2.46             | Price Momentum         |
| 60-Month Active Return with 1-Month Lag  | -2.41             | Price Momentum         |
| Current Liabilities-to-Price   | -2.37             | Liquidity, Risk & Size |
| Average Monthly Trading Volume-to-Market Cap   | -2.32             | Liquidity, Risk & Size |
| 60-Month Active Return with 12-Month Lag   | -2.23             | Price Momentum         |
| Altman Z Score   | -2.19             | Liquidity, Risk & Size |
| Price-to-Total Assets  | -1.88             | Deep Value             |

Source: IHS Markit

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## Europe

The Eurozone Composite PMI moved closer to the 50.0 no-change mark in December, registering at 51.1, down from 52.7 in November, on broadly similar modest growth output in the manufacturing and services sectors, which was down considerably from the elevated rates at the start of the year. The December manufacturing PMI posted at 51.4, the lowest reading since February 2016 and down from 51.8 in November, while the services PMI hit its lowest level in over four years at 51.2 in December, down from 53.4 in November. Continued worries over global trade, ongoing political uncertainties and tightening financial conditions all weighed on confidence, sentiments that also pushed European equities to a third month of negative returns, closing out the year with the worst performance in a decade.

Risk-off was a dominant trade in European markets throughout 2018 (Table 6). For example, Product of Beta and Sigma, a measure of a stock's systematic and total risk, posted the highest average monthly decile return spread of 1.82%, driven by an especially strong finish to the year with a cumulative spread of 21.5% in the final quarter. Yet, the top performing style model for the year was the Price Momentum Model (cumulative spread: 7.0%) given its multifactor construction combining price changes with several risk factors (Figure 3). At the opposite end of the spectrum, factors which lagged on average for the year (Table 7) include several valuation measures such as TTM Sales-to-Price (-1.34%) and Time Weighted EBITDA/EV (-1.06%).

Table 6

### Developed Europe top average monthly decile return spread factor performance, Jan 2018 - Dec 2018

| Factor                                   | Decile spread (%) | Factor group           |
|--|-------------------|------------------------|
| Product of Beta and Sigma                | 1.82              | Liquidity, Risk & Size |
| 60-Month Beta                            | 1.78              | Liquidity, Risk & Size |
| 60-Day Residual Risk                     | 1.65              | Liquidity, Risk & Size |
| Stock Return Volatility                  | 1.59              | Liquidity, Risk & Size |
| 1-Month Stock Return Interquartile Range | 1.52              | Liquidity, Risk & Size |
| 24-Month Value at Risk                   | 1.47              | Price Momentum         |
| 1-Month Realized Stock Return Volatility | 1.47              | Liquidity, Risk & Size |
| 24-Month Residual Return Variance        | 1.46              | Price Momentum         |
| Operating Profit Margin                  | 1.36              | Management Quality     |
| Regression Error of 60-Month CAPM        | 1.29              | Liquidity, Risk & Size |
| NOPAT Margin                             | 1.28              | Management Quality     |
| Revenue per Employee                     | 1.25              | Management Quality     |
| Net Profit Margin                        | 1.24              | Management Quality     |
| 3-M Revision in FY1 EPS Forecasts        | 1.22              | Earnings Momentum      |
| Inventory-to-Total Assets                | 1.16              | Management Quality     |

Source: IHS Markit

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Figure 3

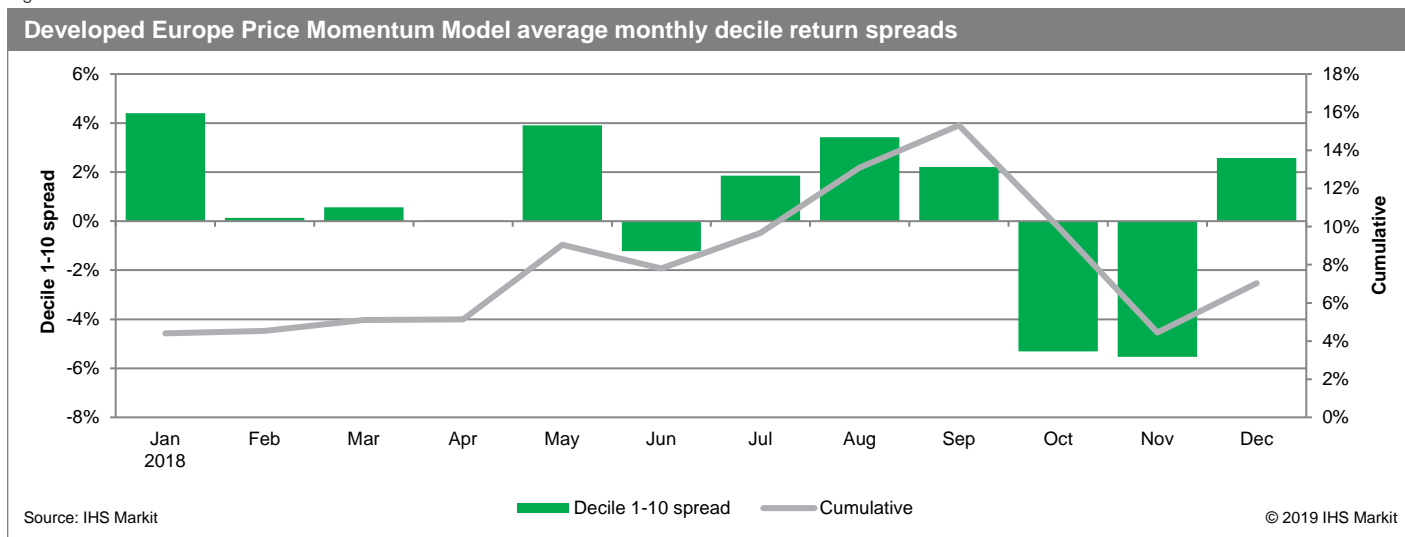


Table 7

**Developed Europe bottom average monthly decile return spread factor performance, Jan 2018 - Dec 2018**

| Factor                               | Decile spread (%) | Factor group           |
|--------------------------------------|-------------------|------------------------|
| TTM Sales-to-Price                   | -1.34             | Deep Value             |
| Time Weighted Sales Yield            | -1.29             | Deep Value             |
| 2-Year Ahead EPS Growth              | -1.22             | Earnings Momentum      |
| Industry Relative TTM Sales-to-Price | -1.18             | Relative Value         |
| Leading 12 Month Sales Yield         | -1.16             | Deep Value             |
| TTM Sales-to-Enterprise Value        | -1.14             | Deep Value             |
| Yield Curve Slope Sensitivity        | -1.07             | Macro                  |
| Time Weighted EBITDA/ EV             | -1.06             | Deep Value             |
| Basic Defensive Interval             | -1.06             | Liquidity, Risk & Size |
| Current Liabilities-to-Price         | -1.01             | Liquidity, Risk & Size |

Source: IHS Markit © 2019 IHS Markit

## Asia-Pacific

Composite manufacturing and services business activity diverged in December between the two largest Asian economies of Japan and China. In Japan, the Nikkei Composite Output Index fell to 52.0, from 52.4 in November, on weaker expansion in the dominant services sector (December PMI: 51.0; November PMI: 52.3) compared with the manufacturing sector (December PMI: 52.6; November PMI: 52.2). However, while only slight, manufacturing PMI data in China fell below the neutral 50.0 level in December, registering at 49.7, down from 50.2 in November, while the services PMI edged up from 53.8 in November to a six-month high of 53.9 in December, pushing the Composite Output Index to a five-month high of 52.2 (November PMI: 51.9). Meantime, equity markets in both countries fell double-digits in 2018, marking their worst year since 2008.

Volatility-based trades were also positive signals in developed Pacific markets in 2018. Outside of Japan, 1-Month Realized Stock Return Volatility (2.58%) was the top performing factor (Table 8) with notable double-digit spreads in June (11.03%) and October (10.20%). We also draw attention to Utilization (1.93%), a proprietary measure of the proportion of inventories sitting in lending programs out on loan, which outperformed in all but two months last year

with a cumulative spread of 23.2% (Figure 4). A handful of signals which underperformed on average for the year (Table 9) are based on analyst outlook, such as 2-Year Ahead EPS Growth Percentage Change (-1.45%) and Leading 12 Month Sales Yield (-0.84%), suggesting some reservation in analyst estimates.

In Japan, measures of uncertainty also dominated the top performing factors on average last year (Table 10). Product of Beta and Sigma (2.83%) led the way with positive spreads in 75% of months. The uncertain environment left little room for strong conviction on a specific style model, with mostly cyclical performance seen throughout the year across our models, with Deep Value registering the top cumulative spread of 3.42% (Figure 5). The bottom performing factors for the year (Table 11) spanned a broad swath of styles including Dividend Coverage Ratio (-2.38%), 24-Month Active Return with 1-Month Lag (-2.20%), Unexpected Profitability (-1.82%) and Street Consensus Rating (-1.63%).

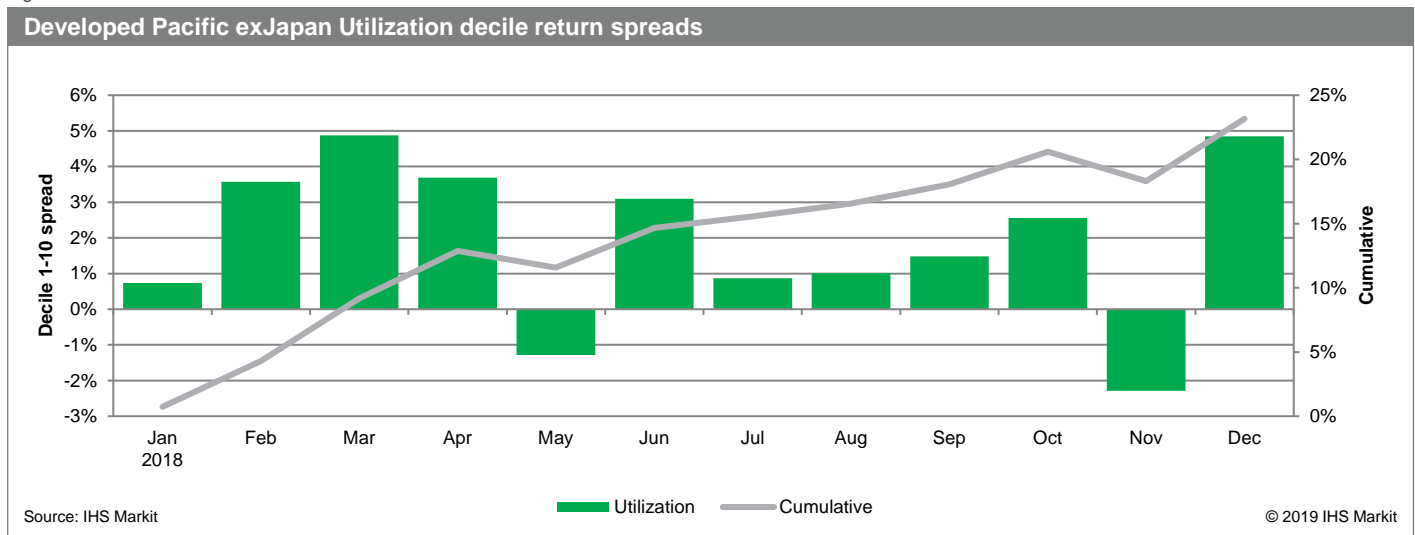
Table 8

| Developed Pacific exJapan top average monthly decile return spread factor performance, Jan 2018 - Dec 2018 |                   |                        |
|--|-------------------|------------------------|
| Factor   | Decile spread (%) | Factor group           |
| 1-Month Realized Stock Return Volatility   | 2.58              | Liquidity, Risk & Size |
| 60-Day Residual Risk   | 2.39              | Liquidity, Risk & Size |
| Stock Return Volatility  | 2.36              | Liquidity, Risk & Size |
| Regression Error of 60-Month CAPM  | 2.35              | Liquidity, Risk & Size |
| 1-Month Stock Return Interquartile Range   | 2.06              | Liquidity, Risk & Size |
| Distress Measure   | 2.00              | Liquidity, Risk & Size |
| Utilization  | 1.93              | Short Sentiment        |
| 24-Month Residual Return Variance  | 1.90              | Price Momentum         |
| Short Loan Concentration   | 1.84              | Short Sentiment        |
| Product of Beta and Sigma  | 1.77              | Liquidity, Risk & Size |
| TTM Operating Income to Enterprise Value   | 1.61              | Deep Value             |
| 39-Week Return with 4-week Lag   | 1.59              | Price Momentum         |
| 52-Week High   | 1.58              | Price Momentum         |
| Net Profit Margin  | 1.56              | Management Quality     |
| Implied Loan Rate  | 1.54              | Short Sentiment        |

Source: IHS Markit

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Figure 4



Source: IHS Markit

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Table 9

| Developed Pacific exJapan bottom average monthly decile return spread factor performance, Jan 2018 - Dec 2018 |                   |                        |
|---|-------------------|------------------------|
| Factor  | Decile spread (%) | Factor group           |
| Latin America Sales Exposure  | -2.51             | Macro                  |
| 2-Year Ahead EPS Growth Percentage Change   | -1.45             | Earnings Momentum      |
| Natural Logarithm of Closing Price (USD)  | -1.44             | Liquidity, Risk & Size |
| 2-Year Ahead EPS Growth   | -1.30             | Earnings Momentum      |
| Average Monthly Trading Volume-to-Market Cap  | -1.13             | Liquidity, Risk & Size |
| Asset Quality Index   | -1.06             | Liquidity, Risk & Size |
| Operating Liability Leverage  | -0.90             | Management Quality     |
| Natural Logarithm of Closing Price  | -0.87             | Liquidity, Risk & Size |
| Leading 12 Month Sales Yield  | -0.84             | Deep Value             |
| Time Weighted Sales Yield   | -0.84             | Deep Value             |

Source: IHS Markit

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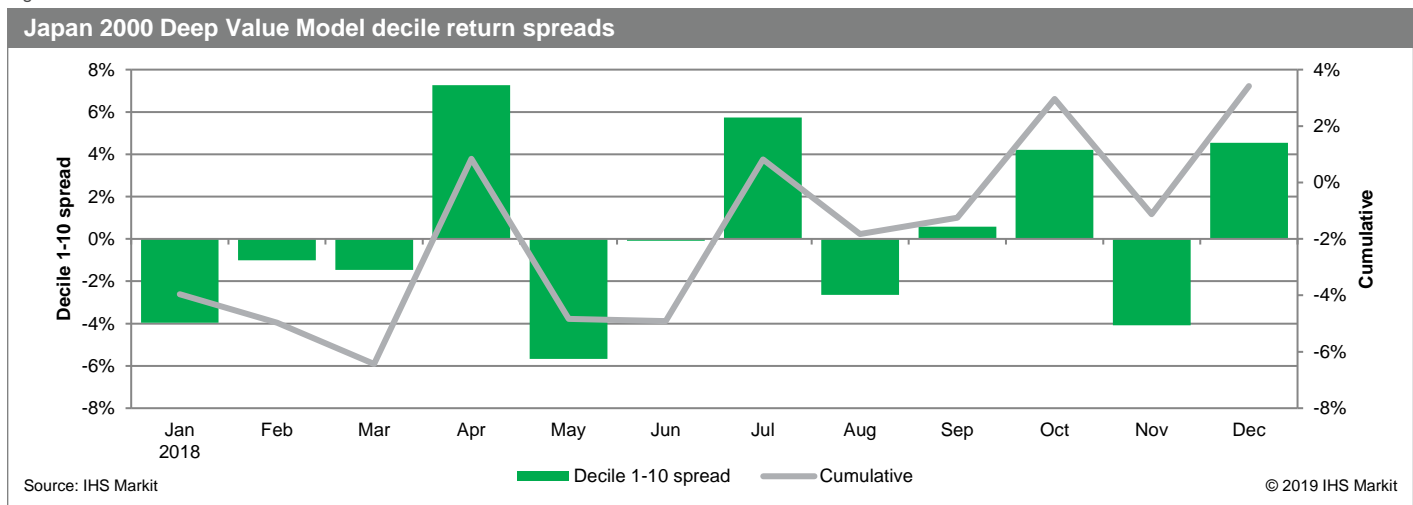
Table 10

| Japan Standard Cap top average monthly decile return spread factor performance, Jan 2018 - Dec 2018 |                   |                        |
|---|-------------------|------------------------|
| Factor  | Decile spread (%) | Factor group           |
| Product of Beta and Sigma   | 2.83              | Liquidity, Risk & Size |
| 1-Month Stock Return Interquartile Range  | 2.81              | Liquidity, Risk & Size |
| 24-Month Value at Risk  | 2.76              | Price Momentum         |
| 1-Month Realized Stock Return Volatility  | 2.67              | Liquidity, Risk & Size |
| Stock Return Volatility   | 2.60              | Liquidity, Risk & Size |
| 24-Month Residual Return Variance   | 2.55              | Price Momentum         |
| CV of Prior 90-Day Closing Prices   | 2.33              | Price Momentum         |
| 60-Month Beta   | 2.19              | Liquidity, Risk & Size |
| Regression Error of 60-Month CAPM   | 2.08              | Liquidity, Risk & Size |
| 60-Day Residual Risk  | 2.07              | Liquidity, Risk & Size |
| Inventory-to-Total Assets   | 1.91              | Management Quality     |
| Distress Measure  | 1.87              | Liquidity, Risk & Size |
| Stability of 5-yr TTM Earnings per Share  | 1.83              | Historical Growth      |
| Average Trading Volume in Preceding 6-month   | 1.80              | Price Momentum         |
| Change in Inventory to Average Assets   | 1.68              | Management Quality     |

Source: IHS Markit

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Figure 5



Source: IHS Markit

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Table 11

| Japan Standard Cap bottom average monthly decile return spread factor performance, Jan 2018 - Dec 2018 |                   |                        |
|--|-------------------|------------------------|
| Factor   | Decile spread (%) | Factor group           |
| Dividend Coverage Ratio  | -2.38             | Liquidity, Risk & Size |
| 24-Month Active Return with 1-Month Lag  | -2.20             | Price Momentum         |
| Average Monthly Trading Volume-to-Market Cap   | -2.20             | Liquidity, Risk & Size |
| Unexpected Profitability   | -1.82             | Management Quality     |
| Street Consensus Rating  | -1.63             | Earnings Momentum      |
| 18-Month Active Return with 1-Month Lag  | -1.62             | Price Momentum         |
| Operating Liability Leverage   | -1.59             | Management Quality     |
| Natural Logarithm of Closing Price   | -1.56             | Liquidity, Risk & Size |
| Dividends- to-Cash Flow  | -1.49             | Management Quality     |
| Fixed Assets Turnover Ratio  | -1.49             | Management Quality     |

Source: IHS Markit

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## Emerging Markets

We conclude with a review of top (Table 12) and bottom (Table 13) performing factors in emerging markets on average in 2018. Following suit with our developed market coverage, volatility-based metrics were key drivers of returns over the course of the year, with Regression Error of 60-Month CAPM (1.74%) topping the list, buoyed by positive spreads in all but two months. At the same time, our style models were particularly effective at distinguishing winners from losers, with strong cumulative spreads across each category (Figure 6), led by Price Momentum (25.0%). On the other hand, factors residing on the laggard board include Average Monthly Trading Volume-to-Market Cap (-1.31%), 6-Month Nominal Change in 12-Month Alpha (-0.95%) and Asia-Pacific Sales Exposure (-0.80%).

Table 12

| Emerging Markets top average monthly quintile return spread factor performance, Jan 2018 - Dec 2018 |                   |                        |
|---|-------------------|------------------------|
| Factor  | Decile spread (%) | Factor group           |
| Regression Error of 60-Month CAPM   | 1.74              | Liquidity, Risk & Size |
| Stock Return Volatility   | 1.73              | Liquidity, Risk & Size |
| 24-Month Residual Return Variance   | 1.69              | Price Momentum         |
| Product of Beta and Sigma   | 1.58              | Liquidity, Risk & Size |
| Latin America Sales Exposure  | 1.42              | Macro                  |
| 60-Day Residual Risk  | 1.41              | Liquidity, Risk & Size |
| Distress Measure  | 1.37              | Liquidity, Risk & Size |
| Industry Relative TTM Dividend Yield  | 1.24              | Relative Value         |
| 5-day Industry Relative Return  | 1.24              | Price Momentum         |
| TTM Dividend Yield  | 1.20              | Deep Value             |
| 1-Month Realized Stock Return Volatility  | 1.19              | Liquidity, Risk & Size |
| 3-M Revision in FY1 EPS Forecasts: Dispersion Relative  | 1.12              | Earnings Momentum      |
| Capital Acquisition Ratio   | 1.10              | Management Quality     |
| Stability of 5-yr TTM Earnings per Share  | 1.09              | Historical Growth      |
| Free Cash Flow Return on Invested Capital   | 1.06              | Management Quality     |

Source: IHS Markit

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Table 13

**Emerging Markets bottom average monthly quintile return spread factor performance, Jan 2018 - Dec 2018**

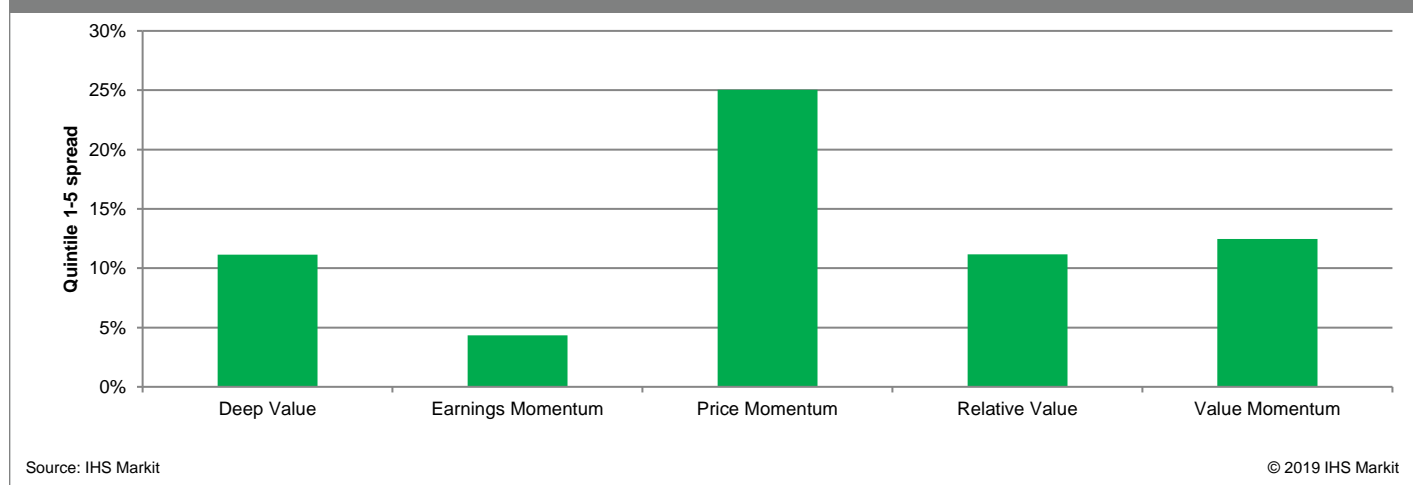
| Factor   | Decile spread (%) | Factor group           |
|--|-------------------|------------------------|
| Average Monthly Trading Volume-to-Market Cap     | -1.31             | Liquidity, Risk & Size |
| Natural Logarithm of Market Capitalization (USD) | -1.05             | Liquidity, Risk & Size |
| 6-Month Nominal Change in 12-Month Alpha         | -0.95             | Price Momentum         |
| Ohlson Bankruptcy Score                          | -0.94             | Liquidity, Risk & Size |
| Natural Logarithm of Market Capitalization       | -0.92             | Liquidity, Risk & Size |
| Cash & Equivalents-to-Current Liabilities        | -0.88             | Liquidity, Risk & Size |
| 2-Year Ahead EPS Growth Percentage Change        | -0.87             | Earnings Momentum      |
| Asia-Pacific Sales Exposure                      | -0.80             | Macro                  |
| 6-Month Nominal Change in 18-Month Alpha         | -0.78             | Price Momentum         |
| Dividends- to-Cash Flow                          | -0.67             | Management Quality     |

Source: IHS Markit

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Figure 6

**Emerging Markets style model cumulative monthly quintile return spreads, Jan 2018 - Dec 2018**



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