

Factor and style model performance: 2021 record book

January 2022

Research Signals

2021 was a year of records, as stocks extended prior year gains following the significant disruption in economic activity caused by the COVID-19 pandemic. Tailwinds from both monetary and fiscal stimulus helped push stocks to all-time highs in several major markets including the US and Europe, though elevated inflation may turn into a headwind as central banks switch to a new tightening regime. Value factors staged a comeback, though with some interruptions, in 2021 (Table 1) after an extended period of underperformance since 2007, as yields and, in turn, the value/growth cycle reacted to the developing inflation and economic growth expectations priced into equity and bond markets.

- US: Our thematic models turned in strong results in 2021, especially among small caps, led by Value Momentum and Deep Value Models
- Developed Europe: Net Operating Asset Turnover and Reinvestment Rate outperformed on average last year, alongside valuation measures
- Developed Pacific: The Deep Value Model and related factors such as Book-to-Market were rewarded throughout much of 2021
- Emerging markets: The Earnings Momentum Model and its component measure, 3-M Revision in FY2 EPS Forecasts, were once again successful in distinguishing winners from losers on average last year

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Table 1

Global factor average monthly quantile return spread performance snapshot, Jan 2021 - Dec 2021

		US Large Cap	US Small Cap	Developed Europe	Developed Pacific ex Japan	Japan Standard Cap	Emerging Markets
Factor	Factor Group						
Book-to-Market	Deep Value	1.71	3.24	1.11	1.83	2.05	0.01
Forward 12-M EPS-to-Enterprise Value		3.63	5.43	3.13	1.14	0.60	0.57
TTM EBITDA-to-Enterprise Value		2.20	4.21	2.68	1.76	0.94	0.29
TTM Free Cash Flow-to-Enterprise Value		1.07	3.82	1.01	0.39	-0.30	0.29
Industry Relative Leading 4-QTRs EPS to Price	Relative Value	1.64	3.81	2.56	1.17	0.67	0.38
Industry Relative TTM Dividend Yield		0.50	0.14	0.74	1.39	1.81	-0.33
Fixed Assets Turnover Ratio	Management Quality	-0.82	2.78	0.27	-0.87	-0.61	0.22
Inventory Turnover Ratio		0.65	1.70	-0.31	1.53	0.01	0.02
Net Operating Asset Turnover		1.23	1.49	0.94	0.59	-1.24	0.63
Change in Accruals to Assets	Earnings Quality	0.78	0.67	-0.27	-0.53	0.11	0.63
Change in TTM COGS vs. Inventory Level		0.53	1.71	1.44	1.34	0.48	0.53
Change in TTM Sales vs. Accounts Receivable		-0.25	-0.71	-0.34	-0.94	-0.04	0.01
Working Capital Accruals		-0.80	0.27	0.30	0.57	0.39	-0.76
1-yr Growth in TTM Free Cash Flow	Historical Growth	0.45	1.55	0.76	1.00	-0.79	-0.06
Reinvestment Rate		1.42	2.89	1.94	0.45	-0.33	0.09
Average Monthly Trading Volume-to-Market Cap	Liquidity, Risk & Size	-0.44	-1.82	-1.08	-0.23	0.00	-0.59
60-Month Beta		-1.43	-2.07	-0.26	-1.61	-1.80	-0.52
Asset Quality Index		0.18	-1.46	-0.71	-0.30	-0.42	-0.13
Operating Leverage		-0.04	-0.55	0.11	-0.66	-0.11	-0.07
Natural Logarithm of Market Capitalization	Earnings Momentum	-0.05	0.17	-0.86	0.86	-0.35	-0.64
2-Year Ahead EPS Growth		0.54	0.02	-0.20	-0.87	0.68	-0.10
3-M Revision in FY2 EPS Forecasts		2.39	3.13	1.95	2.25	0.17	1.51
Real Earnings Surprise		1.64	2.90	0.70	-0.23	-0.18	0.15
24-Month Value at Risk	Price Momentum	-0.67	-0.91	0.56	-0.32	-0.26	-0.39
5-day Industry Relative Return		0.68	1.20	0.05	-2.00	-1.93	-1.63
Industry-adjusted 12-month Relative Price Strength		0.36	1.46	0.64	0.58	-1.60	0.89
Rational Decay Alpha		-2.43	-1.92	-0.50	0.00	-1.18	0.57
Demand Supply Ratio	Short Sentiment	2.25	3.66	1.90	2.42	1.06	0.18
Implied Loan Rate		1.96	2.12	0.36	1.91	1.24	0.30
Style model							
Deep Value		2.60	4.91	1.73	2.22	2.21	-0.30
Earnings Momentum		2.26	2.44	1.21	1.59	0.77	0.95
Price Momentum		-0.24	0.15	0.90	1.89	-0.82	0.89
Relative Value		2.06	3.83	1.41	2.20	1.91	-0.28
Value Momentum		3.20	4.78	1.20	2.70	1.72	-0.37
Historical Growth		1.10	1.41				
GARP		2.04	3.63				

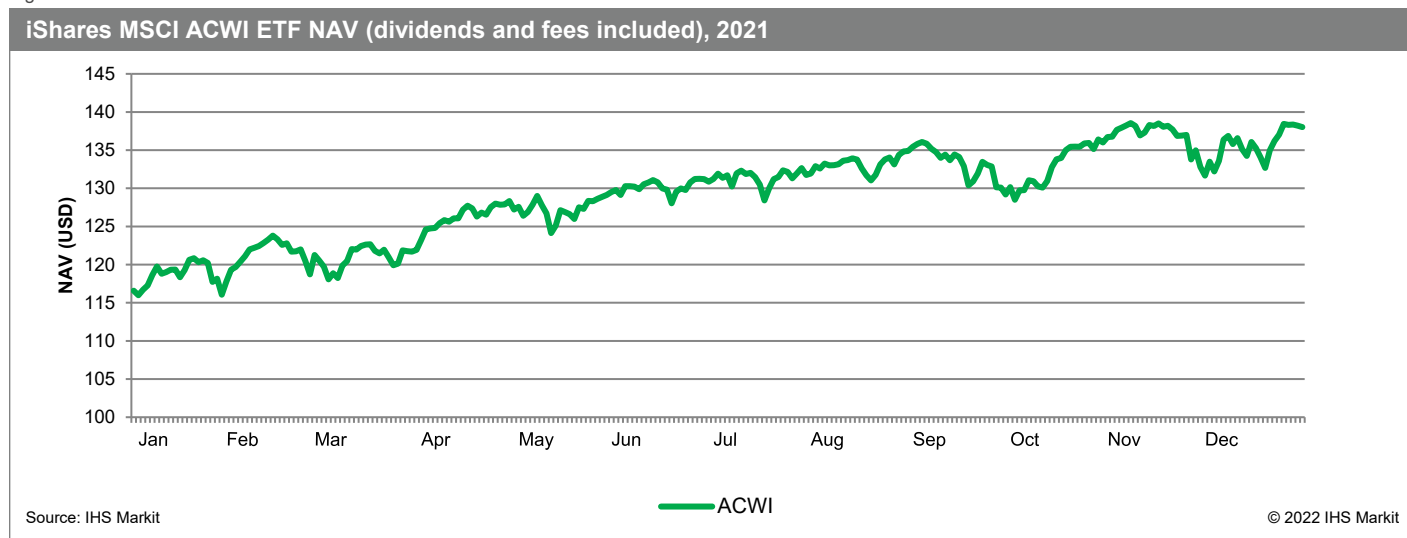
Source: IHS Markit

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Macro overview

To set the backdrop, we provide a quick review of several macro themes defining 2021. First, we review performance of global equities proxied by the iShares MSCI ACWI ETF (Figure 1), sourced from the IHS Markit ETF Analytics database. Stocks extended 2020 gains into 2021 as historic monetary and fiscal policies following the onset of the pandemic supported another year of recovery. While stocks overcame several bouts of volatility as coronavirus variants instilled fears of renewed lockdowns and economic restrictions, elevated inflation and an end to pandemic-era stimulus pose challenges for stocks heading into 2022.

Figure 1



However, the rate of global economic expansion remained broadly solid at the end of 2021, though slowing to a three-month low, according to the J.P.Morgan Global Composite PMI. At 54.3 in December, down from 54.8 in November, the headline figure has signaled expansion for 18 consecutive months (Figure 2). A weaker increase in services activity, which was more directly impacted by COVID-19 restrictions, was offset by faster growth of manufacturing production as supply disruptions eased. Expansions were seen in most large industrial regions, led by the US and Ireland, although Germany was a notable exception (Figure 3).

Figure 2

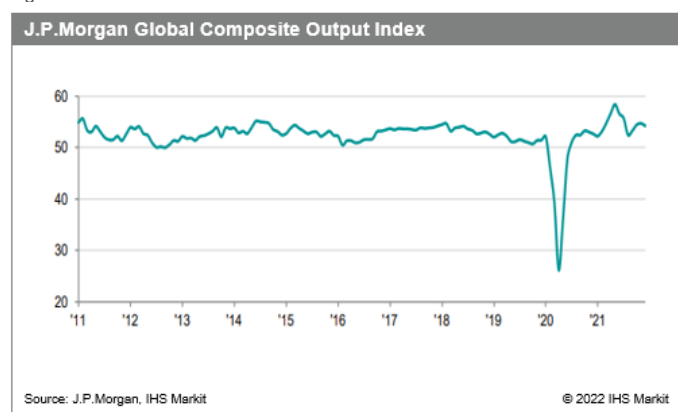
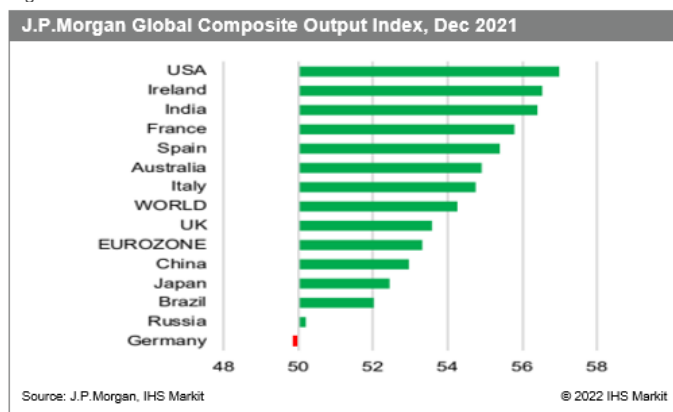


Figure 3



Overall, from a **GDP perspective**, the global economy made the transition from recovery to expansion in 2021. The global real GDP is projected to rise 5.6% in 2021, after falling 3.4% in 2020 amid ongoing turbulence from the COVID-19 pandemic. An uneven economic expansion generated supply/demand imbalances, leading to major supply

chain disruptions and rising inflation. Heading into 2022, businesses will navigate multiple transitions in the global economy, including the shift from fiscal policy stimulus to restraint, rising interest rates and tightening credit conditions.

United States

US Large Cap

US private sector business activity saw a steep increase to end 2021, contributing to a Composite PMI of 57.0 in December, down slightly from 57.2 in November. The latest data was largely driven by a sharp upturn in the service sector, though the Services PMI Business Activity Index eased to a three-month low (December: 57.6; November 58.0). Conversely, the manufacturing PMI (December: 57.7; November 58.3) remained constrained as material shortages and supplier delays dragged on. December stock market performance underscored another solid year for US equities, supported by strong corporate profits and vaccine developments, as an all-time high was hit in all 12 months.

Following a rough year for value measures in 2020, Deep Value factors dominated the list of top average monthly decile return spreads for the year (Table 2). Time Weighted EBITDA/EV (4.74%) registered the top average spread, though with ebbs and flows in performance (Figure 4). Most style models turned in positive average monthly spreads in 2021, with top performance posted by Value Momentum (3.20%). The lone exception was the Price Momentum Model (-0.24%) and, consistent with this theme, Price Momentum measures were among the weakest performing factors on average for the year (Table 3), including Rational Decay Alpha (-2.43%), alongside 3-yr Compound Annual Sales Growth (-2.25%) and Market Volatility Sensitivity (-2.01%).

Table 2

US Large Cap top average monthly decile return spread factor performance, Jan 2021 - Dec 2021

Factor	Decile spread (%)	Factor group
Time Weighted EBITDA/ EV	4.74	Deep Value
Leading 12 Month EBITDA/ EV	4.67	Deep Value
Time Weighted Cash Yield	4.51	Deep Value
Leading 12-Month Mean Earnings Yield	4.11	Deep Value
Leading 12-Month Median Earnings Yield	4.05	Deep Value
Leading 12 Month Cash Yield	3.94	Deep Value
Time Weighted Earnings Yield	3.81	Deep Value
TTM Operating Cash Flow-to-Enterprise Value	3.75	Deep Value
TTM Operating Income to Enterprise Value	3.74	Deep Value
TTM Operating Cash Flow-to-Price	3.72	Deep Value
Forward 12-M EPS-to-Enterprise Value	3.63	Deep Value
TTM Sales-to-Price	3.19	Deep Value
TTM Sales-to-Enterprise Value	3.04	Deep Value
Natural Logarithm of Total Assets (USD)	2.98	Liquidity, Risk & Size
Leading 12 Month Sales Yield	2.98	Deep Value

Source: IHS Markit

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Figure 4

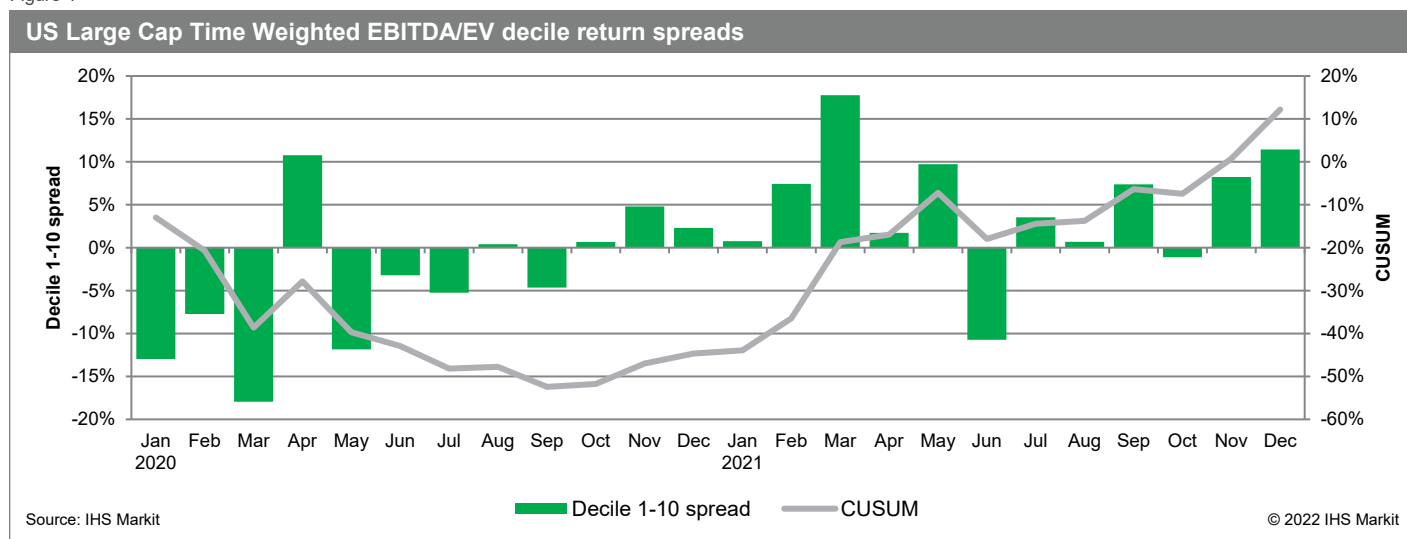


Table 3

US Large Cap bottom average monthly decile return spread factor performance, Jan 2021 - Dec 2021

Factor	Decile spread (%)	Factor group
Debt to Market Cap	-2.99	Liquidity, Risk & Size
Advertising Intensity	-2.96	Management Quality
Growth Duration	-2.75	Liquidity, Risk & Size
TTM Capital Expenditures-to-Price	-2.64	Deep Value
Rational Decay Alpha	-2.43	Price Momentum
3-yr Compound Annual Sales Growth	-2.25	Historical Growth
Attention Span Ratio	-2.08	Management Quality
Market Volatility Sensitivity	-2.01	Macro
24-Month Active Return with 1-Month Lag	-1.86	Price Momentum
18-Month Active Return with 1-Month Lag	-1.80	Price Momentum

Source: IHS Markit

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US Small Cap

As with large caps, Deep Value measures topped the leaderboard of average factor performance for small caps in 2021 (Table 4), led by Leading 12 Month Sales Yield (7.06%). Likewise, the Deep Value Model (4.91%) recorded the highest average monthly spread, with robust performance also associated with Value Momentum (4.78%), Relative Value (3.83%) and GARP (3.63%). On the other hand, Implied Volatility (-3.79%) was among the weakest performing factors on average for the full year (Table 5). The implication is that investors shunned the highest volatility shares (Figure 5), with underperformance in all but three months resulting in a -45.5% cumulative sum in spread performance in 2021, unwinding 2020's positive performance.

Table 4

US Small Cap top average monthly decile return spread factor performance, Jan 2021 - Dec 2021

Factor	Decile spread (%)	Factor group
Leading 12 Month Sales Yield	7.06	Deep Value
TTM Sales-to-Price	6.95	Deep Value
Time Weighted Sales Yield	6.93	Deep Value
Leading 12 Month EBITDA/ EV	6.81	Deep Value
Time Weighted EBITDA/ EV	6.57	Deep Value
Current Liabilities-to-Price	6.37	Liquidity, Risk & Size
TTM Sales-to-Enterprise Value	6.33	Deep Value
Operating Cash Flow Ratio	6.16	Liquidity, Risk & Size
TTM Operating Cash Flow-to-Price	6.14	Deep Value
Net Current Assets-to-Price	6.04	Deep Value
TTM Operating Income to Enterprise Value	5.73	Deep Value
Profitability Ratio	5.69	Management Quality
Cash & Equivalents-to-Current Liabilities	5.66	Liquidity, Risk & Size
Time Weighted Earnings Yield	5.54	Deep Value
Revenue per Employee	5.52	Management Quality

Source: IHS Markit

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Table 5

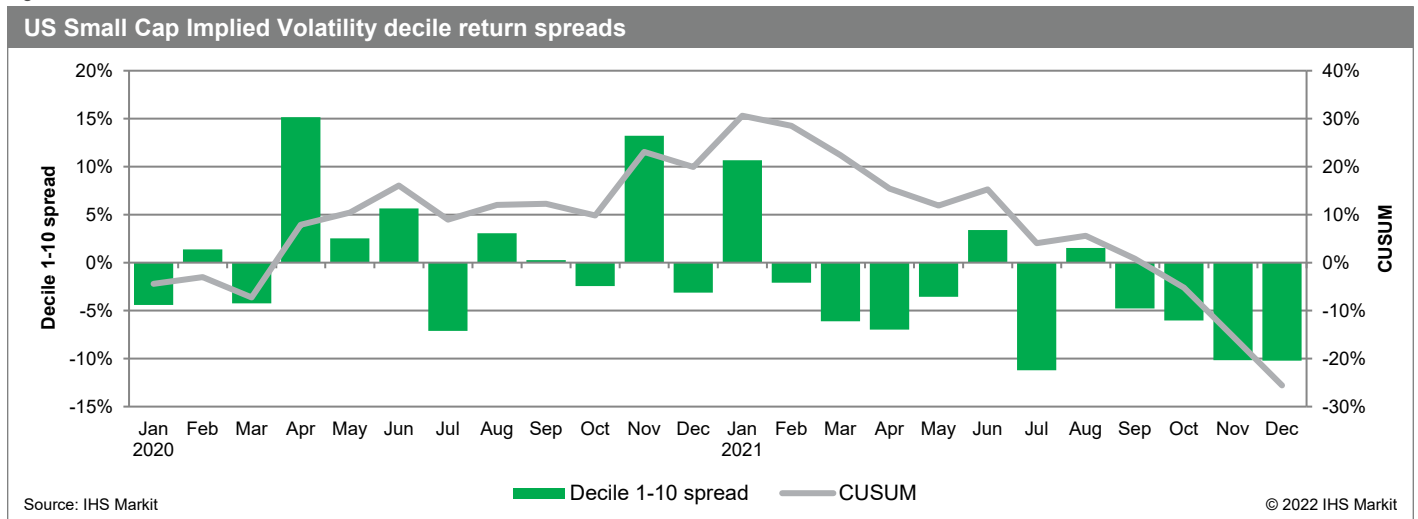
US Small Cap bottom average monthly decile return spread factor performance, Jan 2021 - Dec 2021

Factor	Decile spread (%)	Factor group
TTM Capital Expenditures-to-Price	-5.31	Deep Value
Advertising Intensity	-4.86	Management Quality
Debt to Market Cap	-4.46	Liquidity, Risk & Size
Product of TTM FCF Yield and Forward ROE	-3.92	Earnings Momentum
Implied Volatility	-3.79	Liquidity, Risk & Size
Ohlson Bankruptcy Score	-3.72	Liquidity, Risk & Size
Operating Liability Leverage	-3.67	Management Quality
Attention Span Ratio	-3.02	Management Quality
Flow Ratio	-2.85	Liquidity, Risk & Size
Cash to Enterprise Value	-2.80	Deep Value

Source: IHS Markit

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Figure 5



Europe

Following a brief acceleration in November, economic growth in the euro area eased to a nine-month low during December, with the Composite PMI falling to 53.3 in December, down from 55.4 in November. The slowdown trend resumed amid a resurgence of COVID-19 infections, which had a notable effect on the service sector (December: 53.3; November 55.4), restricting increases in both activity and new business. Manufacturing output growth remained subdued (December PMI: 58.0; November PMI: 58.4), as supply-related disruptions continued to impede production schedules. December equity market performance capped a strong year for stocks, as investors, inspired by US market returns, looked past the latest variant in coronavirus infections and toward positive economic growth.

Also similar to US markets, Deep Value measures were among the more consistently rewarded factors in European markets throughout 2021 (Table 6), led by Time Weighted Earnings Yield (3.99%). In the same vein, the Deep Value Model (1.73%) recorded the highest average spread for the year. Several Management Quality factors were also top performers, including Forward Return on Equity (3.28%) which was a consistently rewarded indicator particularly in 2021 (Figure 6), with outperformance in all but two months and a cumulative spread of 39.3%. In contrast, several Liquidity, Risk & Size measures were the weakest average performers (Table 7), including Flow Ratio (-2.45%) and Debt to Market Cap (-1.69%).

Table 6

Developed Europe top average monthly decile return spread factor performance, Jan 2021 - Dec 2021

Factor	Decile spread (%)	Factor group
Time Weighted Earnings Yield	3.99	Deep Value
Leading 12-Month Mean Earnings Yield	3.52	Deep Value
Leading 12-Month Median Earnings Yield	3.52	Deep Value
Forward Return on Equity	3.28	Management Quality
Forward 12-M EPS-to-Enterprise Value	3.13	Deep Value
TTM EBITDA-to-Price	2.76	Deep Value
Operating Cash Flow Ratio	2.73	Liquidity, Risk & Size
Return on Assets	2.71	Management Quality
TTM EBITDA-to-Enterprise Value	2.68	Deep Value
TTM Cash Flow-to-Price	2.64	Deep Value
TTM Operating Income to Enterprise Value	2.62	Deep Value
Cash Flow Return on Invested Capital	2.61	Management Quality
Industry Relative Leading 4-QTRs EPS to Price	2.56	Relative Value
Net Income per Employee	2.49	Management Quality
Earnings Torpedo	2.49	Earnings Momentum

Source: IHS Markit

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Figure 6

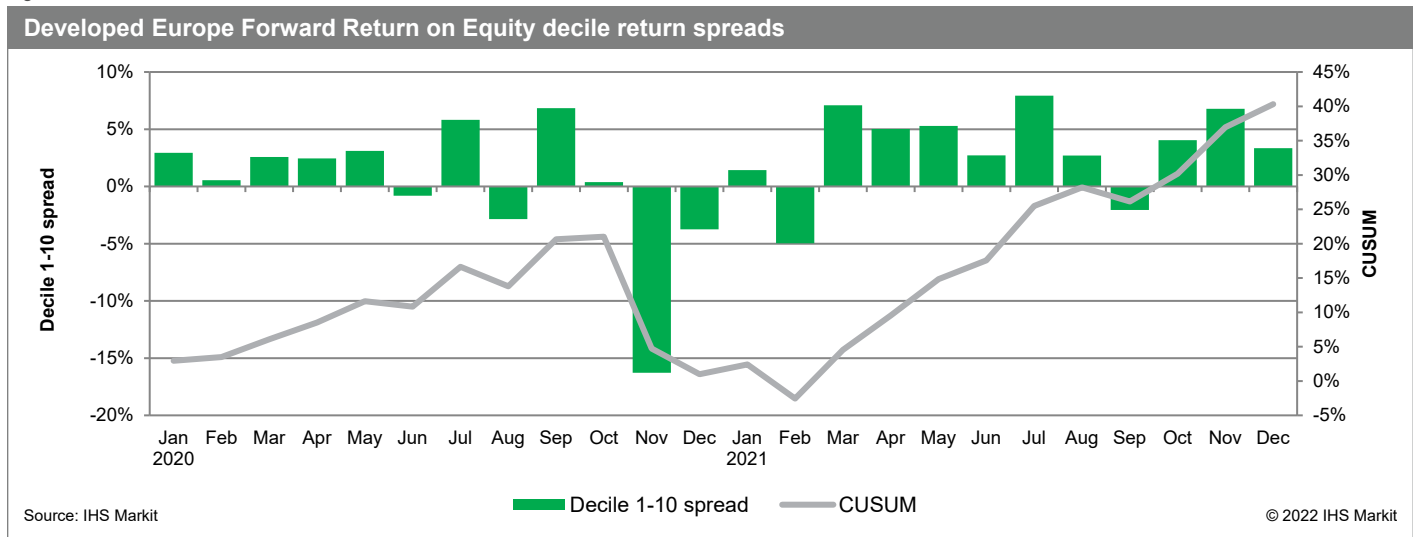


Table 7

Developed Europe bottom average monthly decile return spread factor performance, Jan 2021 - Dec 2021		
Factor	Decile spread (%)	Factor group
Flow Ratio	-2.45	Liquidity, Risk & Size
Debt to Market Cap	-1.69	Liquidity, Risk & Size
Ohlson Bankruptcy Score	-1.56	Liquidity, Risk & Size
TTM Capital Expenditures-to-Price	-1.34	Deep Value
Cash Cycle	-1.23	Management Quality
Net Debt to EBITDA	-1.18	Management Quality
Attention Span Ratio	-1.16	Management Quality
Average Monthly Trading Volume-to-Market Cap	-1.08	Liquidity, Risk & Size
5-yr Relative Book-to-Market	-1.07	Relative Value
Average Payable Period	-1.04	Management Quality

Source: IHS Markit

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Asia-Pacific

Composite manufacturing and services business activity remained above the neutral 50.0 level in the two largest Asian economies of Japan and China in December. In China, the December Composite Output Index signaled a solid increase in overall business activity, registering at 53.0, up from 51.2 in November. Stronger rates of output growth were seen across both manufacturing (December PMI: 50.9; November PMI: 49.9) and service (December PMI: 53.1; November PMI: 52.1) sectors. In Japan, the Composite PMI Output Index slipped to 52.5 in December, from 53.3 in November, on softening in both the manufacturing sector (December PMI: 54.3; November PMI: 54.5) and service (December PMI: 52.1; November PMI: 53.0) sectors. In equity markets, thinner investor optimism in both countries over the course of 2021 resulted in a volatile ride, limiting the upside for the year.

In developed Pacific markets outside Japan, all of the style models outperformed on average in 2021, led by Historical Growth (2.70%). In terms of factor performance, the top performing factors (Table 8) were led by 52-Week High (3.62%), with several months of strong performance associated with stocks trading closest to their annual high (Figure 7). However, investors also took cues from the securities lending market, with measures such as Utilization (3.11%)

also outperforming on average, while factors which tended to struggle for the year (Table 9) include Attention Span Ratio (-2.82%) and Net Debt to EBITDA (-2.55%).

In Japan, the top performing style model last year was Deep Value (2.21%), with positive spreads in two thirds of months (Figure 8). This theme carried over to factor performance, with Deep Value the dominant group among Japan's top performing factors on average in 2021 (Table 10), led by Normalized Earnings Yield (2.65%). At the opposite extreme, 60-Month Beta (-1.80%) and Industry-adjusted 12-month Relative Price Strength (-1.60%) were included in the list of bottom performing factors for the year (Table 11).

Table 8

Developed Pacific exJapan top average monthly decile return spread factor performance, Jan 2021 - Dec 2021

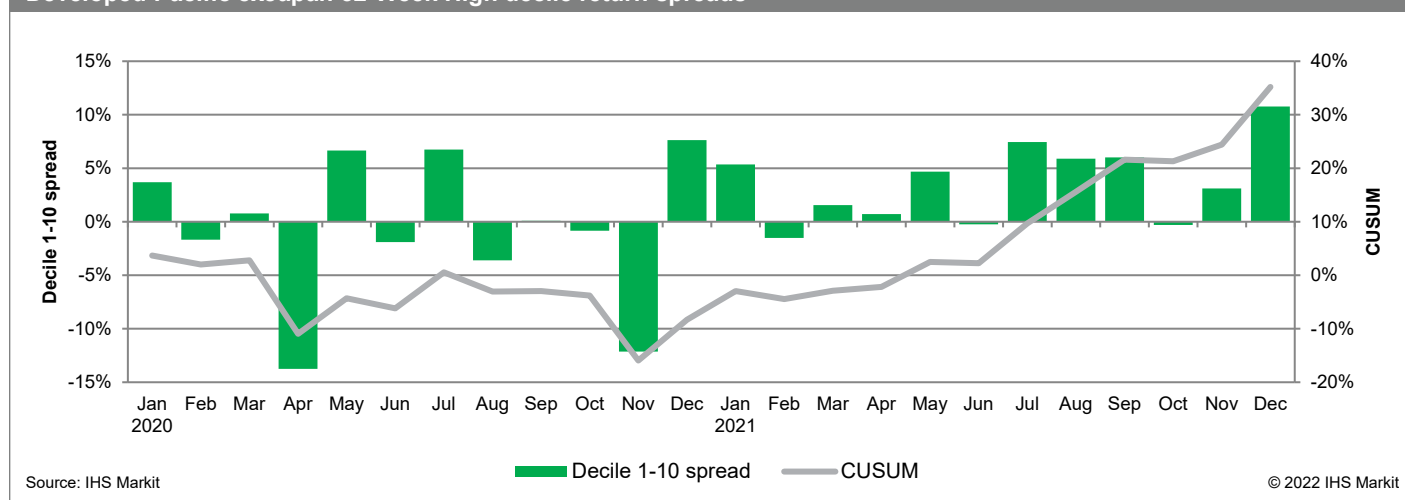
Factor	Decile spread (%)	Factor group
52-Week High	3.62	Price Momentum
60-Day Residual Risk	3.50	Liquidity, Risk & Size
Asset Composition	3.30	Liquidity, Risk & Size
1-Month Realized Stock Return Volatility	3.25	Liquidity, Risk & Size
Utilization	3.11	Short Sentiment
Distress Measure	2.74	Liquidity, Risk & Size
Cash & Equivalents-to-Current Liabilities	2.71	Liquidity, Risk & Size
1-Month Stock Return Interquartile Range	2.69	Liquidity, Risk & Size
Working Capital-to-Total Assets	2.60	Management Quality
CV of Prior 90-Day Closing Prices	2.52	Price Momentum
Demand Supply Ratio	2.42	Short Sentiment
Current Ratio	2.38	Liquidity, Risk & Size
Street Revision Magnitude	2.37	Earnings Momentum
Industry Relative TTM Sales-to-Price	2.34	Relative Value
Time Weighted Earnings Revision Dispersion	2.33	Earnings Momentum

Source: IHS Markit

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Figure 7

Developed Pacific exJapan 52-Week High decile return spreads



Source: IHS Markit

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Table 9

Developed Pacific exJapan bottom average monthly decile return spread factor performance, Jan 2021 - Dec 2021

Factor	Decile spread (%)	Factor group
Attention Span Ratio	-2.82	Management Quality
Net Debt to EBITDA	-2.55	Management Quality
TTM Capital Expenditures-to-Price	-2.13	Deep Value
5-day Industry Relative Return	-2.00	Price Momentum
Debt to Market Cap	-1.80	Liquidity, Risk & Size
60-Month Beta	-1.61	Liquidity, Risk & Size
On Loan Value Concentration	-1.57	Short Sentiment
Market Cap per Analyst	-1.54	Liquidity, Risk & Size
3-yr Compound Annual Sales Growth	-1.39	Historical Growth
Market Volatility Sensitivity	-1.36	Macro

Source: IHS Markit

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Figure 8

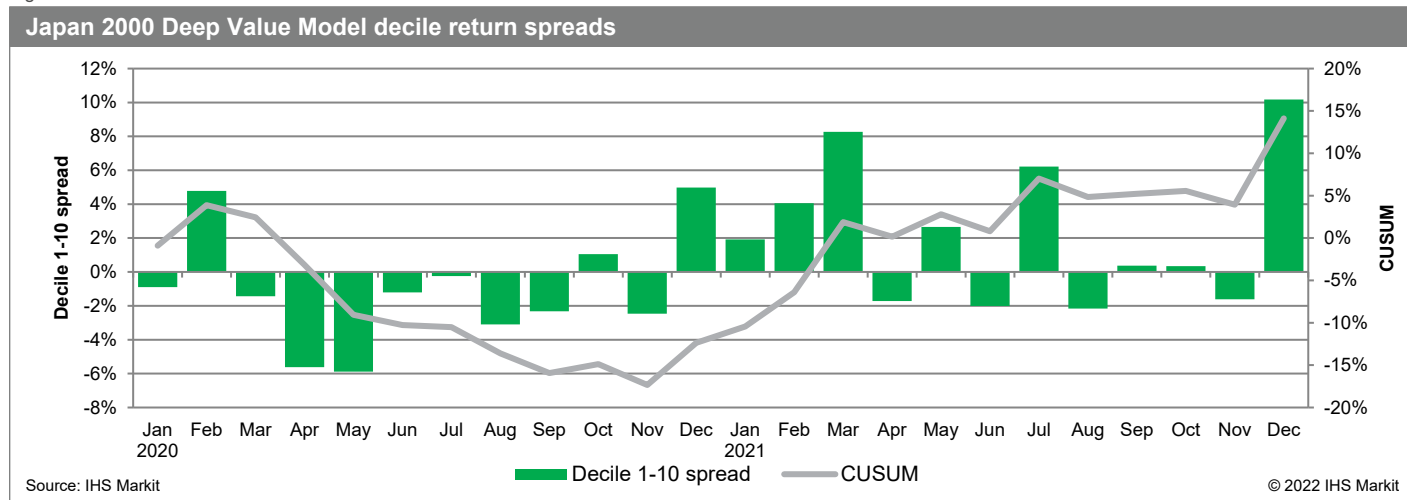


Table 10

Japan Standard Cap top average monthly decile return spread factor performance, Jan 2021 - Dec 2021

Factor	Decile spread (%)	Factor group
Normalized Earnings Yield	2.65	Deep Value
Time Weighted Cash Yield	2.49	Deep Value
Time Weighted Book Yield	2.32	Deep Value
Leading 12 Month Book Yield	2.29	Deep Value
60-Month Alpha	2.23	Price Momentum
Tobin q	2.14	Liquidity, Risk & Size
Price-to-Total Assets	2.13	Deep Value
TTM Dividend Yield	2.12	Deep Value
Time Weighted Earnings Yield	2.11	Deep Value
Natural Logarithm of Total Assets (USD)	2.09	Liquidity, Risk & Size
Book-to-Market	2.05	Deep Value
Net Asset Value to Price	1.94	Deep Value
TTM EBITDA-to-Price	1.94	Deep Value
Leading 12 Month Cash Yield	1.94	Deep Value
Edwards-Bell-Ohlson Value-to-Price	1.88	Deep Value

Source: IHS Markit

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Table 11

Japan Standard Cap bottom average monthly decile return spread factor performance, Jan 2021 - Dec 2021

Factor	Decile spread (%)	Factor group
5-day Industry Relative Return	-1.93	Price Momentum
60-Month Beta	-1.80	Liquidity, Risk & Size
TTM Capital Expenditures-to-Price	-1.69	Deep Value
Std Dev of FY2 EPS Estimates-to-Price	-1.67	Earnings Momentum
Attention Span Ratio	-1.64	Management Quality
Std Dev of FY1 EPS Estimates-to-Price	-1.62	Earnings Momentum
Industry-adjusted 12-month Relative Price Strength	-1.60	Price Momentum
Debt to Market Cap	-1.55	Liquidity, Risk & Size
Demand Value Concentration	-1.34	Short Sentiment
TTM Gross Profit to Assets	-1.33	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 2021. Momentum measures were top contributors last year, including 52-Week High (2.36%), along with 3-M Revision in FY2 EPS Forecasts: Dispersion Relative (2.02%) which outperformed in all but two months in 2021 (Figure 9). The Earnings Momentum Model (0.95%) was also the top performing style model for a second year. Conversely, factors residing at the opposite extreme include a handful of short-term price reversal metrics such as 5-day Industry Relative Return (-1.63%).

Table 12

Emerging Markets top average monthly quintile return spread factor performance, Jan 2021 - Dec 2021

Factor	Decile spread (%)	Factor group
52-Week High	2.36	Price Momentum
1-Year Price Momentum Indicator	2.18	Price Momentum
9-Month Active Return with 1-Month Lag	2.08	Price Momentum
3-M Revision in FY2 EPS Forecasts: Dispersion Relative	2.02	Earnings Momentum
39-Week Return with 4-week Lag	1.97	Price Momentum
Slope of 52 Week Price Trend Line	1.80	Price Momentum
3-M Revision in FY1 EPS Forecasts: Dispersion Relative	1.75	Earnings Momentum
Street Revision Magnitude	1.74	Earnings Momentum
26-Week Relative Price Strength	1.66	Price Momentum
15/36 Week Stock Price Ratio	1.59	Price Momentum
50-200 Day Stock Price Ratio	1.59	Price Momentum
12-Month Active Return with 1-month Lag	1.52	Price Momentum
3-M Revision in FY2 EPS Forecasts	1.51	Earnings Momentum
Slope of 66 Week Price Trend Line	1.49	Price Momentum
Averaged Last 6-M EPS Revisions for FY2	1.49	Earnings Momentum

Source: IHS Markit

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Table 13

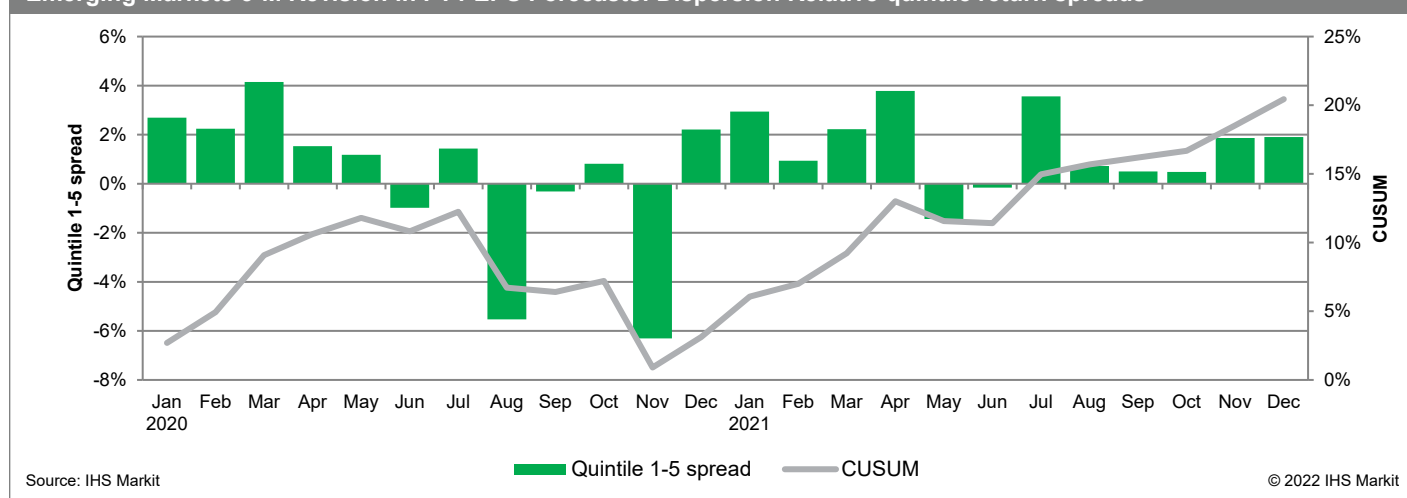
Emerging Markets bottom average monthly quintile return spread factor performance, Jan 2021 - Dec 2021

Factor	Decile spread (%)	Factor group
14 Day Relative Strength Index	-1.82	Price Momentum
5-day Industry Relative Return	-1.63	Price Momentum
Price Above Last 260-day Lowest Trading Price	-1.48	Price Momentum
Natural Logarithm of Closing Price	-1.25	Liquidity, Risk & Size
3-Month Active Return	-1.25	Price Momentum
2-Month Active Return	-1.04	Price Momentum
Market Volatility Sensitivity	-0.97	Macro
5-yr Relative Book-to-Market	-0.93	Relative Value
Net Fixed Assets to Long-term Debt	-0.91	Liquidity, Risk & Size
5-yr Relative TTM Dividend Yield	-0.90	Relative Value

Source: IHS Markit

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Figure 9

Emerging Markets 3-M Revision in FY1 EPS Forecasts: Dispersion Relative quintile return spreads

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