

Momentum Works Everywhere

Across a diverse set of global equities and multiple market capitalizations, we conducted an analysis of 32 distinct long-only factors, including momentum, value, growth, quality, and the market. Notably, momentum demonstrated exceptional performance, surpassing the respective market return in 100% of the samples. Furthermore, momentum consistently yielded the highest excess returns, outperforming other factors in 91% of the samples. Impressively, it also exhibited superior risk-adjusted returns (Sharpe ratio) in 75% of the samples, emphasizing its ability to generate favorable returns with lower associated risk. Additionally, when assessing significance at the 90% level, momentum displayed statistically significant excess returns in 72% of the samples, surpassing all other factors tested in this regard. These findings collectively underscore the robust and reliable performance of momentum as a factor across various market geographies and capitalizations.



*“From there to here, from here to there, momentum works everywhere!”
– Partially attributed to Dr. Suess*

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Summary Statistics

Momentum exhibited superior risk-adjusted returns (Sharpe ratio) in 75% of the samples, emphasizing its ability to generate favorable returns with lower associated risk. Impressively, momentum demonstrated exceptional performance, surpassing the respective market return in 100% of the samples. Furthermore, momentum consistently yielded the highest excess returns, outperforming other factors in 91% of the samples.

Figure 1: Sharpe Ratios

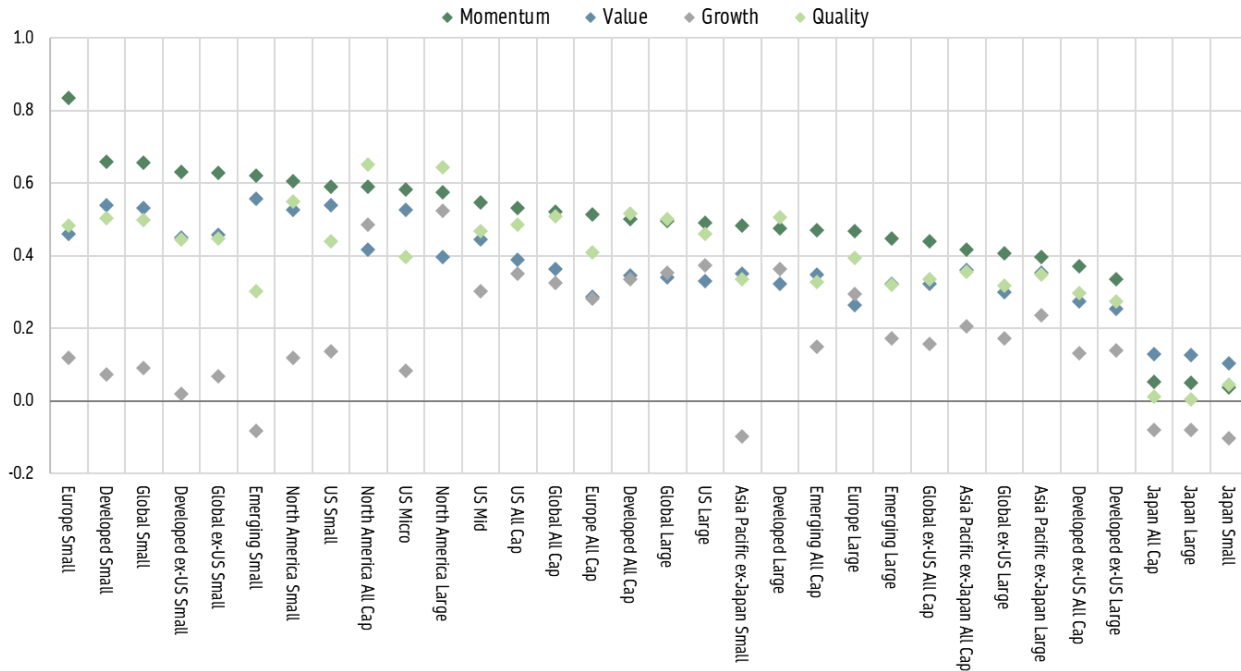
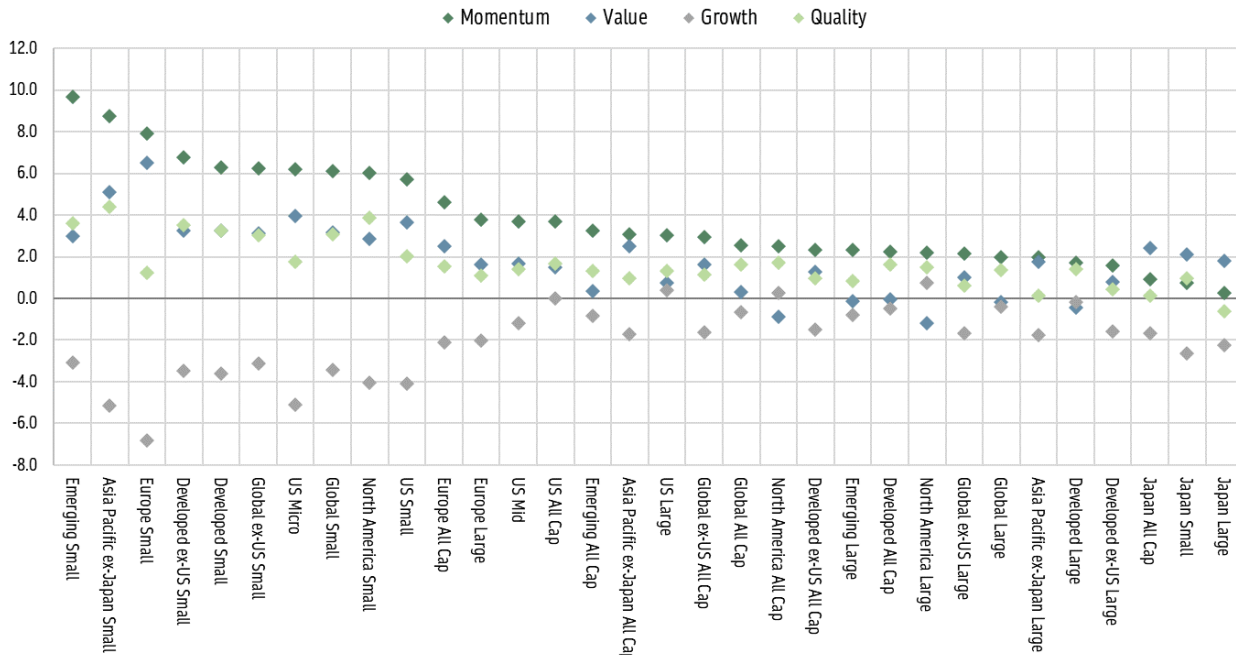
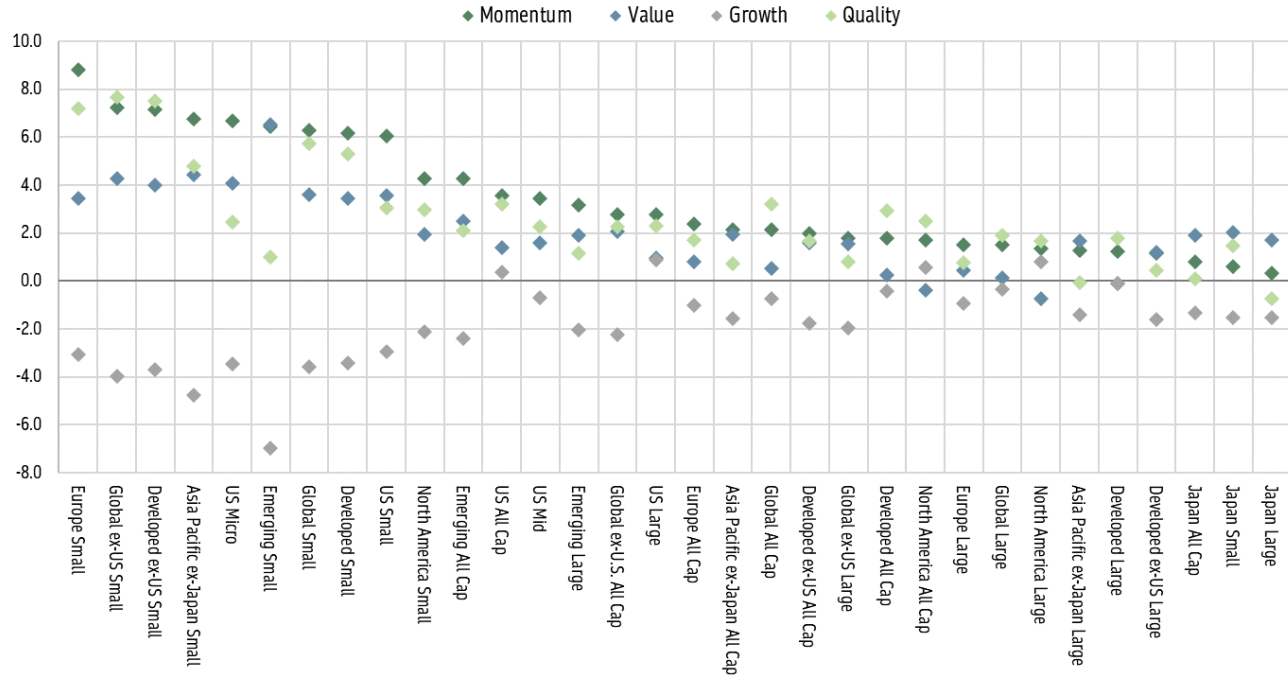


Figure 2: Excess Return to Market



When assessing significance at the 90% level, momentum displayed statistically significant excess returns in 72% of the samples, surpassing all other factors tested in this regard.

Figure 3: Factor Significance, T-Stat (Excess Return)



The following sections provide more detailed analysis of momentum’s performance and risk within global equity markets compared to value, growth, quality, and the market for 32 distinct geographies and size categories. Time periods for this analysis use the full data set available in the Fama-French data library which may vary by geography.

US Equity Markets

Analyzing US data from July of 1963 to August of 2023 (the total data set available to incorporate all factors), we employ quintiles x quintiles for the portfolio sorts. Momentum utilizes the top 20% of prior-year return (excluding the most recent month) rebalanced monthly, while value and growth use the top and bottom book-to-market quintiles, respectively. Quality is determined by the top quintile of operating profitability¹. Aggregation across the quintiles uses average historical market cap weights. The All Cap portfolio uses: Q1 – 2%, Q2 – 3%, Q3 – 6%, Q4 – 12%, and Q5 – 77%. Large Cap is exclusively Q5 – 100%, Mid Cap is Q4 – 100%, Small Cap includes Q1 – 17.5%, Q2 – 29%, Q3 – 53.5%, and Micro Cap comprises of Q1 – 36%, Q2 – 64%.

Summary: Momentum had the highest excess returns, highest risk-adjusted returns, and highest t-stat of excess returns among all the factors tested and throughout market capitalization ranges².

Table 1: Factor Performance, US All Cap

July 1963 – August 2023

	Momentum	Value	Growth	Quality	Market
Return (Annualized)	14.04%	11.85%	10.36%	12.04%	10.37%
Trailing 1-Year Return	18.14%	8.74%	20.41%	20.05%	14.92%
Trailing 3-Year Return (Annualized)	6.11%	21.84%	8.17%	12.02%	9.20%
Trailing 5-Year Return (Annualized)	10.00%	7.97%	13.35%	13.53%	10.19%
Volatility (Annualized)	18.06%	19.03%	16.93%	15.68%	15.50%
Tracking Error (to Market)	8.14%	10.92%	4.67%	3.76%	--
Sharpe Ratio	0.53	0.39	0.35	0.49	0.38
Information Ratio (to Market)	0.45	0.14	0.00	0.45	--
T-Stat (Excess Returns)	3.56	1.40	0.36	3.19	--
Batting Average (Excess Returns)	58%	51%	50%	56%	--

Table 2: Factor Performance, US Large Cap

July 1963 – August 2023

	Momentum	Value	Growth	Quality	Market
Return (Annualized)	13.19%	10.90%	10.51%	11.45%	10.14%
Trailing 1-Year Return	22.33%	11.78%	23.78%	22.39%	17.02%
Trailing 3-Year Return (Annualized)	4.85%	21.75%	9.60%	11.11%	9.84%
Trailing 5-Year Return (Annualized)	10.47%	8.81%	15.35%	14.85%	11.52%
Volatility (Annualized)	17.85%	19.60%	16.27%	15.23%	14.86%
Tracking Error (to Market)	9.12%	12.47%	4.85%	4.19%	--
Sharpe Ratio	0.49	0.33	0.37	0.46	0.38
Information Ratio (to Market)	0.33	0.06	0.08	0.31	--
T-Stat (Excess Returns)	2.77	0.95	0.89	2.31	--
Batting Average (Excess Returns)	57%	51%	51%	54%	--

¹ We use data from Ken French's website:

https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

² Asness (2014) quote on comparing momentum and value within large cap stocks: "Putting it starkly: in-sample, out-of-sample, calculated in Greenwich Connecticut, Chicago, Boston, Palo Alto, Santa Monica, Austin, or in the library with a candlestick, wherever or however you want to look, along any dimension, those who make the claim that momentum fails for large caps, yet being supporters of value investing, are not simply mistaken, they have it backward."

Table 3: Factor Performance, US Mid Cap

July 1963 – August 2023

	Momentum	Value	Growth	Quality	Market
Return (Annualized)	15.43%	13.40%	10.55%	13.16%	11.74%
Trailing 1-Year Return	4.04%	-6.46%	10.63%	10.85%	8.13%
Trailing 3-Year Return (Annualized)	7.00%	17.64%	3.61%	12.10%	9.72%
Trailing 5-Year Return (Annualized)	7.94%	3.21%	8.52%	10.04%	7.77%
Volatility (Annualized)	20.10%	20.21%	20.24%	18.64%	17.66%
Tracking Error (to Market)	8.47%	9.73%	6.71%	4.99%	--
Sharpe Ratio	0.55	0.44	0.30	0.47	0.41
Information Ratio (to Market)	0.43	0.17	-0.18	0.28	--
T-Stat (Excess Returns)	3.43	1.58	-0.70	2.25	--
Batting Average (Excess Returns)	60%	52%	49%	53%	--

Table 4: Factor Performance, US Small Cap

July 1963 – August 2023

	Momentum	Value	Growth	Quality	Market
Return (Annualized)	17.47%	15.40%	7.69%	13.79%	11.77%
Trailing 1-Year Return	5.43%	4.95%	7.69%	12.41%	3.95%
Trailing 3-Year Return (Annualized)	12.79%	26.08%	1.72%	16.75%	10.09%
Trailing 5-Year Return (Annualized)	7.62%	6.67%	3.62%	6.27%	4.50%
Volatility (Annualized)	22.05%	20.39%	23.73%	21.29%	19.66%
Tracking Error (to Market)	7.10%	7.34%	7.54%	5.44%	--
Sharpe Ratio	0.59	0.54	0.14	0.44	0.37
Information Ratio (to Market)	0.80	0.49	-0.54	0.37	--
T-Stat (Excess Returns)	6.04	3.58	-2.93	3.07	--
Batting Average (Excess Returns)	62%	55%	45%	56%	--

Table 5: Factor Performance, US Micro Cap

July 1963 – August 2023

	Momentum	Value	Growth	Quality	Market
Return (Annualized)	17.87%	15.61%	6.55%	13.40%	11.65%
Trailing 1-Year Return	1.42%	3.90%	2.72%	6.51%	-0.04%
Trailing 3-Year Return (Annualized)	14.60%	27.01%	0.28%	16.42%	10.29%
Trailing 5-Year Return (Annualized)	7.42%	8.97%	1.94%	3.42%	3.42%
Volatility (Annualized)	23.10%	21.27%	25.48%	22.55%	20.90%
Tracking Error (to Market)	6.95%	6.84%	8.08%	6.15%	--
Sharpe Ratio	0.58	0.53	0.08	0.40	0.35
Information Ratio (to Market)	0.90	0.58	-0.63	0.28	--
T-Stat (Excess Returns)	6.67	4.08	-3.48	2.45	--
Batting Average (Excess Returns)	63%	55%	44%	57%	--

European Equity Markets

The sample data spans from July 1991 to August 2023. For country grouping portfolios, securities are sorted into large and small cap stocks. Large caps represent the top 90% of market cap for the region, while small caps are in the bottom 10%. Sorting criteria include book-to-market, prior one-year return (excluding the most recent month), and operating profitability. The top 30% of each sorted characteristic forms the value, growth, momentum (rebalanced monthly), and quality portfolios. The Large Cap and Small Cap portfolios are then market cap weighted to create the All Cap portfolio. Refer to table A1 for country grouping constituent definitions.

Summary: Momentum had the highest excess returns, highest risk-adjusted returns, and highest t-stat of excess returns among all the factors tested and throughout market capitalization ranges.

Table 6: Factor Performance, Europe All Cap
July 1991 – August 2023

	Momentum	Value	Growth	Quality	Market
Return (Annualized)	11.01%	8.13%	6.93%	9.08%	7.76%
Trailing 1-Year Return	16.84%	26.28%	18.21%	20.00%	20.67%
Trailing 3-Year Return (Annualized)	3.76%	13.28%	4.39%	7.72%	7.10%
Trailing 5-Year Return (Annualized)	5.56%	4.19%	7.11%	7.04%	4.94%
Volatility (Annualized)	16.83%	20.20%	16.28%	16.41%	17.13%
Tracking Error (to Market)	7.00%	6.49%	5.07%	3.65%	--
Sharpe Ratio	0.51	0.29	0.28	0.41	0.32
Information Ratio (to Market)	0.47	0.06	-0.16	0.36	--
T-Stat (Excess Returns)	2.38	0.81	-1.03	1.71	--
Batting Average (Excess Returns)	59%	53%	44%	55%	--

Table 7: Factor Performance, Europe Large Cap
July 1991 – August 2023

	Momentum	Value	Growth	Quality	Market
Return (Annualized)	10.28%	7.81%	7.14%	8.80%	7.95%
Trailing 1-Year Return	17.18%	27.22%	20.10%	20.96%	22.88%
Trailing 3-Year Return (Annualized)	3.22%	13.29%	5.48%	8.08%	8.50%
Trailing 5-Year Return (Annualized)	5.08%	4.03%	7.81%	7.42%	5.63%
Volatility (Annualized)	16.93%	20.61%	16.22%	16.40%	17.41%
Tracking Error (to Market)	7.71%	6.28%	5.77%	4.50%	--
Sharpe Ratio	0.47	0.26	0.30	0.39	0.32
Information Ratio (to Market)	0.30	-0.02	-0.14	0.19	--
T-Stat (Excess Returns)	1.52	0.44	-0.94	0.77	--
Batting Average (Excess Returns)	55%	53%	46%	54%	--

Table 8: Factor Performance, Europe Small Cap
July 1991 – August 2023

	Momentum	Value	Growth	Quality	Market
Return (Annualized)	17.37%	10.66%	4.61%	11.28%	7.69%
Trailing 1-Year Return	13.57%	17.87%	2.08%	11.40%	8.48%
Trailing 3-Year Return (Annualized)	8.62%	12.87%	-5.29%	4.30%	3.39%
Trailing 5-Year Return (Annualized)	9.64%	5.33%	0.55%	3.31%	2.49%
Volatility (Annualized)	17.99%	18.05%	19.21%	18.50%	17.90%
Tracking Error (to Market)	5.60%	4.53%	4.91%	2.68%	--
Sharpe Ratio	0.83	0.46	0.12	0.48	0.30
Information Ratio (to Market)	1.73	0.66	-0.63	1.34	--
T-Stat (Excess Returns)	8.81	3.46	-3.08	7.22	--
Batting Average (Excess Returns)	75%	56%	43%	68%	--

North American Equity Markets

The sample data spans from July 1991 to August 2023. For country grouping portfolios, securities are sorted into large and small cap stocks. Large caps represent the top 90% of market cap for the region, while small caps are in the bottom 10%. Sorting criteria include book-to-market, prior one-year return (excluding the most recent month), and operating profitability. The top 30% of each sorted characteristic forms the value, growth, momentum, and quality portfolios. The Large Cap and Small Cap portfolios are then market cap weighted to create the All Cap portfolio. Refer to table A1 for country grouping constituent definitions.

Summary: Momentum had the highest excess returns among tested factors throughout market capitalizations. In North America Small Cap, momentum also had the highest t-stat and risk-adjusted returns. However, in North America All Cap and North America Large Cap, quality had a slight edge over momentum with higher t-stats and risk-adjusted returns.

Table 9: Factor Performance, North America All Cap
July 1991 – August 2023

	Momentum	Value	Growth	Quality	Market
Return (Annualized)	12.78%	9.39%	10.53%	11.95%	10.26%
Trailing 1-Year Return	14.58%	3.32%	20.70%	19.98%	14.74%
Trailing 3-Year Return (Annualized)	6.05%	14.99%	7.33%	10.89%	9.83%
Trailing 5-Year Return (Annualized)	9.40%	5.25%	13.43%	13.37%	10.11%
Volatility (Annualized)	17.68%	16.89%	16.86%	14.73%	15.24%
Tracking Error (to Market)	8.82%	7.26%	5.28%	3.31%	--
Sharpe Ratio	0.59	0.42	0.48	0.65	0.52
Information Ratio (to Market)	0.29	-0.12	0.05	0.51	--
T-Stat (Excess Returns)	1.72	-0.40	0.55	2.50	--
Batting Average (Excess Returns)	60%	48%	52%	55%	--

Table 10: Factor Performance, North America Large Cap

July 1991 – August 2023

	Momentum	Value	Growth	Quality	Market
Return (Annualized)	12.44%	9.05%	11.02%	11.74%	10.26%
Trailing 1-Year Return	15.45%	3.21%	22.46%	20.30%	13.46%
Trailing 3-Year Return (Annualized)	5.28%	14.73%	8.27%	10.22%	10.94%
Trailing 5-Year Return (Annualized)	9.48%	5.24%	14.85%	13.97%	10.07%
Volatility (Annualized)	17.54%	16.91%	16.54%	14.58%	15.04%
Tracking Error (to Market)	9.95%	6.07%	6.60%	4.35%	--
Sharpe Ratio	0.57	0.40	0.52	0.64	0.53
Information Ratio (to Market)	0.22	-0.20	0.11	0.34	--
T-Stat (Excess Returns)	1.36	-0.74	0.79	1.65	--
Batting Average (Excess Returns)	59%	48%	53%	54%	--

Table 11: Factor Performance, North America Small Cap

July 1991 – August 2023

	Momentum	Value	Growth	Quality	Market
Return (Annualized)	15.30%	12.10%	5.21%	13.13%	9.25%
Trailing 1-Year Return	6.67%	4.18%	5.24%	16.03%	6.06%
Trailing 3-Year Return (Annualized)	12.58%	17.04%	-1.80%	16.20%	7.56%
Trailing 5-Year Return (Annualized)	7.96%	5.03%	0.49%	6.85%	3.67%
Volatility (Annualized)	21.37%	18.51%	24.02%	19.58%	19.80%
Tracking Error (to Market)	7.62%	6.81%	7.60%	6.68%	--
Sharpe Ratio	0.61	0.53	0.12	0.55	0.35
Information Ratio (to Market)	0.79	0.42	-0.53	0.58	--
T-Stat (Excess Returns)	4.27	1.96	-2.12	2.96	--
Batting Average (Excess Returns)	65%	52%	46%	58%	--

Japanese Equity Markets

The sample data spans from July 1991 to August 2023. For country grouping portfolios, securities are sorted into large and small cap stocks. Large caps represent the top 90% of market cap for the region, while small caps are in the bottom 10%. Sorting criteria include book-to-market, prior one-year return (excluding the most recent month), and operating profitability. The top 30% of each sorted characteristic forms the value, growth, momentum, and quality portfolios. The Large Cap and Small Cap portfolios are then market cap weighted to create the All Cap portfolio. Refer to table A1 for country grouping constituent definitions.

Summary: While momentum did outperform the market based on annualized returns over the data set and throughout market capitalizations, it did so at a low confidence level. Value had the highest excess return, highest risk adjusted returns, and highest t-stat among the factors tested in Japan throughout market capitalizations.

Table 12: Factor Performance, Japan All Cap

July 1991 – August 2023

	Momentum	Value	Growth	Quality	Market
Return (Annualized)	3.37%	4.86%	0.78%	2.58%	2.44%
Trailing 1-Year Return	16.45%	28.47%	7.43%	10.70%	15.43%
Trailing 3-Year Return (Annualized)	1.39%	12.07%	-4.49%	1.25%	3.22%
Trailing 5-Year Return (Annualized)	1.68%	3.69%	1.60%	1.53%	2.73%
Volatility (Annualized)	19.29%	19.62%	19.90%	17.84%	18.19%
Tracking Error (to Market)	7.98%	7.70%	5.54%	4.00%	--
Sharpe Ratio	0.05	0.13	-0.08	0.01	0.00
Information Ratio (to Market)	0.12	0.31	-0.30	0.04	--
T-Stat (Excess Returns)	0.79	1.91	-1.33	0.11	--
Batting Average (Excess Returns)	54%	55%	45%	51%	--

Table 13: Factor Performance, Japan Large Cap

July 1991 – August 2023

	Momentum	Value	Growth	Quality	Market
Return (Annualized)	3.32%	4.84%	0.78%	2.41%	3.04%
Trailing 1-Year Return	16.49%	28.82%	8.41%	11.48%	17.42%
Trailing 3-Year Return (Annualized)	1.75%	12.63%	-3.79%	1.77%	5.04%
Trailing 5-Year Return (Annualized)	2.17%	3.81%	2.37%	1.86%	3.58%
Volatility (Annualized)	19.41%	19.77%	19.82%	17.77%	18.12%
Tracking Error (to Market)	9.08%	6.74%	6.98%	5.25%	--
Sharpe Ratio	0.05	0.13	-0.08	0.00	0.04
Information Ratio (to Market)	0.03	0.27	-0.32	-0.12	--
T-Stat (Excess Returns)	0.32	1.72	-1.52	-0.73	--
Batting Average (Excess Returns)	53%	54%	45%	47%	--

Table 14: Factor Performance, Japan Small Cap

July 1991 – August 2023

	Momentum	Value	Growth	Quality	Market
Return (Annualized)	3.14%	4.51%	-0.21%	3.36%	2.41%
Trailing 1-Year Return	15.91%	25.14%	-1.30%	3.70%	11.57%
Trailing 3-Year Return (Annualized)	-2.11%	6.81%	-10.87%	-3.59%	-0.86%
Trailing 5-Year Return (Annualized)	-2.93%	2.17%	-5.62%	-1.84%	-0.88%
Volatility (Annualized)	21.50%	20.69%	24.79%	22.32%	21.47%
Tracking Error (to Market)	6.64%	5.22%	6.75%	4.23%	--
Sharpe Ratio	0.04	0.10	-0.10	0.05	0.00
Information Ratio (to Market)	0.11	0.40	-0.39	0.22	--
T-Stat (Excess Returns)	0.61	2.02	-1.54	1.48	--
Batting Average (Excess Returns)	55%	54%	45%	53%	--

Asia Pacific ex-Japan Equity Markets

The sample data spans from July 1991 to August 2023. For country grouping portfolios, securities are sorted into large and small cap stocks. Large caps represent the top 90% of market cap for the region, while small caps are in the bottom 10%. Sorting criteria include book-to-market, prior one-year return (excluding the most recent month), and operating profitability. The top 30% of each sorted characteristic forms the value, growth, momentum, and quality portfolios. The Large Cap and Small Cap portfolios are then market cap weighted to create the All Cap portfolio. Refer to table A1 for country grouping constituent definitions.

Summary: Momentum had the highest excess return and risk-adjusted returns (Sharpe ratio) among all factors tested and across market capitalizations in Asia ex-Japan Equity markets. However, in Asia Pacific ex-Japan Large Cap, value had a higher t-stat of excess returns.

Table 15: Factor Performance, Asia Pacific ex-Japan All Cap

July 1991 – August 2023

	Momentum	Value	Growth	Quality	Market
Return (Annualized)	11.31%	10.77%	6.53%	9.21%	8.25%
Trailing 1-Year Return	-0.40%	-1.08%	-3.87%	2.78%	-0.33%
Trailing 3-Year Return (Annualized)	0.96%	8.10%	-4.37%	1.92%	2.77%
Trailing 5-Year Return (Annualized)	2.88%	2.25%	0.73%	5.63%	1.65%
Volatility (Annualized)	21.49%	23.30%	20.45%	19.33%	20.12%
Tracking Error (to Market)	8.23%	8.54%	5.51%	5.93%	--
Sharpe Ratio	0.42	0.36	0.20	0.35	0.29
Information Ratio (to Market)	0.37	0.30	-0.31	0.16	--
T-Stat (Excess Returns)	2.15	1.95	-1.56	0.71	--
Batting Average (Excess Returns)	60%	53%	45%	49%	--

Table 16: Factor Performance, Asia Pacific ex-Japan Large Cap

July 1991 – August 2023

	Momentum	Value	Growth	Quality	Market
Return (Annualized)	10.93%	10.73%	7.20%	9.11%	8.96%
Trailing 1-Year Return	0.25%	-0.49%	-2.12%	3.83%	0.53%
Trailing 3-Year Return (Annualized)	0.09%	8.36%	-4.16%	1.81%	3.71%
Trailing 5-Year Return (Annualized)	2.21%	2.44%	1.22%	5.98%	2.28%
Volatility (Annualized)	21.59%	23.74%	20.44%	19.36%	20.55%
Tracking Error (to Market)	9.20%	7.64%	6.62%	7.37%	--
Sharpe Ratio	0.40	0.35	0.24	0.35	0.32
Information Ratio (to Market)	0.21	0.23	-0.27	0.02	--
T-Stat (Excess Returns)	1.26	1.67	-1.40	-0.07	--
Batting Average (Excess Returns)	58%	51%	46%	49%	--

Table 17: Factor Performance, Asia Pacific ex-Japan Small Cap
July 1991 – August 2023

	Momentum	Value	Growth	Quality	Market
Return (Annualized)	13.94%	10.31%	0.04%	9.57%	5.19%
Trailing 1-Year Return	-6.44%	-6.42%	-18.69%	-6.48%	-12.71%
Trailing 3-Year Return (Annualized)	8.55%	5.38%	-6.80%	2.62%	-0.80%
Trailing 5-Year Return (Annualized)	8.40%	0.15%	-4.16%	2.14%	-2.22%
Volatility (Annualized)	23.93%	22.59%	23.49%	21.55%	22.17%
Tracking Error (to Market)	7.13%	6.17%	5.57%	4.67%	--
Sharpe Ratio	0.48	0.35	-0.10	0.33	0.13
Information Ratio (to Market)	1.23	0.83	-0.92	0.94	--
T-Stat (Excess Returns)	6.76	4.43	-4.78	4.79	--
Batting Average (Excess Returns)	68%	62%	39%	63%	--

Developed Equity Markets

The sample data spans from July 1991 to August 2023. For country grouping portfolios, securities are sorted into large and small cap stocks. Large caps represent the top 90% of market cap for the region, while small caps are in the bottom 10%. Sorting criteria include book-to-market, prior one-year return (excluding the most recent month), and operating profitability. The top 30% of each sorted characteristic forms the value, growth, momentum, and quality portfolios. The Large Cap and Small Cap portfolios are then market cap weighted to create the All Cap portfolio. Refer to table A1 for country grouping constituent definitions.

Summary: Momentum had the highest excess returns among tested factors throughout market capitalizations. However, quality exhibited slightly higher risk-adjusted returns and t-stats of excess returns in Developed All Cap and Large Cap. Still, momentum had the highest risk-adjusted returns and t-stats in Developed Small Cap.

Table 18: Factor Performance, Developed All Cap
July 1991 – August 2023

	Momentum	Value	Growth	Quality	Market
Return (Annualized)	10.33%	8.07%	7.62%	9.74%	8.10%
Trailing 1-Year Return	15.04%	10.72%	18.55%	18.32%	15.40%
Trailing 3-Year Return (Annualized)	4.11%	14.16%	5.21%	9.11%	8.34%
Trailing 5-Year Return (Annualized)	7.14%	4.61%	10.30%	10.66%	7.76%
Volatility (Annualized)	15.95%	16.56%	15.71%	14.29%	14.97%
Tracking Error (to Market)	6.98%	5.85%	4.48%	2.71%	--
Sharpe Ratio	0.50	0.35	0.33	0.52	0.38
Information Ratio (to Market)	0.32	0.00	-0.11	0.60	--
T-Stat (Excess Returns)	1.80	0.23	-0.42	2.95	--
Batting Average (Excess Returns)	59%	51%	49%	56%	--

Table 19: Factor Performance, Developed Large Cap

July 1991 – August 2023

	Momentum	Value	Growth	Quality	Market
Return (Annualized)	9.94%	7.77%	8.01%	9.60%	8.20%
Trailing 1-Year Return	15.75%	10.72%	20.76%	19.22%	15.31%
Trailing 3-Year Return (Annualized)	3.65%	14.28%	6.33%	9.37%	9.62%
Trailing 5-Year Return (Annualized)	7.22%	4.67%	11.50%	11.46%	7.95%
Volatility (Annualized)	15.98%	16.84%	15.60%	14.28%	15.05%
Tracking Error (to Market)	7.86%	5.16%	5.53%	3.69%	--
Sharpe Ratio	0.47	0.32	0.36	0.51	0.39
Information Ratio (to Market)	0.22	-0.08	-0.03	0.38	--
T-Stat (Excess Returns)	1.26	-0.12	-0.10	1.80	--
Batting Average (Excess Returns)	59%	50%	50%	54%	--

Table 20: Factor Performance, Developed Small Cap

July 1991 – August 2023

	Momentum	Value	Growth	Quality	Market
Return (Annualized)	13.66%	10.59%	3.73%	10.62%	7.35%
Trailing 1-Year Return	8.66%	10.54%	-0.26%	10.04%	5.26%
Trailing 3-Year Return (Annualized)	8.03%	12.84%	-4.84%	6.37%	3.85%
Trailing 5-Year Return (Annualized)	6.17%	3.95%	-0.38%	3.21%	1.78%
Volatility (Annualized)	17.16%	15.29%	18.90%	16.37%	16.40%
Tracking Error (to Market)	5.41%	4.65%	4.96%	3.23%	--
Sharpe Ratio	0.66	0.54	0.07	0.50	0.30
Information Ratio (to Market)	1.17	0.70	-0.73	1.01	--
T-Stat (Excess Returns)	6.18	3.43	-3.42	5.29	--
Batting Average (Excess Returns)	67%	56%	41%	65%	--

Developed ex-US Equity Markets

The sample data spans from July 1991 to August 2023. For country grouping portfolios, securities are sorted into large and small cap stocks. Large caps represent the top 90% of market cap for the region, while small caps are in the bottom 10%. Sorting criteria include book-to-market, prior one-year return (excluding the most recent month), and operating profitability. The top 30% of each sorted characteristic forms the value, growth, momentum, and quality portfolios. The Large Cap and Small Cap portfolios are then market cap weighted to create the All Cap portfolio. Refer to table A1 for country grouping constituent definitions.

Summary: Momentum had the highest excess returns and risk-adjusted returns (Sharpe ratio) among tested factors throughout market capitalizations. However, value had a slightly higher t-stat in Developed ex-US Large Cap, while quality had a slightly higher t-stat in Developed ex-US Small Cap.

Table 21: Factor Performance, Developed ex-US All Cap

July 1991 – August 2023

	Momentum	Value	Growth	Quality	Market
Return (Annualized)	8.34%	7.28%	4.49%	6.98%	6.00%
Trailing 1-Year Return	14.08%	21.72%	13.44%	15.35%	15.49%
Trailing 3-Year Return (Annualized)	3.11%	13.89%	1.13%	5.76%	5.93%
Trailing 5-Year Return (Annualized)	4.75%	4.84%	5.00%	5.56%	4.24%
Volatility (Annualized)	16.12%	17.93%	16.35%	15.63%	16.07%
Tracking Error (to Market)	6.29%	5.49%	4.53%	2.87%	--
Sharpe Ratio	0.37	0.27	0.13	0.30	0.23
Information Ratio (to Market)	0.37	0.23	-0.33	0.34	--
T-Stat (Excess Returns)	1.98	1.58	-1.75	1.69	--
Batting Average (Excess Returns)	56%	55%	48%	55%	--

Table 22: Factor Performance, Developed ex-US Large Cap

July 1991 – August 2023

	Momentum	Value	Growth	Quality	Market
Return (Annualized)	7.81%	7.01%	4.65%	6.65%	6.23%
Trailing 1-Year Return	14.73%	22.67%	15.54%	16.66%	17.72%
Trailing 3-Year Return (Annualized)	2.70%	14.32%	2.04%	6.14%	7.59%
Trailing 5-Year Return (Annualized)	4.58%	4.94%	5.80%	5.95%	5.08%
Volatility (Annualized)	16.24%	18.37%	16.35%	15.73%	16.35%
Tracking Error (to Market)	7.08%	5.14%	5.32%	3.69%	--
Sharpe Ratio	0.34	0.25	0.14	0.27	0.24
Information Ratio (to Market)	0.22	0.15	-0.30	0.11	--
T-Stat (Excess Returns)	1.17	1.20	-1.61	0.45	--
Batting Average (Excess Returns)	55%	54%	48%	51%	--

Table 23: Factor Performance, Developed ex-US Small Cap

July 1991 – August 2023

	Momentum	Value	Growth	Quality	Market
Return (Annualized)	12.92%	9.42%	2.69%	9.69%	6.16%
Trailing 1-Year Return	8.33%	13.24%	-4.12%	4.01%	4.03%
Trailing 3-Year Return (Annualized)	6.72%	9.81%	-6.90%	2.29%	1.59%
Trailing 5-Year Return (Annualized)	6.08%	3.63%	-2.20%	1.93%	0.74%
Volatility (Annualized)	16.76%	15.67%	18.30%	16.47%	16.28%
Tracking Error (to Market)	4.99%	4.15%	4.57%	2.51%	--
Sharpe Ratio	0.63	0.45	0.02	0.45	0.23
Information Ratio (to Market)	1.35	0.79	-0.76	1.40	--
T-Stat (Excess Returns)	7.15	4.00	-3.69	7.50	--
Batting Average (Excess Returns)	69%	56%	42%	68%	--

Emerging Markets Equity

The sample data spans from July 1991 to August 2023. For country grouping portfolios, securities are sorted into large and small cap stocks. Large caps represent the top 90% of market cap for the region, while small caps are in the bottom 10%. Sorting criteria include book-to-market, prior one-year return (excluding the most recent month), and operating profitability. The top 30% of each sorted characteristic forms the value, growth, momentum, and quality portfolios. The Large Cap and Small Cap portfolios are then market cap weighted to create the All Cap portfolio.

Summary: Momentum had the highest excess returns and risk-adjusted returns (Sharpe ratio) among factors tested across market capitalizations. However, value had a slightly higher t-stat in Emerging Markets Small Cap.

Table 24: Factor Performance, Emerging Markets All Cap
July 1991 – August 2023

	Momentum	Value	Growth	Quality	Market
Return (Annualized)	12.13%	10.04%	5.41%	9.08%	7.53%
Trailing 1-Year Return	4.26%	9.30%	-1.50%	6.67%	4.71%
Trailing 3-Year Return (Annualized)	5.00%	11.84%	-5.74%	3.17%	2.05%
Trailing 5-Year Return (Annualized)	7.78%	5.02%	1.26%	4.49%	2.76%
Volatility (Annualized)	20.73%	22.12%	20.44%	20.49%	20.73%
Tracking Error (to Market)	5.62%	5.89%	4.87%	3.70%	--
Sharpe Ratio	0.47	0.35	0.15	0.33	0.25
Information Ratio (to Market)	0.82	0.43	-0.44	0.42	--
T-Stat (Excess Returns)	4.26	2.52	-2.41	2.11	--
Batting Average (Excess Returns)	61%	55%	43%	54%	--

Table 25: Factor Performance, Emerging Markets Large Cap
July 1991 – August 2023

	Momentum	Value	Growth	Quality	Market
Return (Annualized)	11.72%	9.57%	5.90%	9.04%	7.93%
Trailing 1-Year Return	3.27%	9.11%	-1.62%	6.59%	5.02%
Trailing 3-Year Return (Annualized)	3.91%	11.45%	-5.90%	2.81%	3.12%
Trailing 5-Year Return (Annualized)	7.27%	4.47%	1.85%	4.54%	2.91%
Volatility (Annualized)	20.95%	22.44%	20.58%	20.83%	21.04%
Tracking Error (to Market)	6.20%	5.39%	5.62%	4.73%	--
Sharpe Ratio	0.45	0.32	0.17	0.32	0.27
Information Ratio (to Market)	0.61	0.30	-0.36	0.23	--
T-Stat (Excess Returns)	3.16	1.91	-2.03	1.16	--
Batting Average (Excess Returns)	60%	54%	46%	52%	--

Table 26: Factor Performance, Emerging Markets Small Cap
July 1991 – August 2023

	Momentum	Value	Growth	Quality	Market
Return (Annualized)	15.32%	13.94%	0.59%	8.66%	7.42%
Trailing 1-Year Return	13.50%	10.93%	-0.76%	7.04%	6.63%
Trailing 3-Year Return (Annualized)	14.99%	15.27%	-4.65%	6.10%	4.83%
Trailing 5-Year Return (Annualized)	12.14%	9.91%	-4.31%	3.64%	2.78%
Volatility (Annualized)	20.92%	20.80%	21.45%	20.80%	20.44%
Tracking Error (to Market)	6.35%	5.21%	5.18%	7.12%	--
Sharpe Ratio	0.62	0.56	-0.08	0.30	0.25
Information Ratio (to Market)	1.24	1.25	-1.32	0.17	--
T-Stat (Excess Returns)	6.47	6.52	-6.96	0.98	--
Batting Average (Excess Returns)	71%	69%	31%	56%	--

Global Equity

We construct the Global portfolios as weighted averages of the corresponding developed portfolio and emerging markets portfolio. The Global portfolios use 88% weight on developed and a 12% weight on emerging markets³.

Summary: Momentum had the highest excess returns among all factors tested and throughout market capitalizations. In addition, momentum exhibited the highest risk-adjusted returns (Sharpe ratio) in Global All Cap and in Global Small Cap, while quality was essentially tied with momentum in Global Large Cap. As far as t-stats, quality wins in Global All Cap and Large Cap, while momentum wins in Global Small Cap.

Table 27: Factor Performance, Global All Cap
July 1991 – August 2023

	Momentum	Value	Growth	Quality	Market
Return (Annualized)	10.66%	8.42%	7.46%	9.76%	8.13%
Trailing 1-Year Return	13.76%	10.63%	16.11%	16.98%	14.14%
Trailing 3-Year Return (Annualized)	4.28%	13.94%	3.99%	8.48%	7.63%
Trailing 5-Year Return (Annualized)	7.29%	4.71%	9.30%	10.00%	7.22%
Volatility (Annualized)	15.94%	16.69%	15.72%	14.53%	15.19%
Tracking Error (to Market)	6.49%	5.52%	4.18%	2.50%	--
Sharpe Ratio	0.52	0.36	0.32	0.51	0.38
Information Ratio (to Market)	0.39	0.05	-0.16	0.65	--
T-Stat (Excess Returns)	2.14	0.54	-0.73	3.19	--
Batting Average (Excess Returns)	60%	49%	48%	58%	--

³ For the Global Small and Global ex-US Small we use the emerging markets all portfolio rather than the emerging markets small portfolio due to market cap comparisons.

Table 28: Factor Performance, Global Large Cap

July 1991 – August 2023

	Momentum	Value	Growth	Quality	Market
Return (Annualized)	10.27%	8.11%	7.87%	9.65%	8.27%
Trailing 1-Year Return	14.26%	10.61%	18.03%	17.77%	14.11%
Trailing 3-Year Return (Annualized)	3.76%	14.00%	4.96%	8.69%	8.89%
Trailing 5-Year Return (Annualized)	7.31%	4.70%	10.44%	10.72%	7.39%
Volatility (Annualized)	15.98%	16.94%	15.60%	14.52%	15.28%
Tracking Error (to Market)	7.31%	4.87%	5.17%	3.44%	--
Sharpe Ratio	0.50	0.34	0.35	0.50	0.39
Information Ratio (to Market)	0.27	-0.03	-0.08	0.40	--
T-Stat (Excess Returns)	1.51	0.14	-0.36	1.89	--
Batting Average (Excess Returns)	60%	49%	49%	55%	--

Table 29: Factor Performance, Global Small Cap

July 1991 – August 2023

	Momentum	Value	Growth	Quality	Market
Return (Annualized)	13.58%	10.64%	4.02%	10.53%	7.46%
Trailing 1-Year Return	8.17%	10.44%	-0.32%	9.71%	5.25%
Trailing 3-Year Return (Annualized)	7.72%	12.76%	-4.84%	6.06%	3.68%
Trailing 5-Year Return (Annualized)	6.43%	4.12%	-0.07%	3.46%	1.96%
Volatility (Annualized)	17.09%	15.61%	18.61%	16.37%	16.48%
Tracking Error (to Market)	5.13%	4.40%	4.58%	2.80%	--
Sharpe Ratio	0.66	0.53	0.09	0.50	0.31
Information Ratio (to Market)	1.19	0.72	-0.75	1.10	--
T-Stat (Excess Returns)	6.29	3.59	-3.56	5.72	--
Batting Average (Excess Returns)	68%	58%	42%	65%	--

Global ex-US Equity

We construct the Global portfolios as weighted averages of the corresponding developed portfolio and emerging markets portfolio. Global ex-US portfolios use a weight of 75% on developed ex-US and 25% weight to emerging markets.

Summary: Momentum had the highest annualized excess returns and risk-adjusted returns (Sharpe ratio) among all factors tested and throughout market capitalizations. However, quality had a slightly higher t-stat of excess returns in Global ex-US Small Cap.

Table 30: Factor Performance, Global ex-US All Cap

July 1991 – August 2023

	Momentum	Value	Growth	Quality	Market
Return (Annualized)	9.48%	8.18%	4.91%	7.69%	6.55%
Trailing 1-Year Return	11.62%	18.60%	9.67%	13.23%	12.78%
Trailing 3-Year Return (Annualized)	3.69%	13.47%	-0.43%	5.24%	5.04%
Trailing 5-Year Return (Annualized)	5.61%	4.96%	4.23%	5.43%	3.95%
Volatility (Annualized)	16.25%	17.99%	16.39%	15.91%	16.38%
Tracking Error (to Market)	5.49%	4.94%	3.97%	2.49%	--
Sharpe Ratio	0.44	0.32	0.16	0.34	0.26
Information Ratio (to Market)	0.53	0.33	-0.41	0.46	--
T-Stat (Excess Returns)	2.79	2.07	-2.23	2.25	--
Batting Average (Excess Returns)	61%	54%	45%	55%	--

Table 31: Factor Performance, Global ex-US Large Cap

July 1991 – August 2023

	Momentum	Value	Growth	Quality	Market
Return (Annualized)	8.99%	7.87%	5.16%	7.45%	6.84%
Trailing 1-Year Return	11.84%	19.25%	11.18%	14.19%	14.50%
Trailing 3-Year Return (Annualized)	3.12%	13.69%	0.22%	5.44%	6.55%
Trailing 5-Year Return (Annualized)	5.37%	4.91%	4.99%	5.74%	4.62%
Volatility (Annualized)	16.34%	18.36%	16.36%	16.02%	16.64%
Tracking Error (to Market)	6.16%	4.60%	4.71%	3.26%	--
Sharpe Ratio	0.41	0.30	0.17	0.32	0.27
Information Ratio (to Market)	0.35	0.22	-0.36	0.19	--
T-Stat (Excess Returns)	1.80	1.56	-1.97	0.80	--
Batting Average (Excess Returns)	59%	53%	45%	53%	--

Table 32: Factor Performance, Global ex-US Small Cap
July 1991 – August 2023

	Momentum	Value	Growth	Quality	Market
Return (Annualized)	12.92%	9.80%	3.54%	9.73%	6.68%
Trailing 1-Year Return	7.36%	12.29%	-3.36%	4.77%	4.26%
Trailing 3-Year Return (Annualized)	6.39%	10.37%	-6.44%	2.63%	1.78%
Trailing 5-Year Return (Annualized)	6.62%	4.04%	-1.16%	2.72%	1.33%
Volatility (Annualized)	16.79%	16.28%	17.91%	16.49%	16.53%
Tracking Error (to Market)	4.52%	3.79%	3.91%	2.09%	-
Sharpe Ratio	0.63	0.46	0.07	0.45	0.26
Information Ratio (to Market)	1.38	0.82	-0.80	1.46	-
T-Stat (Excess Returns)	7.24	4.27	-3.98	7.68	-
Batting Average (Excess Returns)	69%	59%	42%	67%	-

Appendix: Definitions and Significance

Table A1: Country Groupings

	Developed	Developed ex-US	Europe	Japan	Asia Pacific ex-Japan	North America
Australia	x	x			x	
Austria	x	x	x			
Belgium	x	x	x			
Canada	x	x				x
Switzerland	x	x	x			
Germany	x	x	x			
Denmark	x	x	x			
Spain	x	x	x			
Finland	x	x	x			
France	x	x	x			
Great Britain	x	x	x			
Greece	x	x	x			
Hong Kong	x	x			x	
Ireland	x	x	x			
Italy	x	x	x			
Japan	x	x		x		
Netherlands	x	x	x			
Norway	x	x	x			
New Zealand	x	x			x	
Portugal	x	x	x			
Sweden	x	x	x			
Singapore	x	x			x	
United States	x					x

The emerging markets countries currently include Brazil, Chile, China, Colombia, Czech Republic, Egypt, Greece, Hungary, India, Indonesia, Malaysia, Mexico, Pakistan, Peru, Philippines, Poland, Qatar, Saudi Arabia, South Africa, South Korea, Taiwan, Thailand, Turkey, United Arab Emirates.

In Table A2, we label (in bold) the highest t-statistic for each region and cap range. In terms of significance at the 90% level: Momentum's excess returns are significant in 23 of the 32 (72%) test cases. Quality is close behind with 69% of test cases indicating significance. Value comes next at 56%, with growth being either statistically indistinguishable from zero or having significant negative excess returns in all the test cases. In terms of the horse race, momentum wins 56% of the time, while quality and value win 25% and 19% of the time, respectively.

Table A2: Statistical Significance Across Geographic and Market Cap Ranges

	T-Stat (Excess Returns)			
United States	Momentum	Value	Growth	Quality
US All Cap	3.56	1.40	0.36	3.19
US Large	2.77	0.95	0.89	2.31
US Mid	3.43	1.58	-0.70	2.25
US Small	6.04	3.58	-2.93	3.07
US Micro	6.67	4.08	-3.48	2.45
Global				
Global All Cap	2.14	0.54	-0.73	3.19
Global Large	1.51	0.14	-0.36	1.89
Global Small	6.29	3.59	-3.56	5.72
Global ex-US				
Global ex-US All Cap	2.79	2.07	-2.23	2.25
Global ex-US Large	1.80	1.56	-1.97	0.80
Global ex-US Small	7.24	4.27	-3.98	7.68
Developed				
Developed All Cap	1.80	0.23	-0.42	2.95
Developed Large	1.26	-0.12	-0.10	1.80
Developed Small	6.18	3.43	-3.42	5.29
Developed ex-US				
Developed ex-US All Cap	1.98	1.58	-1.75	1.69
Developed ex-US Large	1.17	1.20	-1.61	0.45
Developed ex-US Small	7.15	4.00	-3.69	7.50
Emerging Markets				
Emerging All Cap	4.26	2.52	-2.41	2.11
Emerging Large	3.16	1.91	-2.03	1.16
Emerging Small	6.47	6.52	-6.96	0.98
Asia Pacific ex-Japan				
Asia Pacific ex-Japan All Cap	2.15	1.95	-1.56	0.71
Asia Pacific ex-Japan Large	1.26	1.67	-1.40	-0.07
Asia Pacific ex-Japan Small	6.76	4.43	-4.78	4.79
Japan				
Japan All Cap	0.79	1.91	-1.33	0.11
Japan Large	0.32	1.72	-1.52	-0.73
Japan Small	0.61	2.02	-1.54	1.48
Europe				
Europe All Cap	2.38	0.81	-1.03	1.71
Europe Small	8.81	3.46	-3.08	7.22
Europe Large	1.52	0.44	-0.94	0.77
North America				
North America All Cap	1.72	-0.40	0.55	2.50
North America Large	1.36	-0.74	0.79	1.65
North America Small	4.27	1.96	-2.12	2.96

Table A3 shows the annualized excess return and Sharpe ratio for momentum across all 32 sample regions and market caps. Momentum exhibits positive excess return in all cases and on a risk-adjusted Sharpe ratio basis is very competitive outside of Japan.

Table A3: Excess Returns and Sharpe Ratios for Momentum

	Momentum Annualized Excess Return (to Market)	Sharpe Ratio
Europe Small	9.68%	0.83
Europe Large	2.34%	0.47
Europe All	3.25%	0.51
North America Small	6.05%	0.61
North America Large	2.18%	0.57
North America All	2.52%	0.59
Japan Small	0.73%	0.04
Japan Large	0.28%	0.05
Japan All	0.93%	0.05
Asia Pacific ex-Japan Small	8.74%	0.48
Asia Pacific ex-Japan Large	1.97%	0.40
Asia Pacific ex-Japan All	3.07%	0.42
Developed Small	6.31%	0.66
Developed Large	1.73%	0.47
Developed All	2.24%	0.50
Developed ex-US Small	6.76%	0.63
Developed ex-US Large	1.57%	0.34
Developed ex-US All	2.34%	0.37
Emerging Markets Small	7.90%	0.62
Emerging Markets Large	3.79%	0.45
Emerging Markets All	4.60%	0.47
Global Small	6.12%	0.66
Global Large	2.00%	0.50
Global All	2.54%	0.52
Global ex-US Small	6.24%	0.63
Global ex-US Large	2.15%	0.41
Global ex-US All	2.93%	0.44
US Micro	6.22%	0.58
US Small	5.70%	0.59
US Mid	3.68%	0.55
US Large	3.05%	0.49
US All	3.68%	0.53

About EAM

EAM Investors is solely focused on delivering alpha for clients in global equity markets. A momentum-driven approach to investing leverages their collective insight within a systematic process designed to deliver consistent and predictable outcomes. EAM's Informed Momentum® investment process has been applied consistently across all strategies since inception of the firm in 2007.

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Important Disclosures

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The U.S. Dollar is the currency used to express performance.

Fama-French returns referenced in this document are calculated using monthly data from Ken French’s website:
https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html