1992 Called. It Wants Its Style (Box) Back

Challenging the traditional style box with momentum

Momentum and value (along with quality) represent some of the most significant premia in equity markets (see Momentum: The Ever-Rising Tide). Furthermore, momentum and value display a long-term negative correlation (see Momentum Is *Usually* Not Value) which suggests a beneficial pairing for diversifying one's portfolio. So, why is momentum excluded from the traditional style box? While it may be that a similar diversifying effect exists when pairing growth and value, we find that this traditional pairing is sub-optimal to the momentum and value pairing. Further, by examining 'growth' performance cycles, we find that momentum can capture a large share of the upside while preserving capital better on the downside. Therefore, we find that momentum is a worthy complement - or outright substitute - to growth approaches given its long-term positive correlation and superior historical performance, suggesting a better construct than the 'traditional' style box.

Travis Prentice
Chief Investment Officer
Portfolio Manager

David Wroblewski
Director of Applied Research

The Style Box and Portfolio Construction

In 1992, Morningstar introduced the Style Box[1], a three-by-three grid, aiming to deliver a framework that would ultimately improve multi-portfolio construction through an easily interpreted visual representation of an underlying portfolio's characteristics. Size and style, represented by market capitalization and valuation, were the basis for the grid with a portfolio's weighted-average market capitalization determining its classification as large, mid, or small. Conversely, two representative valuation frameworks determine a portfolio's style as value, growth, or somewhere in between – otherwise known as blend. The premise of the Style Box was simple – complementary boxes can be combined in any fashion to improve investment outcomes at an expected level of risk – and the potential for a properly diversified portfolio of portfolios is realized. The aforementioned potential, however, shows remarkable room for improvement. If the goal is to improve outcomes at the total fund level, then the introduction of another style cannot be ignored.

Factor Model Evidence for the Inclusion of Momentum

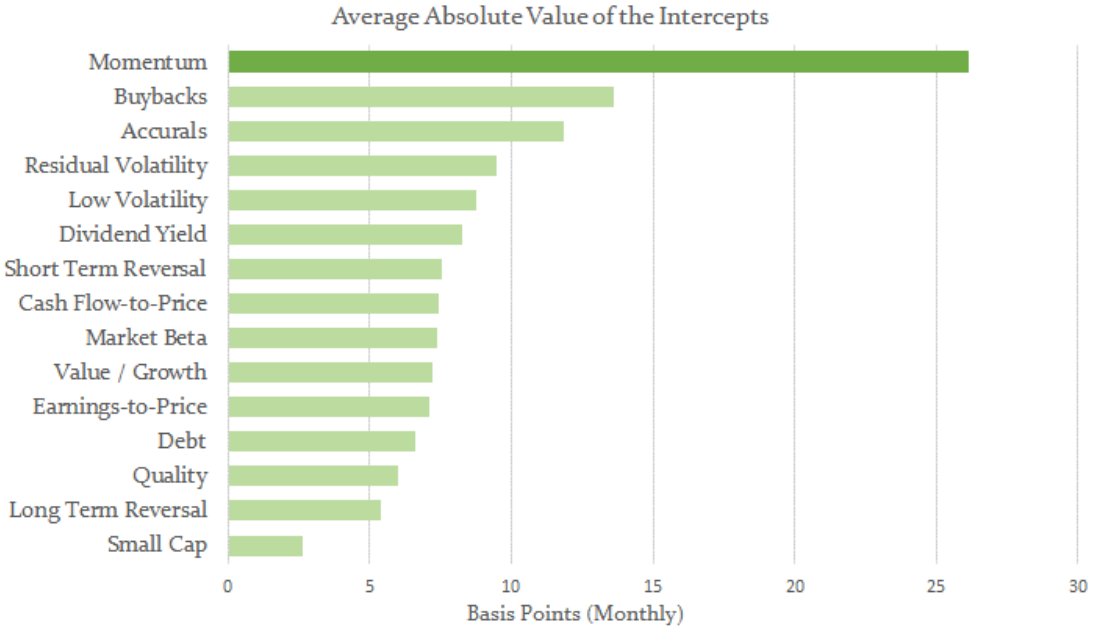
The current gold-standard for factor models is the Fama and French (2015) five-factor model (FF-5). This model proposes to explain stock returns according to market, size, value/growth, operating profitability, and investment factors. FF-5 is so intertwined with the world of finance that it provides the foundation of the standard style box asset allocation framework.

To test the ability of the FF-5 and the style box framework to explain stock returns, we consider a US equity universe of stocks and test fifteen sets of ten decile portfolio returns arising from famous stock pricing anomalies. For each anomaly, we separately regress each of the ten decile returns (in excess of the risk-free rate) onto the FF-5 and then compute the average over the absolute value of the ten intercepts. These measures represent the error involved in the FF-5's ability to explain each anomaly.

Figure 1 displays the average absolute pricing errors. Notice that momentum gives the FF-5 model the greatest challenge with 26 basis points per month of error. This large error means that if an investor only uses the FF-5 as a basis for their investments, they lose out on the additional 26 basis points per month that momentum provides above the FF-5 factor returns. See Appendix A1 for more statistics relating to these same regressions.

[1] Fama and French (1992) also contributed to the proliferation of the use of the Style Box in "The Cross-Section of Expected Stock Returns", The Journal of Finance, 47, 427-465. (1992). Pg. 451: "Our main result is that two easily measured variables, size, and book-to-market equity seem to describe the cross-section of average stock returns."

Figure 1: Pricing Errors for Stock Pricing Anomalies
July 1963 – December 2022



Further Evidence for Momentum's Inclusion

Using Fama-French data[2] spanning the time-period of January 1927 through December 2022, we construct US long-only, market cap-weighted, top quintile portfolios for momentum, value, and growth. The momentum sorts are based on the trailing 1-year return excluding the most recent month, while the value (growth) sorts are based on (top/bottom) book-to-market ratios. The market portfolio is cap-weighted and consists of all available U.S. stocks.

We also consider a similar analysis with a universe of global ex-us stocks. Using Fama-French data, the momentum portfolio returns are formed from the weighted-average of the following: top quintile prior return stocks intersected with each of the five size quintiles. The returns are cap-weighted, and the weights used across the five intersection quintiles are the historical average of market cap weights for the size quintiles (Q1-3%, Q2-4%, Q3-6%, Q4-12%, Q5-75%). The value portfolio is constructed analogously with the replacement of top quintile prior returns with top quintile book-to-market. The market portfolio is also constructed with these same size quintile market cap weights. We construct the returns for global developed ex-US and then separately for emerging markets and combine the two using 75% global developed ex-US and 25% emerging markets aggregation weights. Note that for emerging markets, we use the top 30% of momentum and value (due to data limitations) intersected with both a large cap and a small cap set of stocks representing the entire EM universe. We then use the approximate cap-weighted historical average of 90% large cap and 10% small cap for the EM portfolio returns.

[2] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

Figure 2 displays the long-term growth of momentum, value, growth, and the market in US equities. In terms of single-factor alpha satellites, momentum is the leader by far. Alone, this dynamic is a good reason for the inclusion of momentum in a portfolio. Interestingly, the growth strategy trails the market portfolio over this 96-year period, providing a basis to question growth's inclusion in an investor's portfolio[3]. Figure 2.1 shows a similar result for a global ex-US universe of stocks.

Figure 2: Growth of the Strategies (US)
January 1927 – December 2022

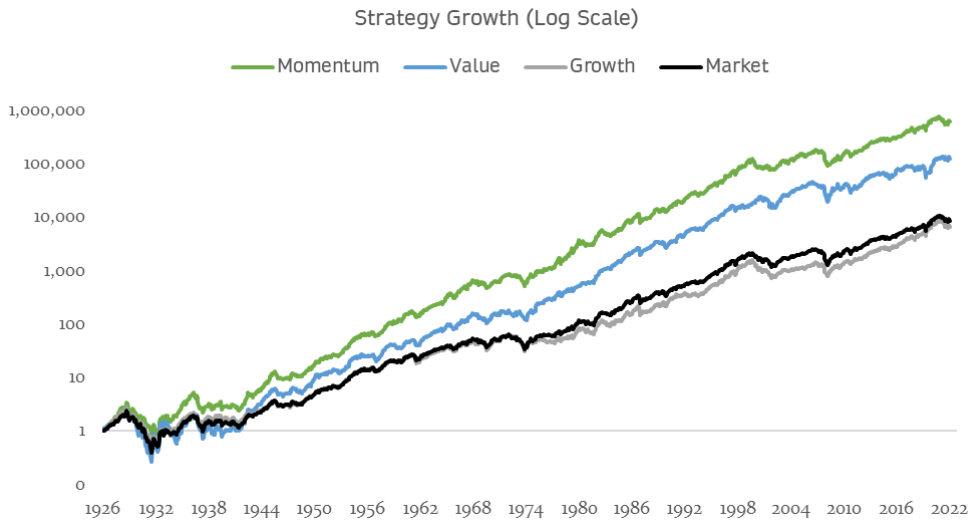
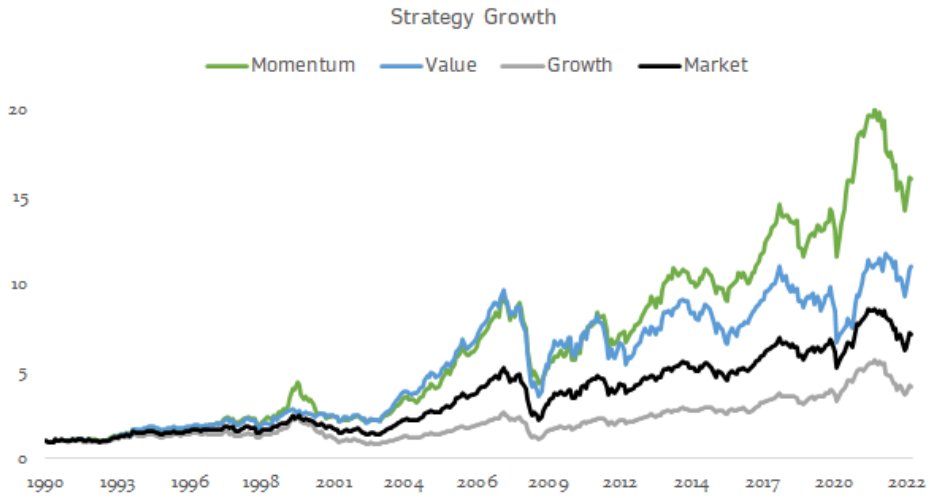


Figure 2.1: Growth of the Strategies (Global ex-US)
November 1990– December 2022



[3] The growth portfolio defined as the bottom quintile book-to-market ratio stocks produces very similar results to those obtained by using the Russell 3000 Growth Index as well as the MSCI ACWI ex-US Growth Index (see Appendix A2).

Further, Table 1 provides several measures of performance and risk statistics associated with momentum, value, and growth in US equity markets. As shown, both momentum and value outperform the market by about 5% and 3% annualized, respectively. Growth, however, trails the market by over 30 basis points annualized! We note that growth does exhibit a lower tracking error than that of momentum or value. However, the risk-adjusted statistics for both momentum and value are superior to that of growth. In addition, momentum outperforms the market in 60% of the sample months and has an impressive t-statistic (for excess returns) of 5.61, all superior to value or growth.

Similarly, Table 1.1 displays analogous results in the global ex-US universe with both momentum and value outperforming the market while growth again trails. Momentum again provides statistically significant positive excess returns.

Table 1: Strategy Statistics (US)

January 1927 – December 2022

	Momentum	Value	Growth	Market
Return (Annualized)	**14.86%**	12.98%	9.55%	9.87%
Trailing 1-Year Return	-13.35%	**-2.67%**	-27.76%	-20.18%
Trailing 3-Year Return (Annualized)	6.82%	**10.75%**	8.27%	6.97%
Trailing 5-Year Return (Annualized)	10.05%	7.12%	**11.83%**	8.65%
Volatility (Annualized)	20.25%	27.83%	**18.90%**	18.55%
Tracking Error (to Market)	8.47%	14.38%	**4.72%**	--
Sharpe Ratio	**0.57**	0.35	0.33	0.36
Information Ratio (to Market)	**0.59**	0.22	-0.07	--
T-Stat (Excess Returns)	**5.61**	3.23	-0.44	--
Batting Average (Excess Returns)	**60%**	52%	50%	--

Table 1.1: Strategy Statistics (Global ex-US)

November 1990– December 2022

	Momentum	Value	Growth	Market
Return (Annualized)	**8.99%**	7.71%	4.47%	6.28%
Trailing 1-Year Return	-17.03%	**-3.13%**	-24.88%	-15.67%
Trailing 3-Year Return (Annualized)	**4.05%**	3.83%	1.28%	1.35%
Trailing 5-Year Return (Annualized)	**3.43%**	1.33%	3.07%	1.58%
Volatility (Annualized)	16.82%	19.00%	**16.78%**	16.46%
Tracking Error (to Market)	6.62%	6.13%	**4.72%**	--
Sharpe Ratio	**0.39**	0.28	0.12	0.24
Information Ratio (to Market)	**0.41**	0.23	-0.38	--
T-Stat (Excess Returns)	**2.23**	1.68	-2.01	--
Batting Average (Excess Returns)	**59%**	54%	46%	--

Portfolios are calculated using data from Ken French's website: https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.
The Market portfolio return represents the cap-weighted entire universe of stocks returns. Please see Important Disclosures at the end of this document.

Moreover, Figure 3 and Figure 3.1 plot the three-year excess returns for momentum and growth relative to the market portfolio. As can be seen from the chart, momentum spends much more time with a positive excess return. As important, momentum over most periods can outperform the market or hold in better during significant growth downdrafts. This dynamic provides evidence for momentum being a worthy complement for growth as it looks to provide a bit of a ballast in times of growth performance tumult.

Figure 3: Three-Year Excess Returns (US)

January 1927 – December 2022

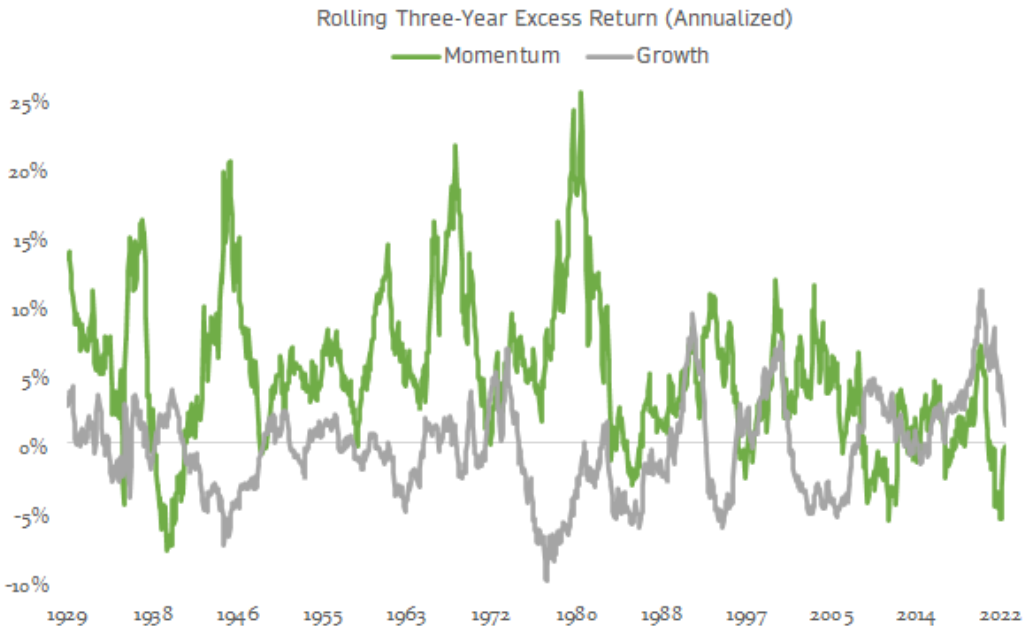


Figure 3.1: Three-Year Excess Returns (Global ex-US)

November 1990– December 2022

Momentum as a Substitute for Growth

As we know from our previous research (see Momentum Is Not Growth), momentum and growth are positively correlated on average over the long term. This dynamic, in and of itself, provides the basic foundation for an exploration of momentum as substitute for growth. However, if an asset allocator were to change from growth to momentum in their portfolios, what can they assume will happen during extreme tail events with respect to the distribution of growth's excess returns? Consider the five best calendar year excess returns for growth historically in US equity markets: 2020, 1998, 1991, 1969, and 1927. These five years yielded excess returns to the market in the range of +12.3% to +17.6% with an average yearly excess return of +15.29%. During those same years, momentum had excess returns ranging from +3.2% to +20.1% with an average yearly excess return of +12.1%. Impressively, momentum had an average upside capture of 79.3% in the best five years for growth on record. Figure 4 shows this upside capture graphically.

In the global ex-US universe, this upside capture is even more pronounced. The five best calendar year excess returns for growth historically (2020, 2019, 2015, 2011, and 1999) yielded excess returns to the market in the range of +5.0% to +22.5% with an average yearly excess return of +11.3%. During those same years, momentum had excess returns ranging from +0.9% to +34.3% with an average yearly excess return of +11.2%. Impressively, momentum had an average upside capture of 99.6% in the best five years for growth on record. Figure 4.1 shows this upside capture graphically[1].

Figure 4: Top Five Calendar Year Excess Returns for Growth (US)
January 1927 – December 2022

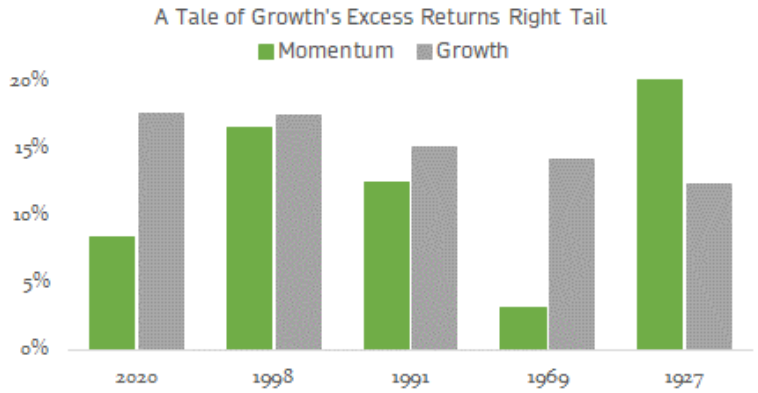
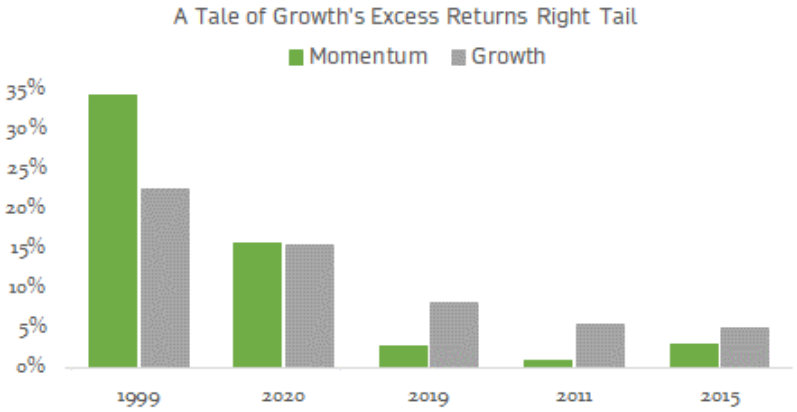


Figure 4.1: Top Five Calendar Year Excess Returns for Growth (Global ex-US)
November 1990– December 2022



On the other hand, consider the five worst calendar years for growth based on excess returns, which in the US were 1933, 1993, 1976, 1970, and 1943. These five years yielded negative excess returns for growth in the range of -17.7% to -10.4% with an average of -12.9%. However, during the same five years, momentum's excess return was between -6.9% and +17.8% with an average excess return of +7.9%. Therefore, during the worst years for growth, momentum not only avoided capturing growth's downside, but also outperformed the market (by a significant amount).

Similarly, in the global ex-US universe, the five worst calendar years for growth based on excess returns were 2022, 2006, 2003, 2001, and 2000. These five years yielded negative excess returns for growth in the range of -15.2% to -8.5% with an average of -10.6%. However, during the same five years, momentum's excess return was between -15.8% and +3.9% with an average excess return of -3.0%. Therefore, during the worst years for growth, momentum captured only 29% growth's downside.

The swapping of growth for momentum allows one to capture most (nearly 80% in the US, and nearly 100% in global ex-US) of the upside during growth's best calendar years but not participate as much (or at all) in growth's largest downdrafts. Figure 5 and Figure 5.1 show this graphically.

Figure 5: Bottom Five Calendar Year Excess Returns for Growth (US)

January 1927 – December 2022

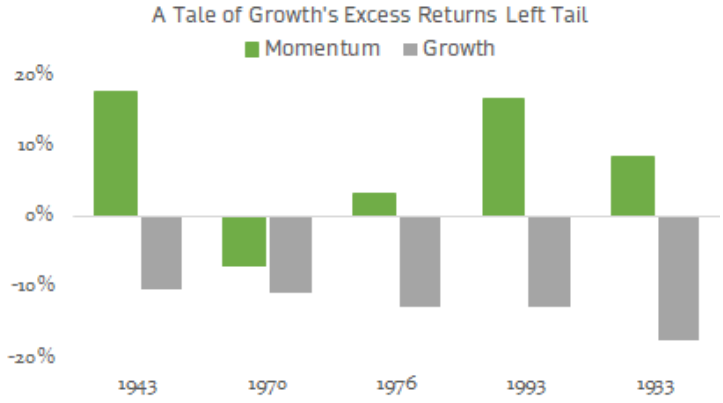
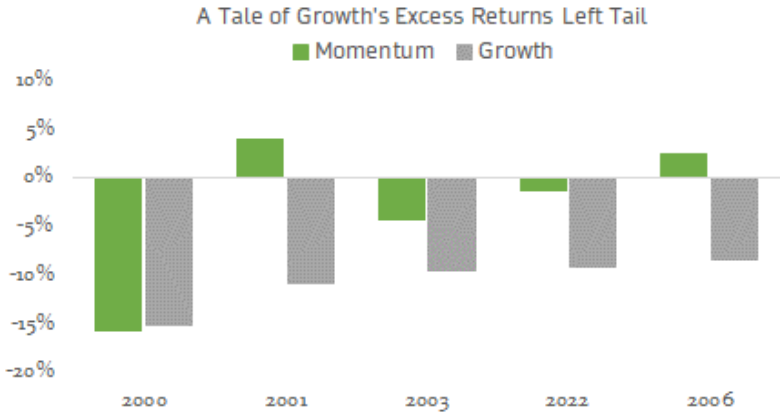


Figure 5.1: Bottom Five Calendar Year Excess Returns for Growth (Global ex-US)

November 1990– December 2022



Further, growth as a strategy tends to experience consecutive years of negative excess returns. Since 1927, there have been five periods in which growth trailed the market on a calendar year basis for three or more years in a row in US equity markets. In fact, two of these negative runs for growth lasted seven years! For momentum, a three-calendar year run of negative excess returns only occurred once during the sample (in the late 1930s). Figure 6 shows the average calendar year excess returns during these negative growth runs (indexed by the final year of the run) for both growth and momentum. The average of the five extended growth runs is -4.60%. Momentum, on the other hand, had a positive calendar year excess return average in four out of the five runs, averaging 6.30% of excess return over these five runs, and had a higher average excess return than growth in all five runs. This lack of downside capture for momentum relative to growth is what allows for momentum to cutoff deep valleys of growth underperformance.

With respect to the global ex-US portfolios, there is only one period of a negative growth run that lasted for three or more consecutive calendar years (a six-year run ending in 2006). Figure 6.1 shows the average calendar year excess returns during this negative growth run for both growth and momentum. The average yearly excess return during the growth run was -8.64%. Momentum, on the other hand, had a positive calendar year average excess return of +1.63% during the same period.

Taken together, momentum's ability to capture most (nearly 80% on average in the US and nearly 100% in global ex-US) of growth's best calendar years, while not participating as much (or at all) in growth's worst calendar years, and not suffering as many consecutive calendar years of underperformance, provides further evidence for momentum as a credible substitute for growth.

Figure 6: Growth's Underperformance Runs (US)

January 1927 – December 2022

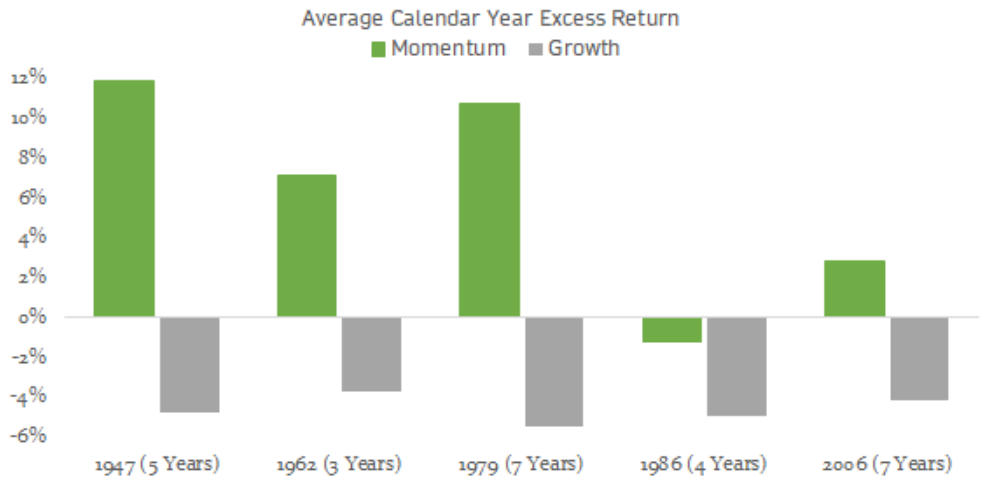
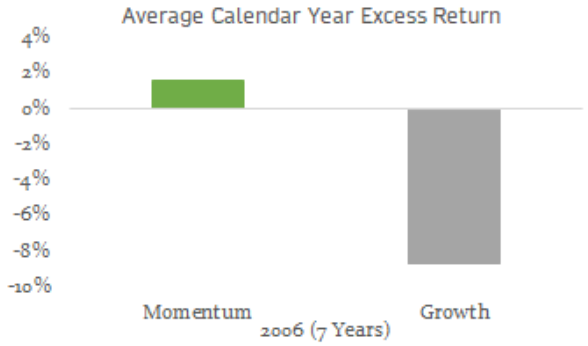


Figure 6.1: Growth's Underperformance Runs (Global ex-US)

November 1990– December 2022



Momentum with Value

In the traditional style box setting, asset allocators typically choose portfolio combinations related to market capitalization (size) and value/growth strategies. The idea being that, partitioning the market in this way, one can diversify one's holdings while gaining exposure to all areas of the market. Intuitively, this makes sense if each partitioning strategy, independently, displays a premium above and beyond the market return. However, for the typical growth strategy, this is simply not the case. Gaining exposure to premia that pay in a diversified manner is a more robust strategy compared to the traditional style box setting.

Consider Table 2 and Figure 7 which shows momentum (M), growth (G), and value (V) combination portfolios in US equity markets. V+M denotes the 50/50 split between value and momentum, V+G represents a 50/50 split between value and growth, and V+G+M denotes a 50/25/25 split of value, growth, and momentum, respectively. As can be seen from the table, the V+M portfolio has the highest annualized return, highest Sharpe ratio, highest information ratio, best batting average and highest t-stat. Moreover, notice that the V+G portfolio does outperform the market but is far inferior to the V+M portfolio on almost every metric (V+G does have a lower tracking error). If one must include growth in a portfolio, momentum is clearly a worthy complement. In the V+G+M portfolio, the addition of momentum at a 25% weight increases the V+G annualized return by 135 basis points, increases the Sharpe ratio, information ratio, and batting average while increasing the t-stat. In any scenario, momentum should be added to one's portfolio to improve risk-adjusted returns over the traditional style box construction (V+G).

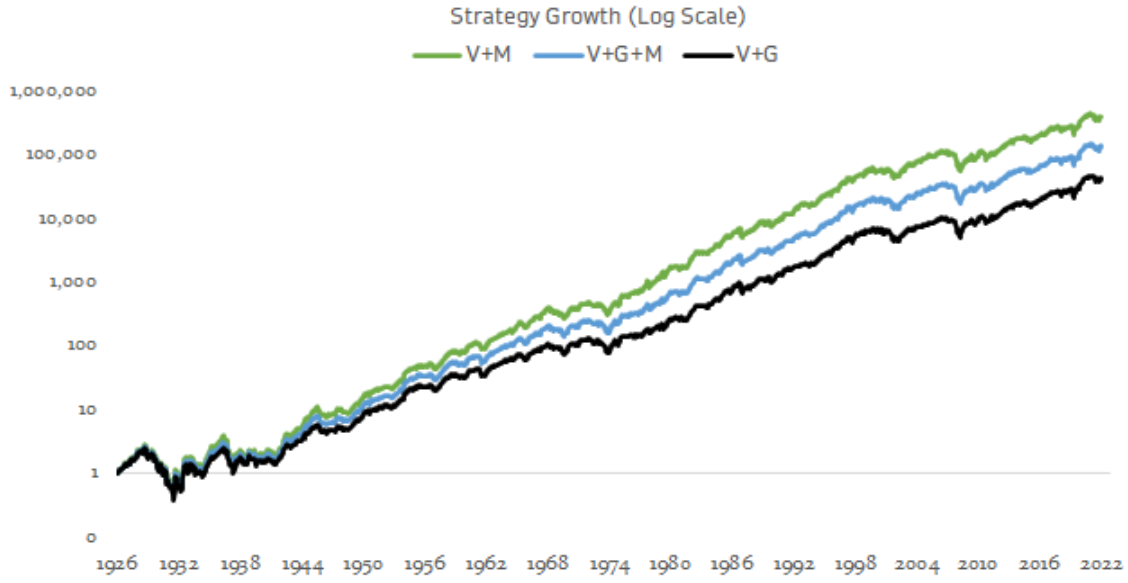
Table 2: Combination Strategy Statistics (US)

January 1927 – December 2022

	V+M	V+G+M	V+G	Market
Return (Annualized)	**14.30%**	12.98%	11.63%	9.87%
Trailing 1-Year Return	**-7.75%**	-11.74%	-15.65%	-20.18%
Trailing 3-Year Return (Annualized)	9.50%	9.97%	10.37%	6.97%
Trailing 5-Year Return (Annualized)	9.11%	9.60%	10.04%	8.65%
Volatility (Annualized)	22.64%	22.25%	22.10%	18.55%
Tracking Error (to Market)	7.71%	6.56%	6.08%	--
Sharpe Ratio	**0.49**	0.44	0.38	0.36
Information Ratio (to Market)	**0.57**	0.47	0.29	--
T-Stat (Excess Returns)	**6.09**	5.26	3.64	--
Batting Average (Excess Returns)	**58%**	57%	53%	--

Portfolios are calculated using data from Ken French's website: https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.
The Market portfolio return represents the cap-weighted entire universe of stocks returns. V+M is an equal weighted momentum and value portfolio.
V+G is an equal weighted value and growth portfolio. V+G+M represents 50% weight on value and 25% on each of growth and momentum.
Please see Important Disclosures at the end of this document.

Figure 7: Growth of the Combination Strategies (US)
January 1927 – December 2022



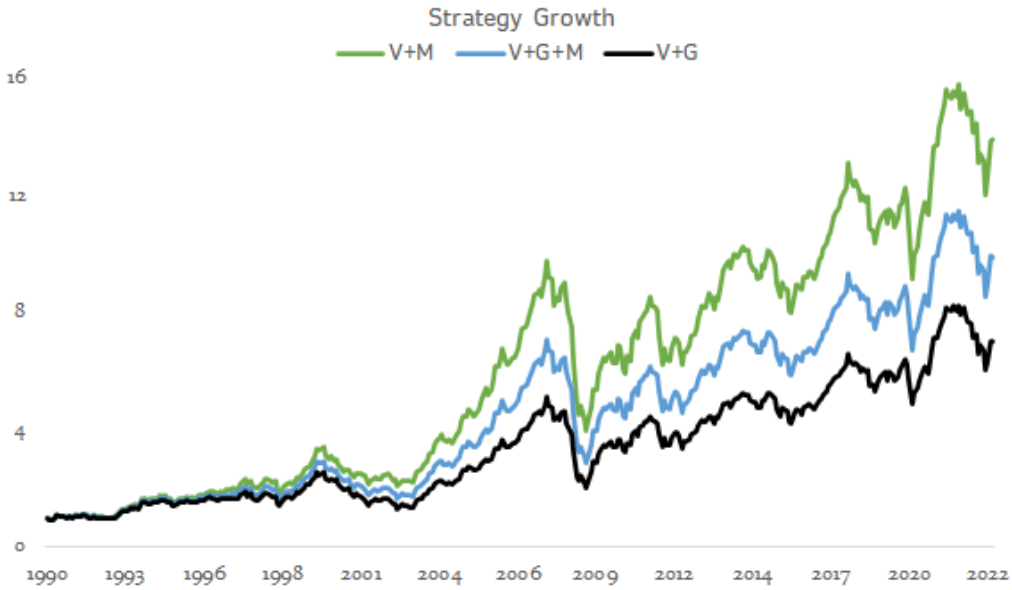
Similarly, Table 2.1 and the following Figure 7.1 show the combination portfolios for global ex-US. Again, adding momentum to value, or to a value/growth strategy boosts the excess return and t-statistic significantly while also increasing the Sharpe and information ratios.

Table 2.1: Combination Strategy Statistics (Global ex-US)
November 1990– December 2022

	V+M	V+G+M	V+G	Market
Return (Annualized)	**8.51%**	7.37%	6.22%	6.28%
Trailing 1-Year Return	**-10.15%**	-12.25%	-14.35%	-15.67%
Trailing 3-Year Return (Annualized)	**4.22%**	3.58%	2.92%	1.35%
Trailing 5-Year Return (Annualized)	**2.58%**	2.53%	2.46%	1.58%
Volatility (Annualized)	17.10%	**17.06%**	17.19%	16.46%
Tracking Error (to Market)	3.35%	2.22%	**2.07%**	--
Sharpe Ratio	**0.36**	0.29	0.22	0.24
Information Ratio (to Market)	**0.66**	0.49	-0.03	--
T-Stat (Excess Returns)	**3.73**	2.91	0.19	--
Batting Average (Excess Returns)	**59%**	56%	50%	--

Portfolios are calculated using data from Ken French's website: https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html. The Market portfolio return represents the cap-weighted entire universe of stocks returns. V+M is an equal weighted momentum and value portfolio. V+G is an equal weighted value and growth portfolio. V+G+M represents 50% weight on value and 25% on each of growth and momentum. Please see Important Disclosures at the end of this document.

Figure 7.1: Growth of the Combination Strategies (Global ex-US)
November 1990– December 2022



Conclusion

Through our analysis, we find momentum to be a worthy addition to any investor's diversified portfolio as a stand-alone alpha source, as a diversifier to value exposure, or as a substitute or complement to traditional growth. Along with their positive correlations over the long term, momentum's ability to capture most of growth's best calendar years while limiting the participation in growth's downdrafts provides substantial evidence of a worthy substitution for traditional growth in a portfolio. Moreover, we find that value and momentum are a better pair than value and growth on almost every metric. In any case, adding momentum to a value and growth portfolio has provided better outcomes than that of value and growth alone. To wit, we find that momentum should be included outside or inside any "style box."

Appendix A1: Spanning Tests

The study of Linear Algebra involves matrices and their numerous applications. One of these applications relates to factor models and asset pricing theory. Factor models allow one to reduce the dimensionality of the vector space of stock returns. Rather than consider all stock returns and their covariances with each other separately, one can choose to represent each return series as a linear combination of a prescribed set of factor returns. Upon doing so, all stock return information is then contained in the factor return information. If the factor model is "good" at approximating the set of all stock returns, then the factor returns should be close to a basis in the linear algebra sense. This means that the factor returns span the return space and do so without redundancy. Spanning means that the linear combination of factor returns exists for all stock returns, while without redundancy means that there is no linear dependence amongst the set of factors. In practice, this is a daunting task for a finite set of factors with the model error represented in both the intercept and residual terms.

We use the current state-of-the-art model, the Fama and French (2015) five-factor model and test the spanning ability. To test this, we use test portfolio returns for the fifteen sets of anomaly decile returns, four sets of 5x5 portfolio returns, and two sets of industry partition returns. The data is from Ken French's website[4]. We use the longest possible over-lapping time-period in which the return data for all anomalies, factors, and test portfolios exists (July 1963 – December 2022). If the factor model perfectly spanned these test portfolios, we would have zero residuals and zero intercepts for all of the test portfolio regressions – at least with respect to a statistical hypothesis test. The gold-standard test for this setup is based on the *F*-test and is due to Gibbons, Ross, and Shanken (1989) (GRS-test). The null hypothesis for the GRS-test is that all the intercepts (pricing error) for a set of test portfolio regressions against the factor model are simultaneously zero: $H_0 : \alpha_i = 0; \; i = 1, 2, 3, \ldots, N.$ Rejection of the null, in this case, means that the model fails to span the test portfolios. We show in Table A1.1, for each decile anomaly and partition, the average over the absolute value of the intercepts (lower is preferred), the average of the adjusted *R*-squared statistic (higher is better), the GRS-test statistic (lower is preferred) along with the associated *p*-value (larger is preferred). We also show the intercept (and associated t-stat) from a separate regression of the top – bottom decile returns onto the Fama-French five-factor model (a lower intercept is preferred).

[4] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

Table A1.1: Spanning Tests for Stock Pricing Anomalies

July 1963 – December 2022

Decile Anomaly	Average Abs. of Intercepts (bps)	Average Adj. R^2 (%)	GRS-Statistic	P-Value	Top - Bottom: Alpha (bps)	T-Stat
Small Cap	3	96	1.26	0.251	1	0.21
Value / Growth	7	91	1.20	0.288	-12	-1.37
Momentum	**26**	**81**	**4.32**	**0.000**	**138**	**5.24**
Quality	6	92	1.79	0.059	0	-0.01
Debt	7	91	2.57	**0.005**	4	0.49
Earnings-to-Price	7	88	1.59	0.107	-10	-0.88
Cash Flow-to-Price	7	88	1.48	0.141	-18	-1.53
Dividend Yield	8	84	2.07	**0.025**	-3	-0.20
Short Term Reversal	8	86	1.01	0.432	14	0.67
Long Term Reversal	5	87	0.90	0.530	-13	-0.87
Accurals	12	88	3.76	**0.000**	41	3.83
Buybacks	**14**	87	**4.46**	**0.000**	29	3.08
Market Beta	7	87	1.91	0.041	-9	-0.59
Low Volatility	9	88	2.65	**0.004**	47	2.84
Residual Volatility	9	90	4.25	**0.000**	56	4.00
Partitions						
Industries - SIC (10)	16	70	3.88	0.000		
Industries - SIC (47)	**50**	**59**	**4.06**	0.000		
Momentum x Size (5 x 5)	**27**	86	**4.48**	0.000		
B/M x Size (5 x 5)	8	92	3.03	0.000		
OP x Size (5 x 5)	6	92	2.04	0.002		
Investments x Size (5 x 5)	8	93	3.27	0.000		

Appendix A2: Comparison of the Growth Measures

The definition used to create the top quintile growth portfolios uses solely the book-to-market ratio measure. One natural question is if a more complicated growth stock definition changes the results in a material way? We find the answer to be "not particularly". For comparison, consider the Russell 3000 Growth Index which is based on stocks with not only relatively higher price-to-book ratios, but also higher I/B/E/S forecast medium term (2 year) growth and higher sales per share historical growth (5 years). Figure A2.1 shows the profits of the Russell 3000 Growth Index along with the growth portfolio of bottom quintile book-to-market stocks. Indeed, these different measures produce similar return streams. As further evidence of this similarity, Table A2.1, shows other comparison measures.

Figure A2.1: Long-Term Comparison (US)
January 1979 – December 2022

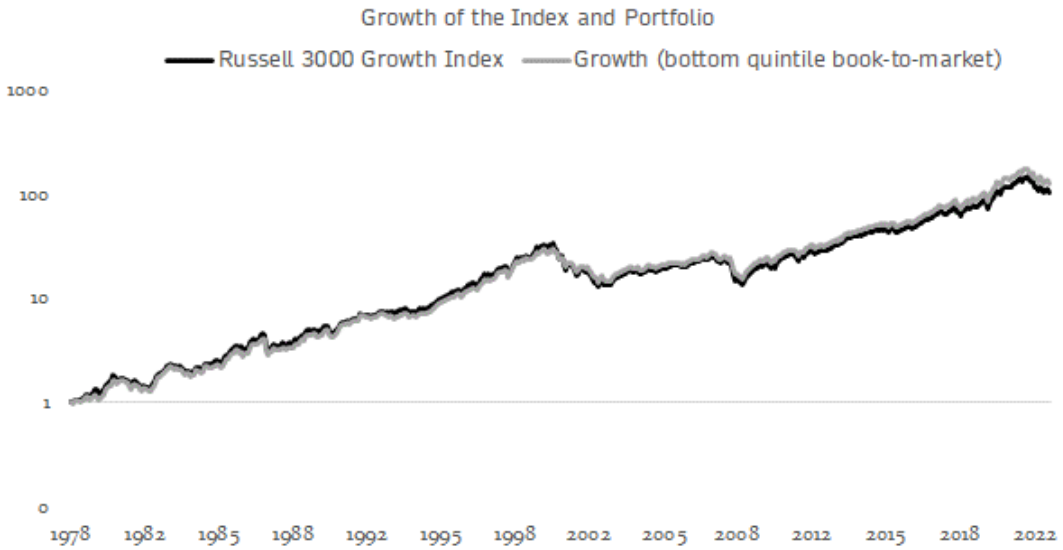


Table A2.1: Long-Term Comparison (US)
January 1979 – December 2022

	Russell 3000 Growth	Growth	Russell 3000	Market
Return (Annualized)	11.17%	11.64%	11.58%	11.64%
Trailing 1-Year Return (Annualized)	-28.97%	-27.76%	-19.21%	-20.18%
Trailing 3-Year Return (Annualized)	7.32%	8.27%	7.07%	6.97%
Trailing 5-Year Return (Annualized)	10.45%	11.83%	8.79%	8.65%
Volatility (Annualized)	17.50%	16.84%	15.61%	15.70%
Tracking Error (to Market)	4.23%	4.60%	0.99%	--
Sharpe Ratio	0.40	0.45	0.48	0.48
Information Ratio (to Market)	-0.11	0.00	-0.05	--
T-Stat (Excess Returns)	-0.19	0.25	-0.41	--
Batting Average (Excess Return)	52%	49%	46%	--

As a further comparison, consider the MSCI ACWI ex-US Growth Index which is based on five stock characteristics: The long-term forward EPS growth rate, short-term forward EPS growth rate, current internal growth rate and long-term historical EPS growth trend and long-term historical sales per share growth trend. Figure A2.2 shows the profits of the MSCI ACWI ex-US Growth Index along with the growth portfolio of bottom quintile book-to-market stocks. Indeed, these different measures produce similar return streams. As further evidence of this similarity, Table A2.2 shows other comparison measures.

Figure A2.2: Long-Term Comparison (Global ex-US)

January 1997– December 2022

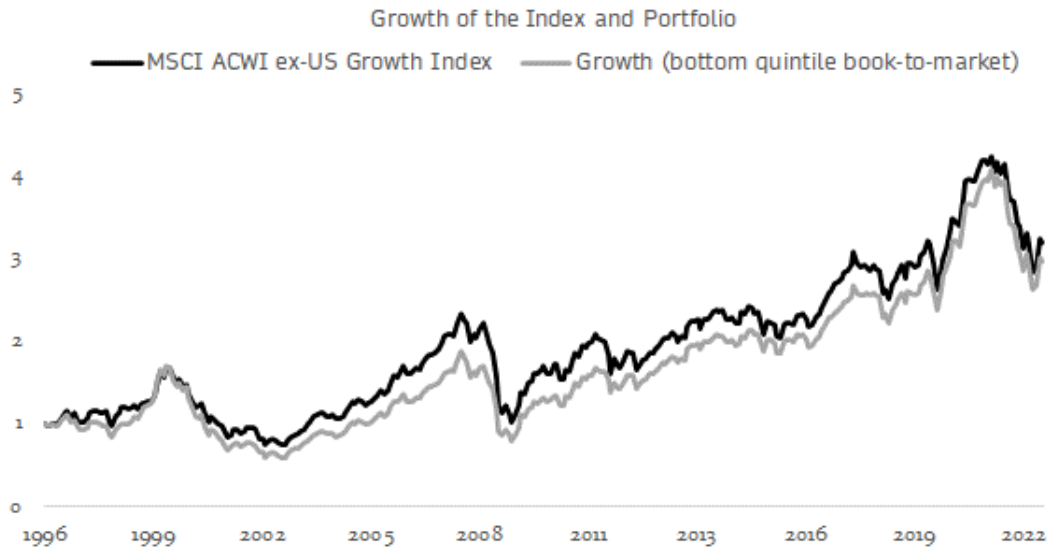


Table A2.2: Long-Term Comparison (Global ex-US)

January 1997– December 2022

	MSCI ACWI ex-US Growth	Growth	MSCI ACWI ex-US	Market
Return (Annualized)	4.55%	4.24%	5.04%	5.77%
Trailing 1-Year Return (Annualized)	-22.80%	-24.88%	-15.57%	-15.67%
Trailing 3-Year Return (Annualized)	-0.10%	1.28%	0.53%	1.35%
Trailing 5-Year Return (Annualized)	1.83%	3.07%	1.36%	1.58%
Volatility (Annualized)	17.18%	17.60%	17.08%	17.20%
Tracking Error (to Market)	3.91%	5.10%	2.12%	--
Sharpe Ratio	0.16	0.13	0.18	0.23
Information Ratio (to Market)	-0.31	-0.30	-0.34	--
T-Stat (Excess Returns)	-1.52	-1.39	-1.73	--
Batting Average (Excess Return)	46%	49%	43%	--

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

The U.S. Market portfolio return represents the return of the U.S. universe of stocks. The U.S. Dollar is the currency used to express performance.

[1] When considering the momentum tails, growth has an upside capture in momentum's best five years of about 3%, as growth averages 0.81% excess with momentum at an average of 26.78%. As for momentum's left tail – the worst five years – the average excess return for momentum is -11.40% with growth at -0.34% during those same years. Similarly, in Global eX US, when considering the momentum tails, growth has an upside capture in momentum's best five years of about 39%, as growth averages 6.69% excess with momentum at an average of 16.95%. As for momentum's left tail – the worst five years – the average excess return for momentum is -9.88% with growth at -5.27% during those same years. This This data suggests again that momentum and growth are clearly different strategies.

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