U.S. Stock Selection Model Performance Review

2017: The Return of Security Selection

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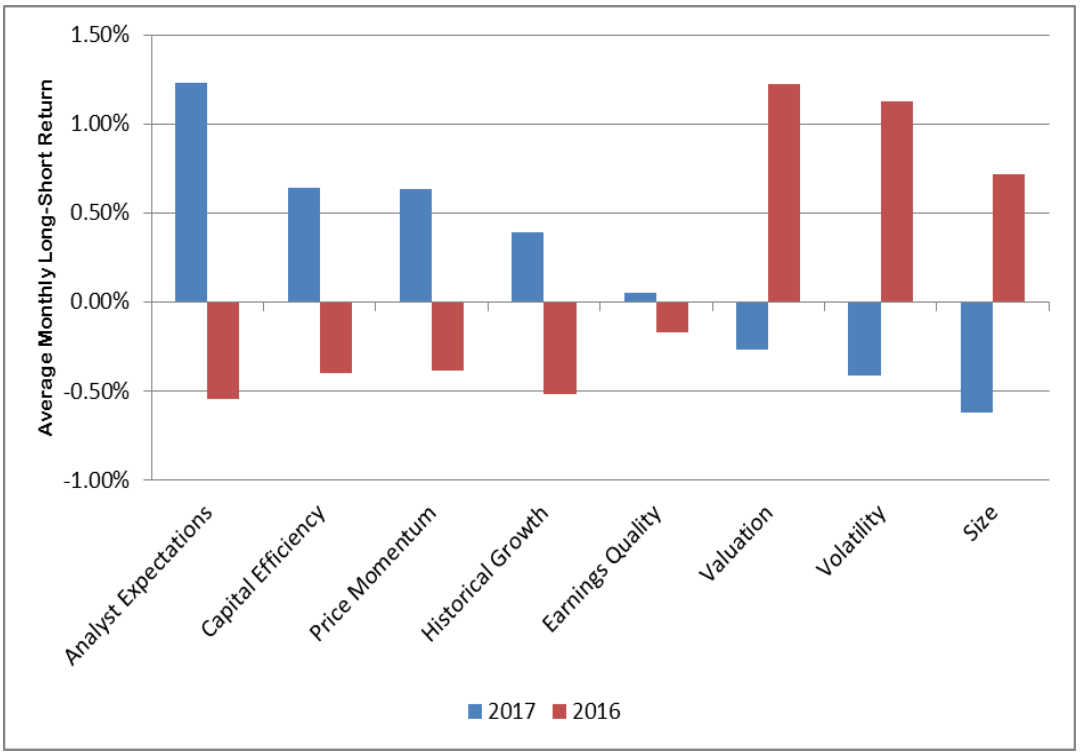
Starting with the U.S. election in November 2016, the S&P 500® Index has registered 14 consecutive months of positive total returns. Only once has the S&P 500 had a longer run of positive returns when in May 1959 the index notched a 15-month streak. Given this market environment, the fact that trend following strategies registered strong results in 2017 should be no surprise.

Analysts are very astute at identifying trends. Strategies based on analyst revisions were the strongest strategy category in 2017. As analyst and price momentum strategies put up strong results (Figure 1), and as market participants became increasingly comfortable with risk, valuation strategies generally lagged. Strategy performance in 2017 is essentially the mirror opposite of 2016.

Coincident with strong equity returns, U.S. stocks began to trade on the basis of their own idiosyncratic factors, as opposed to sector or common factor risk. The emergence of a so-called stock pickers' market was evidenced by the decline in average stock correlations to the lowest levels since November 2000 (Figure 2).

Figure 1- Average Monthly Quintile Return Spreads For Popular Investment Styles (Detailed in Appendix A)
S&P 500 (2016 & 2017)



Source: S&P Global Market Intelligence Quantamental Research. All returns and indices are unmanaged, statistical composites and their returns do not include payment of any sales charges or fees an investor would pay to purchase the securities they represent. Such costs would lower performance. It is not possible to invest directly in an index. Past performance is not a guarantee of future results. Data as of 12/31/2017.

While valuation was the strongest category of strategies in 2016, in 2017 valuation was one of the weakest (Figure 1). Just as the correlation between securities declined in 2017, the co-movement of strategies also declined. The top-bottom quintile return spread and Information Coefficient of the valuation and price momentum strategies produced opposite signs in 6 of the 12 months in 2017 (Figures 4 and 5).

Figure 2 - Average of Historical 12-Month Trailing Pair Wise Correlation (S&P 500 Universe, 12/31/1987 – 12/31/2017)

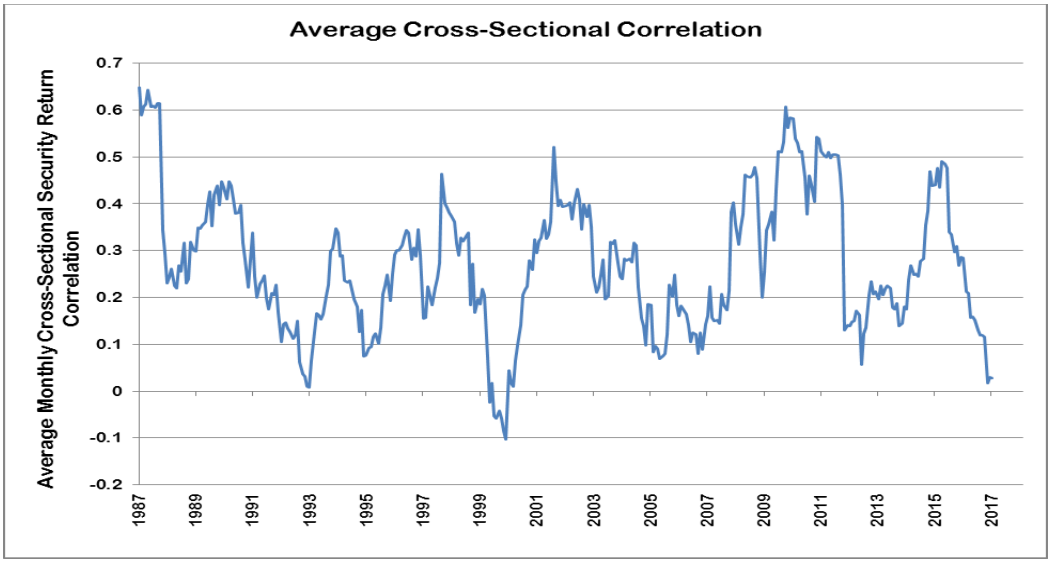
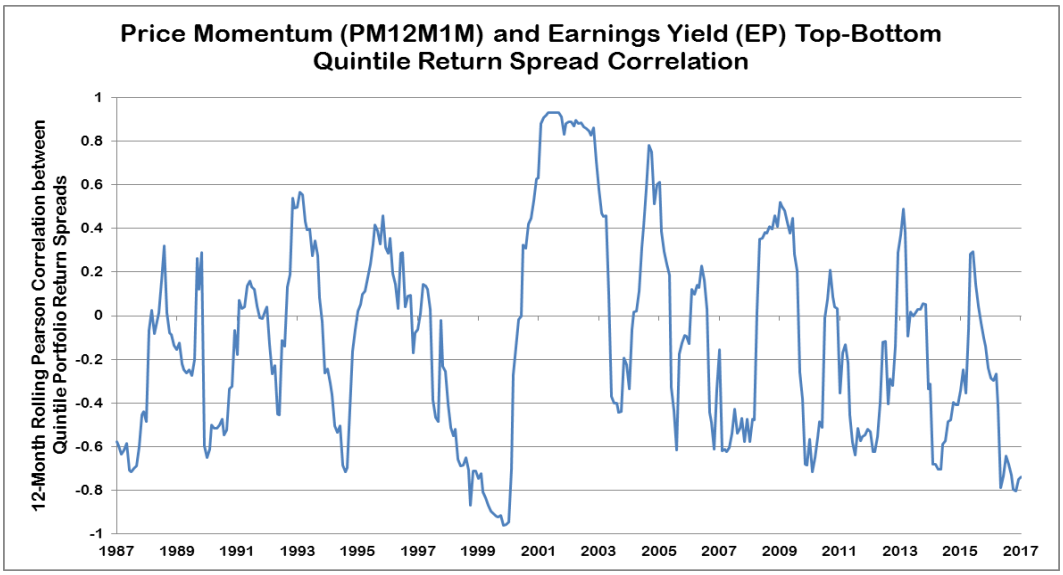


Figure 3 - Historical 12-Month Trailing Return Correlation between Quintile Monthly Return Spread for securities sorted monthly by Momentum (AFL Factor Code PM12M1M) and Earnings Yield (AFL Factor Code EP) (S&P 500 Universe, 12/31/1987 – 12/31/2017)



Source for Figures 2 and 3: S&P Global Market Intelligence Quantamental Research. All returns and indices are unmanaged, statistical composites and their returns do not include payment of any sales charges or fees an investor would pay to purchase the securities they represent. Such costs would lower performance. It is not possible to invest directly in an index. Past performance is not a guarantee of future results. Data as of 12/31/2017.

Figure 3 tells a similar story to Figure 2, where the correlation between both stocks and strategies declined to near extreme levels. For investors pursuing a multi-factor approach this is generally good news as models are designed such that part of the model is normally producing profitable signals. Table 1 demonstrates exactly this. All 4 of our strategy models returned positive long-only excess returns in 2017, but the Valuation Model was the only model to produce a negative long-short return over the time period. The Price Momentum and Growth models notched solid monthly spreads of 49 and 40 basis points, respectively.

Table1 - Model Summary Performance
Russell 3000 Growth / Russell 3000 Value / Russell 3000 (January 2017 to December 2017)

Model Name	Universe	Average 1-Month Quintile Spread	Average Q1 Monthly Excess Return	Average 1-Month IC
Growth Benchmark Model ("GBM")	Russell 3000 Growth	0.40%	0.06%	0.030
Value Benchmark Model ("VBM")	Russell 3000 Value	-0.11%	0.04%	0.018
Quality Model ("QM")	Russell 3000	0.07%	0.05%	0.025
Price Momentum Model ("PMM")	Russell 3000	0.49%	0.22%	0.036

Source: S&P Global Market Intelligence Quantamental Research. All returns and indices are unmanaged, statistical composites and their returns do not include payment of any sales charges or fees an investor would pay to purchase the securities they represent. Such costs would lower performance. It is not possible to invest directly in an index. Past performance is not a guarantee of future results. Data as of 12/31/2017.

The live, out-of-sample results for the four models were all solidly positive on both a long-only and a long-short return basis.

Table 2- Model Historical Summary Performance – Live Performance
Russell 3000 Growth / Russell 3000 Value / Russell 3000 (January 2011 to December 2017)

Model Name	Universe	Average 1-Month Quintile Spread	Average Q1 Monthly Excess Return	Average 1-Month IC
Growth Benchmark Model ("GBM")	Russell 3000 Growth	1.02%	0.28%	0.039
Value Benchmark Model ("VBM")	Russell 3000 Value	0.84%	0.21%	0.039
Quality Model ("QM")	Russell 3000	0.70%	0.27%	0.038
Price Momentum Model ("PMM")	Russell 3000	0.81%	0.29%	0.047

Source: S&P Global Market Intelligence Quantamental Research. All returns and indices are unmanaged, statistical composites and their returns do not include payment of any sales charges or fees an investor would pay to purchase the securities they represent. Such costs would lower performance. It is not possible to invest directly in an index. Past performance is not a guarantee of future results. Data as of 12/31/2017.

Figure 4- Monthly Historical Equal-Weighted Quintile Return Spread
Russell 3000 Growth / Russell 3000 Value / Russell 3000 (January 2017 – December 2017)

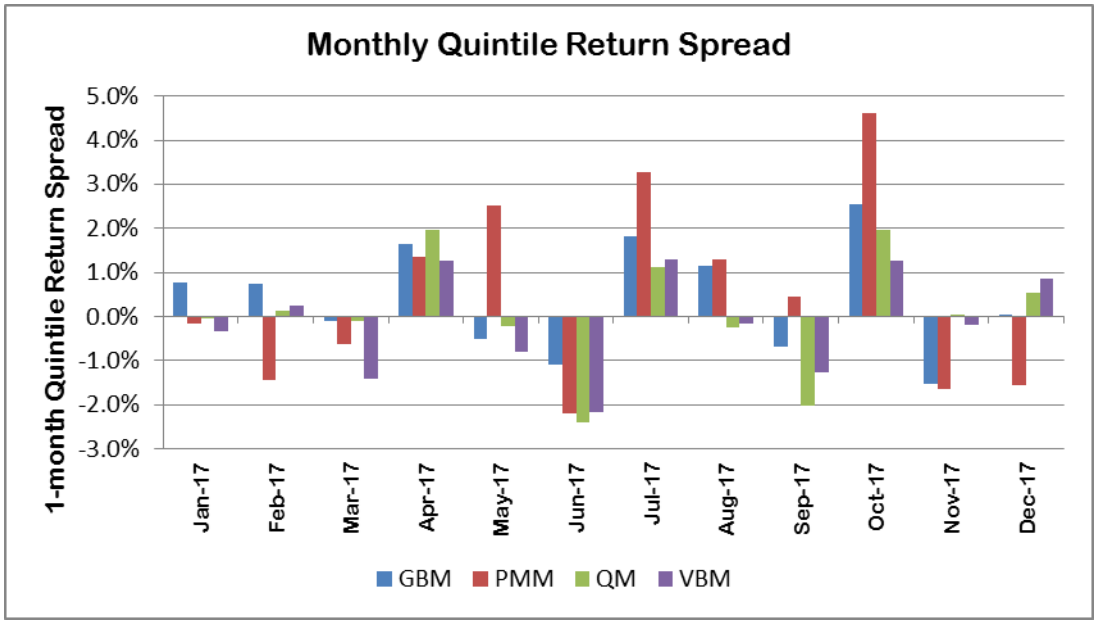
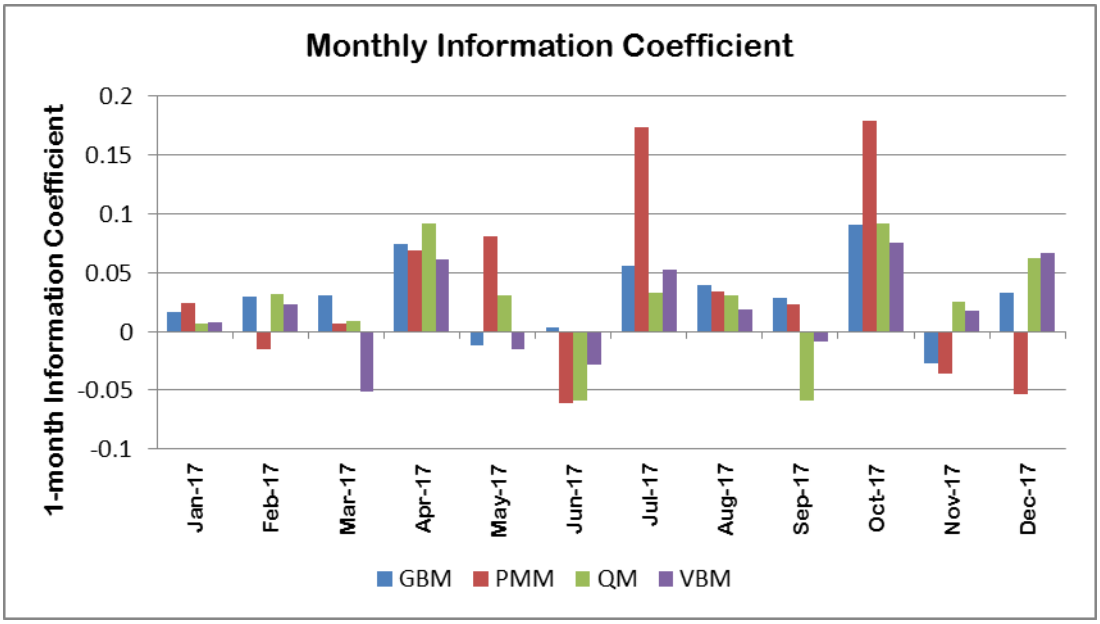


Figure 5 - Monthly Information Coefficient
Russell 3000 Growth / Russell 3000 Value / Russell 3000 (January 2017 – December 2017)



Source for Figures 4 and 5: S&P Global Market Intelligence Quantamental Research. All returns and indices are unmanaged, statistical composites and their returns do not include payment of any sales charges or fees an investor would pay to purchase the securities they represent. Such costs would lower performance. It is not possible to invest directly in an index. Past performance is not a guarantee of future results. Data as of 12/31/2017.

Explanation of Returns Presented in this Paper

This paper presents the returns of hypothetical portfolios formed based on the model scores. All returns are calculated based on actual historical returns of the underlying stocks, but do not represent actual trading results and they do not include payments of any sales charges, fees, or trading costs. Such costs would have lowered performance. It is not possible to invest directly in an index or the model portfolios on which the results presented here are based. Past performance is not a guarantee of future results.

Glossary of Definitions Used in this Paper

"Spread" returns, also referred to as return spreads or long-short return spreads, are the returns of a screened portfolio of the top 20% of ranked stocks (quintile 1) minus the returns of the bottom 20% screened portfolio (quintile 5). Stock returns within each portfolio are equally-weighted. The model portfolios are rebalanced at calendar month end.

"Excess" returns are returns of model portfolios formed from the top 20% of ranked stocks (referred to as "quintile 1" or "Q1") minus the return of the equally-weighted universe. Where noted in tables, Q2, Q3, Q4, and Q5 present the returns of hypothetical portfolios of the lower-ranked quintiles, each containing a distinct 20% portion of the universe.

"Absolute" returns are the model return of the equally-weighted portfolio without subtracting benchmark returns.

"Information Coefficient", or "IC" is the rank correlation of the model monthly scores with the forward 1-month returns of the underlying stocks. An IC score measures how closely related the model rankings (scores) are to the returns that follow. The closer the score/return relationship, the higher the IC.

"Information Ratio" or "IR", of a result is the average of monthly excess return over the period divided by the standard deviation of these returns.

The benchmark return is the return of a portfolio containing the constituents of the reference index (such as the Russell 3000), with equal weighting and a monthly rebalance.

The models were released in January 2011 and were constructed with benefit of hindsight for returns prior to 2011. We refer to the historical period before 2011 as "back-test". We refer to the performance of the model from 2011 and beyond as the "live" performance.

1. Growth Benchmark Model

The Growth Benchmark Model ("GBM") was created to outperform a growth benchmark, defined as the Russell 3000 Growth Index. The model identifies companies with a consistent track record of earnings growth, as well as emerging growth candidates. The model scores are based on seven subcomponents: Earnings Momentum, Historical Growth, Liquidity and Leverage, Price Momentum, Value, Quality, and Capital Efficiency. Table 3 summarizes the Growth Model Performance from January 1987 through December 2017. The model inception date is January 2011.

Table 3 - Summary Historical Performance Statistics for Growth Benchmark Model
Russell 3000 Growth Universe (January 1987 – December 2017)

	Q1	Q2	Q3	Q4	Q5	Long-Short Quintile Return Spread
Average Monthly Absolute Return[1]	1.61%***	1.20%***	0.94%***	0.67%**	0.04%	1.57%***
Annualized Absolute Return	21.06%	15.33%	11.94%	8.38%	0.44%	20.54%
Annualized Information Ratio[2]	1.68	0.82	0.04	-1.07	-1.39	0.27

Information Coefficient Summary	
Average 1-Month IC	0.054***
1-Month IC Information Ratio	0.89
1-Month IC Hit Rate[3]	83%***

*** 1% significance; **5% significance; *10% significance

Source: S&P Global Market Intelligence Quantamental Research. All returns and indices are unmanaged, statistical composites and their returns do not include payment of any sales charges or fees an investor would pay to purchase the securities they represent. Such costs would lower performance. It is not possible to invest directly in an index. Past performance is not a guarantee of future results. Data as of 12/31/2017.

1.1 Model Performance in 2017

Figure 6 displays the 1-month quintile return spreads and 1-month Information Coefficients (ICs) for the model during 2017. The GBM generated a positive average return spread of 0.40% and IC of 0.03 in 2017. The model's strongest month was October and the model generated positive IC's in 10 of 12 months in 2017. During most of 2017 the market was in search of companies that would generate positive upside growth surprises. This was captured in the GBM within the Investor Sentiment and Earnings Momentum sub composites (Figure 7). Companies that had disappointing earnings saw pronounced stock price declines.

[1] Average Monthly Returns are absolute returns based on a monthly rebalance portfolio.

[2] Information Ratio calculated on monthly excess returns relative to equal-weighted benchmark.

[3] IC Hit Rate is defined as the percentage of monthly where the IC is positive.

Figure 6 - Growth Benchmark Model: Historical 1-Month Equal Weighted Quintile Return Spread and Information Coefficient
Russell 3000 Growth (January 2017 – December 2017)

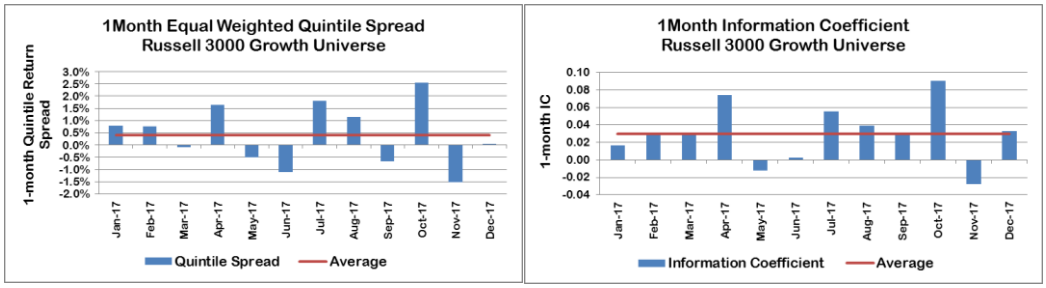
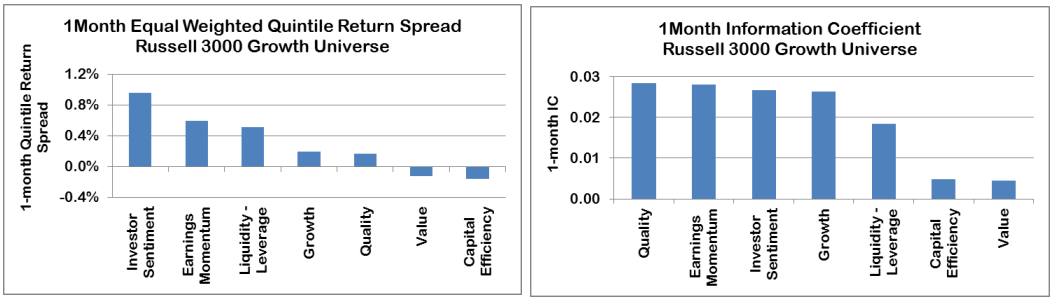


Figure 7 shows the average 1-month quintile return spead and IC for each model subcomponent of the GBM for 2017. Five of the seven model subcomponents posted postive return spreads, while all seven components produced postive average IC's. Trend Following (labeled Investor Sentiment) and Analyst Sentiment (labled Earnings Momentum) were the strongest model components.

Figure 7- Growth Benchmark Model Subcomponents: Historical 1-Month Equal Weighted Quintile Return Spread and Information Coefficient
Russell 3000 Growth (January 2017 – December 2017)



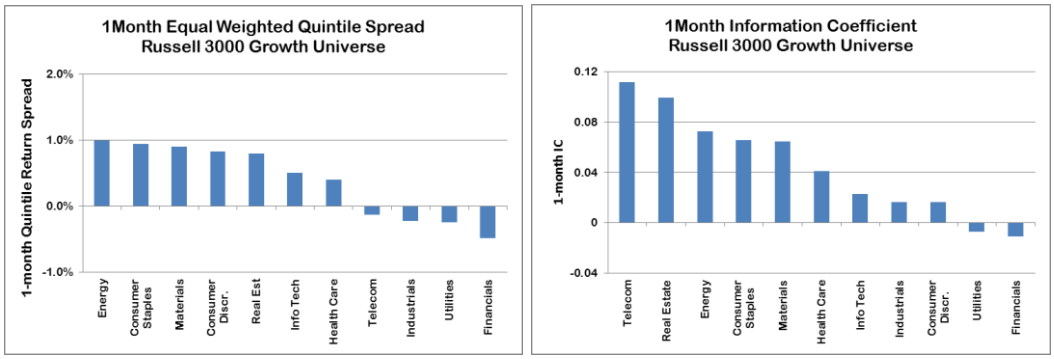
Source for Figures 6 and 7: S&P Global Market Intelligence Quantamental Research. All returns and indices are unmanaged, statistical composites and their returns do not include payment of any sales charges or fees an investor would pay to purchase the securities they represent. Such costs would lower performance. It is not possible to invest directly in an index. Past performance is not a guarantee of future results. Data as of 12/31/2017.

1.2 Sector Performance in 2017

Figure 8 breaks the performance of the GBM out by sector. The GBM outperformed in 7 of the 11 GICS sectors (explained in Appendix B). The model struggled within Energy during 2016. But 2017 saw the strongest performance in the Energy sector as energy prices stabilized and begun to rebound. The GBM produced positive average ICs in 9 of the 11 GICs sectors with the model struggling in Utilities and Financials.

Figure 8 - Growth Benchmark Model by Sector: 1-Month Equal Weighted Historical Quintile Return Spread and Information Coefficient

Russell 3000 Growth (January 2017 – December 2017)



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1.3 Quintile Portfolio Characteristics and Portfolio Tilt Neutralization

Table 4 reports the median market capitalization and 60-month Capital Asset Pricing Model (CAPM) beta of the top and bottom quintile portfolios. The median market cap of the long portfolio (Quintile 1) was $2.19 billion compared with $1.46 billion for the short portfolio (Quintile 5) indicating a model preference for larger capitalization companies. We saw a similar tilt in 2016. The median betas of the long and short portfolio were similar at 1.11 and 1.07. Thus the model was not influenced by the very strong rising equity markets in 2017.

Table 4 - Growth Benchmark Model: Median Market Cap and 60-Month CAPM Beta
Quintile 1 and Quintile 5 – Russell 3000 Growth Universe (January 2017 – December 2017)

Median Measure	Quintile 1	Quintile 5
Market Cap ($ Million)	2,190	1,456
60M CAPM Beta	1.11	1.07

Source: S&P Global Market Intelligence Quantamental Research. All returns and indices are unmanaged, statistical composites and their returns do not include payment of any sales charges or fees an investor would pay to purchase the securities they represent. Such costs would lower performance. It is not possible to invest directly in an index. Past performance is not a guarantee of future results. Data as of 12/31/2017.

The Russell 1000 Growth Index (a proxy of larger capitalization growth stocks) outperformed the Russell 2000 Growth Index (a proxy for small companies) by 8.04% in 2017. Table 5 shows the model results neutralizing for beta and size. The average neutralized 1-month return spread falls 10 bps a month, indicating that a portion of the GBM may be attributed to its exposure to these factors.

Table 5 - Growth Benchmark Model: Original and Beta/Size Neutralized Historical Performance
Russell 3000 Growth Universe (January 2017 – December 2017)

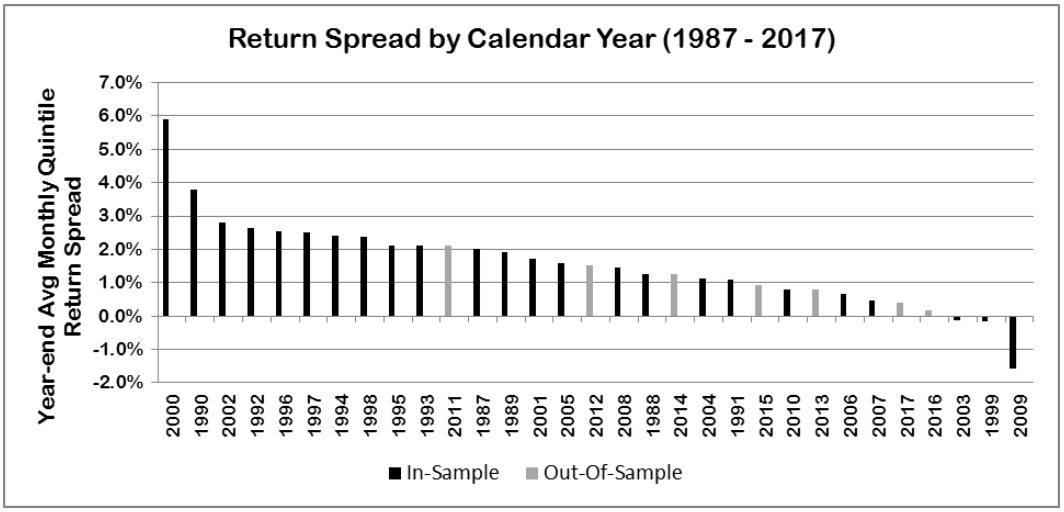
Model	Average 1-Month Quintile Return Spread	Average 1-Month IC
Original GBM	0.40%	0.030
Size/Beta Neutral GBM	0.30%	0.030

Source: S&P Global Market Intelligence Quantamental Research. All returns and indices are unmanaged, statistical composites and their returns do not include payment of any sales charges or fees an investor would pay to purchase the securities they represent. Such costs would lower performance. It is not possible to invest directly in an index. Past performance is not a guarantee of future results. Data as of 12/31/2017.

1.4 Historical Comparison

Figure 9 shows the calendar-year performance of the GBM since 1987. The average monthly return spread for 2017, while strong, ranks relatively low among all model years. The model performance, as measured by average monthly quintile return spread, for the "live" period (grey bars 2011-2017) was 1.02% compared with 1.73% during the backtest period (black bars 1987-2010). The worst performing year was 2009 (low price, high beta rally) at -1.57% average monthly spread. Other years with a negative spread return were 1999 ("tech bubble") and 2003 ("junk rally").

Figure 9 - Growth Benchmark Model: Historical Year Average Monthly Quintile Return Spread
Russell 3000 Growth Universe (January 1987 – December 2017)



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2. Value Benchmark Model

The Value Benchmark Model ("VBM") identifies potentially underpriced stocks with strong underlying fundamentals, using intrinsic and relative valuation measures. The model selects companies with low valuations, high earnings quality, stable growth rates, and improving

analyst ("Street) sentiment. The VBM has six subcomponents: Valuation, Earnings Quality, Financial Health, Growth Stability, Street Sentiment, and Price Momentum. Summary Model performance results from January 1987 through December 2017 are shown in Table 6.

Table 6 - Summary Historical Performance Statistics for Value Benchmark Model
Russell 3000 Value Universe (January 1987 – December 2017)

	Q1	Q2	Q3	Q4	Q5	Long-Short Quintile Return Spread
Average Monthly Absolute Return[4]	1.40%***	1.07%***	0.84%***	0.51%*	-0.24%	1.64%***
Annualized Absolute Return	18.16%	13.56%	10.53%	6.26%	-2.84%	21.56%
Annualized Information Ratio[5]	1.30	0.23	-0.64	-2.39	-2.62	0.35

Information Coefficient Summary	
Average 1-Month IC	0.055***
1-Month IC Information Ratio	0.95
1-Month IC Hit Rate[6]	83%***

*** 1% significance; **5% significance; *10% significance

Source: S&P Global Market Intelligence Quantamental Research. All returns and indices are unmanaged, statistical composites and their returns do not include payment of any sales charges or fees an investor would pay to purchase the securities they represent. Such costs would lower performance. It is not possible to invest directly in an index. Past performance is not a guarantee of future results. Data as of 12/31/2017.

2.1 Model Performance in 2017

Figure 10 illustrates the monthly quintile return spreads and ICs for the VBM in the Russell 3000 Value Index for 2017. The average monthly return spread and IC were -0.11% and 0.018 respectively. The VBM struggled for much of 2017, returning a positive quintile spread in only 5 months. The model did post positive ICs in the final 3 months of 2017, with two of those months also generating positive long-short returns.

[4] Average Monthly Returns are absolute returns based on a monthly rebalance portfolio.

[5] Information Ratio calculated on monthly excess returns relative to equal-weighted benchmark.

[6] IC Hit Rate is defined as the percentage of monthly where the IC is positive.

Figure 10 - Value Benchmark Model:
Historical 1-Month Equal Weighted Quintile Spread and Information Coefficient
Russell 3000 Value (January 2017 – December 2017)

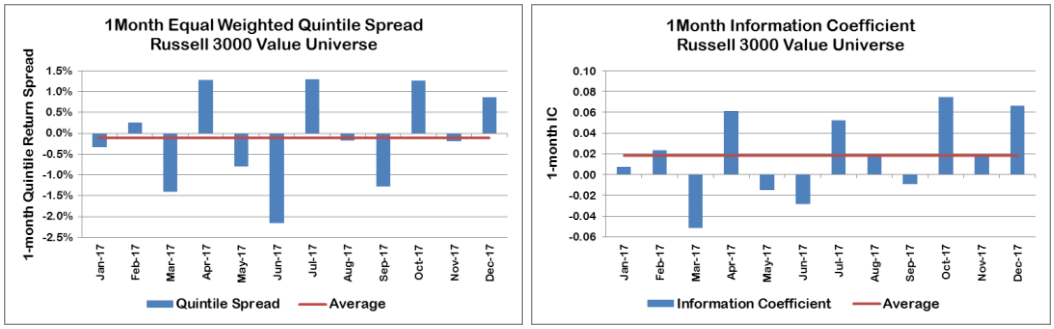
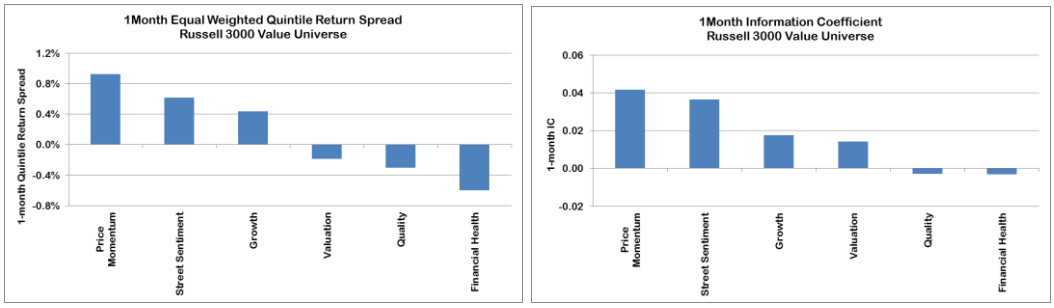


Figure 11 shows the average 1-month quintile return spread and average 1-month IC for each of the subcomponents of the Value Benchmark Model over the Russell 3000 Value universe for 2017. Three of the six subcomponents posted positive returns and four of the subcomponents produced positive ICs. Similar to the GBM, Price Momentum, Street Sentiment and Growth were the dominant strategies in 2017.

Figure 11- Value Benchmark Model Subcomponents:
Historical 1-Month Equal Weighted Quintile Spread and Information Coefficient
Russell 3000 Value (January 2017 – December 2017)



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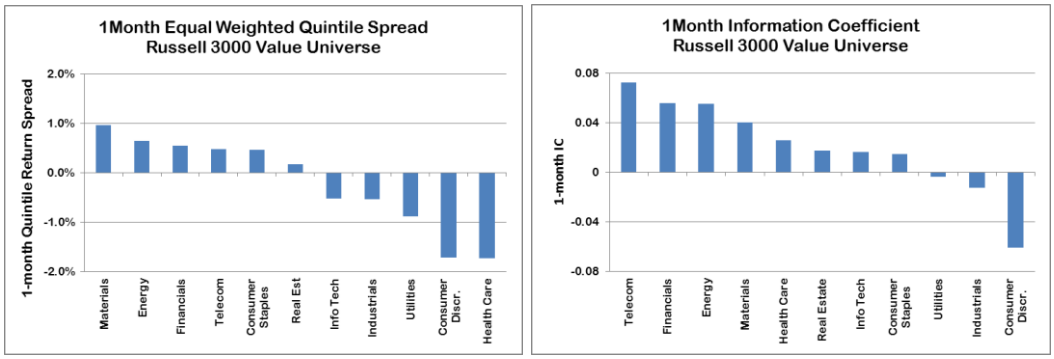
2.2 Sector Performance in 2017

The 1-month average quintile return spreads and ICs of the model within the eleven GICS sectors are shown in Figure 12. The VBM produced positive 1-month ICs in eight of the eleven sectors. The weakest performance was in Health Care with an average monthly return spread of -1.73%.

Figure 12 - Value Benchmark Model by Sector:
1-Month Equal Weighted Historical Quintile Spread and Information Coefficient
Russell 3000 Value (January 2017 – December 2017)



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2.3 Quintile Portfolio Characteristics and Portfolio Tilt Neutralization

Table 7 highlights the median market capitalization and median 60-month CAPM Beta of the quintile 1 (long) and quintile 5 (short) portfolios. The median market capitalization of the long portfolio was $2.04 billion, compared with $0.85 billion for the short portfolio. From these data, a definitive large company tilt in the VBM model can be concluded. Table 8 shows the VBM performance adjusted for size and CAPM Beta. The adjusted results were somewhat weaker than the unadjusted results.

Table 7 Value Benchmark Model: Median Market Cap and 60-Month CAPM Beta Quintile 1 and Quintile 5
Russell 3000 Value Universe (January 2017 – December 2017)

Median Measure	Quintile 1	Quintile 5
Market Cap ($ Million)	2,037	853
60M CAPM Beta	1.04	1.05

Table 8 Value Benchmark Model: Original and Beta/Size Neutralized Historical Performance
Russell 3000 Value Universe (January 2017 – December 2017)

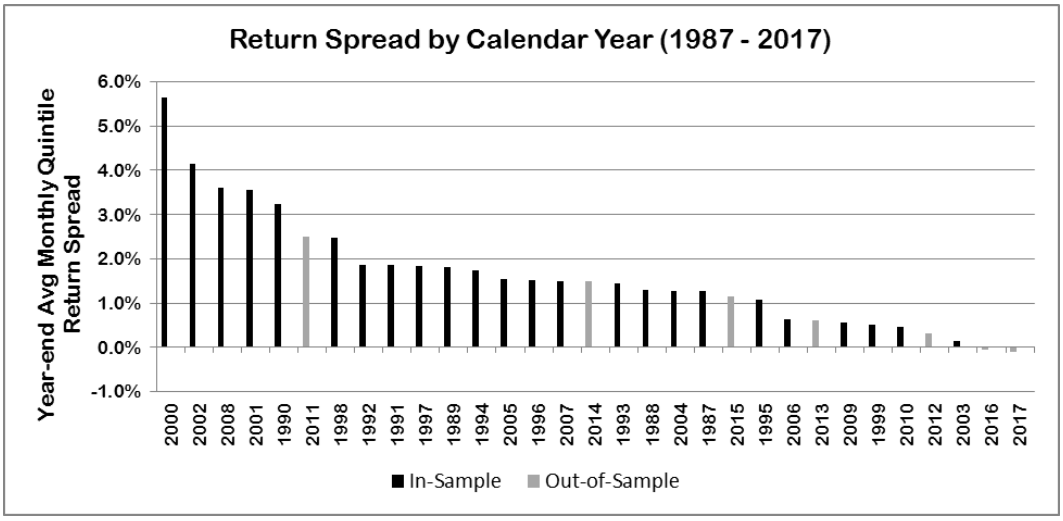
Model	Average 1-Month Quintile Return Spread	Average 1-Month IC
Original VBM	-0.11%	0.018
Size/Beta Neutral VBM	-0.16%	0.013

Source: S&P Global Market Intelligence Quantamental Research. All returns and indices are unmanaged, statistical composites and their returns do not include payment of any sales charges or fees an investor would pay to purchase the securities they represent. Such costs would lower performance. It is not possible to invest directly in an index. Past performance is not a guarantee of future results. Data as of 12/31/2017.

2.4 Historical Comparison

The VBM's 'backtest' (1987-2010: shown in black bars) and 'live' (2011-2017 shown in grey bars) quintile return spreads are displayed in Figure 13. Both 2016 and 2017 registered negative long-short returns, the only negative years in the entire time period.

Figure 13 - Value Benchmark Model: Historical Year Average Monthly Quintile Return Spread
Russell 3000 Value Universe (January 1987 – December 2017)



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3. Quality Model

The Quality Model ("QM") seeks to extend the analysis of earnings quality beyond accruals and includes several measures of balance sheet efficiency/strength that have been shown to indicate medium and long-term earnings quality. The Quality Model is comprised of five subcomponents: Growth Stability, Operating Efficiency, Valuation, Financial Health and Earnings Quality. The detailed summary performance statistics for the model from January 1987 to December 2017 are shown in Table 9.

Table 9 - Summary Historical Performance Statistics for Quality Model
Russell 3000 (January 1987 – December 2017)

	Q1	Q2	Q3	Q4	Q5	Long-Short Quintile Return Spread
Average Monthly Absolute Return[7]	1.33%***	1.08%***	0.79%***	0.45%	-0.18%	1.51%***
Annualized Absolute Return	17.20%	13.82%	9.92%	5.57%	-2.14%	19.73%
Annualized Information Ratio[8]	0.97	0.44	-0.82	-2.26	-2.19	0.26

Information Coefficient Summary	
Average 1-Month IC	0.053***
1-Month IC Information Ratio	0.84
1-Month IC Hit Rate[9]	81%***

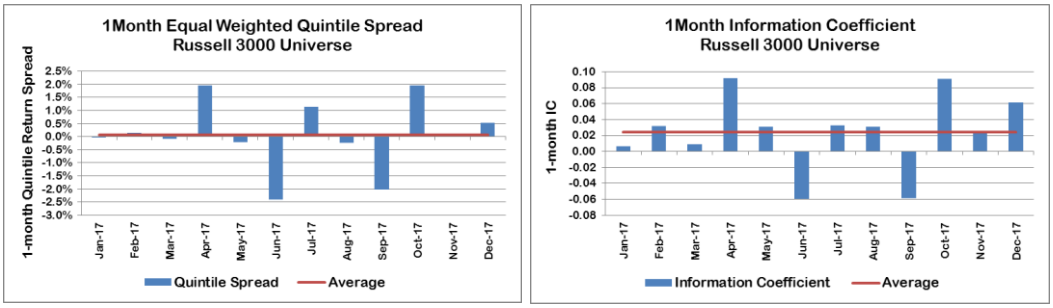
*** 1% significance; **5% significance; *10% significance

Source: S&P Global Market Intelligence Quantamental Research. All returns and indices are unmanaged, statistical composites and their returns do not include payment of any sales charges or fees an investor would pay to purchase the securities they represent. Such costs would lower performance. It is not possible to invest directly in an index. Past performance is not a guarantee of future results. Data as of 12/31/2017.

3.1 Model Performance in 2017

The QM produced an average 1-month equal-weighted return spread and 1-month IC of 0.07% and 0.025, respectively in 2017 (Figure 14). The QM model struggled in 2017 as the market tended to favor high growth companies. The model posted negative return spreads in eight of twelve months. The model posted positive return spreads in only one model subcomponent: Growth (Figure 15).

Figure 14 - Quality Model:
Historical 1-Month Equal Weighted Quintile Return Spread and Information Coefficient
Russell 3000 (January 2017 – December 2017)

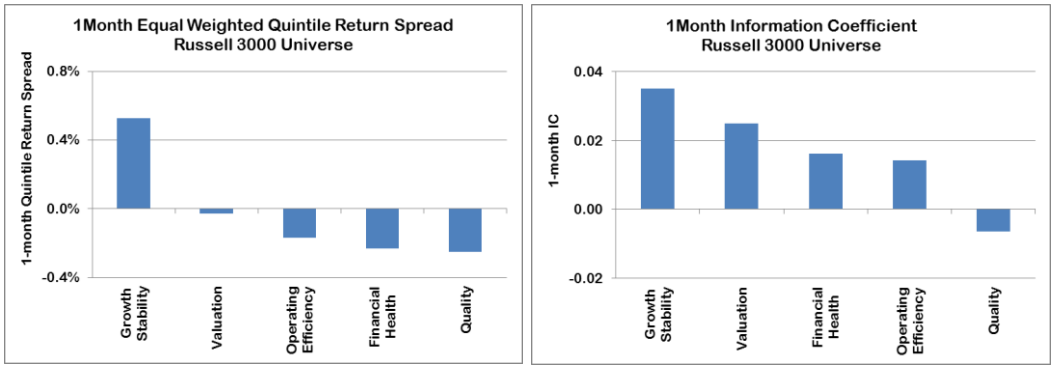


[7] Average Monthly Returns are absolute returns based on a monthly rebalance portfolio.

[8] Information Ratio calculated on monthly excess returns relative to equal-weighted benchmark.

[9] IC Hit Rate is defined as the percentage of monthly where the IC is positive.

Figure 15 - Quality Model Subcomponents:
Historical 1-Month Equal Weighted Quintile Return Spread and Information Coefficient
Russell 3000 (January 2017 – December 2017)

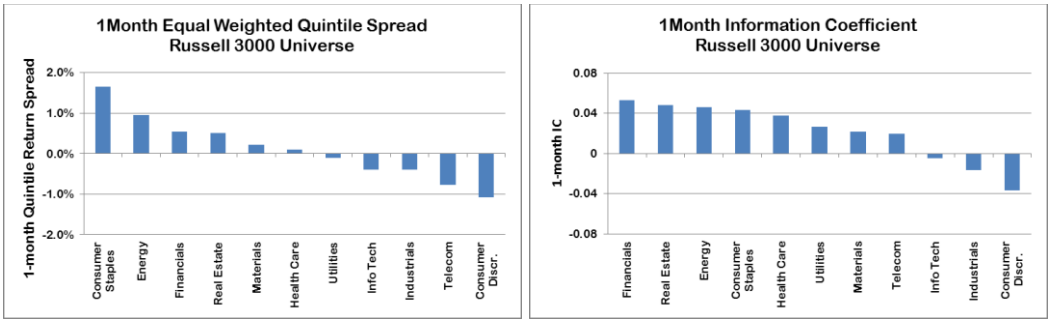


Source: S&P Global Market Intelligence Quantamental Research. All returns and indices are unmanaged, statistical composites and their returns do not include payment of any sales charges or fees an investor would pay to purchase the securities they represent. Such costs would lower performance. It is not possible to invest directly in an index. Past performance is not a guarantee of future results. Data as of 12/31/2017.

3.2 Sector Performance in 2017

The average historical 1-month quintile return spread and IC for the QM within GIC sectors are shown in Figure 16. While the QM generated positive IC's in eight of the GIC sectors, it only generated a positive return spread in six sectors. The model turned in the best performance in the Energy, Real Estate and Financials sector, while Consumer Discretionary and Industrials were the weakest.

Figure 16 - Quality Model Sector:
1-Month Equal Weighted Historical Quintile Spread and Information Coefficient
Russell 3000 Universe (January 2017 – December 2017)



Source: S&P Global Market Intelligence Quantamental Research. All returns and indices are unmanaged, statistical composites and their returns do not include payment of any sales charges or fees an investor would pay to purchase the securities they represent. Such costs would lower performance. It is not possible to invest directly in an index. Past performance is not a guarantee of future results. Data as of 12/31/2017.

3.3 Quintile Portfolio Characteristics and Portfolio Tilt Neutralization

The QM's median market capitalization and median 60-month CAPM beta of the top and bottom quintile portfolios are shown in Table 10. As might be expected, the QM prefers larger capitalization, lower beta names.

Table 10 - Quality Model: Median Market Cap and 60-Month CAPM Beta Quintile 1 and Quintile 5
Russell 3000 Universe (January 2017 – December 2017)

Median Measure	Quintile 1	Quintile 5
Market Cap ($ Million)	2,660	963
60M CAPM Beta	1.04	1.14

The Russell 1000 Index (a proxy for larger capitalization stocks) outperformed the Russell 2000 (a proxy for smaller capitalization stocks) by 7.04% in 2017. Thus, it is likely that a portion of the QM return might be attributed to its large company tilt. To adjust for this, we neutralize 2017 returns for size and beta. The results in Table 11 indicate that the performance of the QM deteriorated from a positive 7 basis point spread to a negative -15 basis point per month quintile spread when neutralized for size and beta.

Table 11 - Quality Model: Original and Beta/Size Neutralized Historical Performance
Russell 3000 Universe (January 2017 – December 2017)

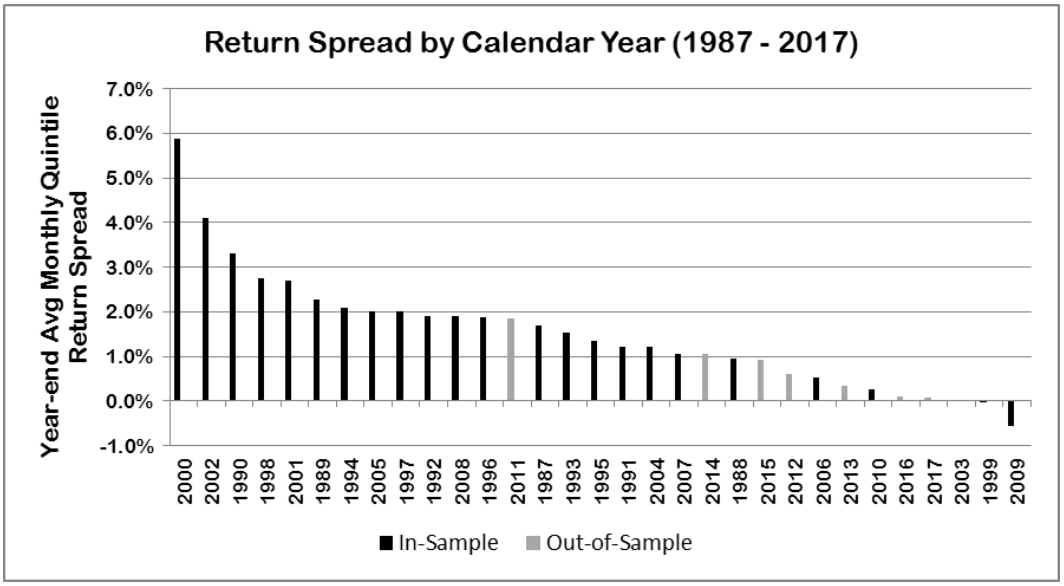
Model	Average 1-Month Quintile Return Spread	Average 1-Month IC
Original QM	0.07%	0.025
Size/Beta Neutral QM	-0.15%	0.019

Source for Tables 10 and 11: S&P Global Market Intelligence Quantamental Research. All returns and indices are unmanaged, statistical composites and their returns do not include payment of any sales charges or fees an investor would pay to purchase the securities they represent. Such costs would lower performance. It is not possible to invest directly in an index. Past performance is not a guarantee of future results. Data as of 12/31/2017.

3.4 Historical Comparison

Figure 17 details the average 1-month quintile spread by calendar year. The long-short return for 2017 ranked as the fourth weakest year for the QM, while 2016 was the fifth. The QM struggles during risk-seeking market environments as quality firms are often out of favor. The best QM average long-short return spread was generated in 2000 (5.89%) when value and high quality stocks rallied after the collapse of the tech bubble. The worst return for the QM was in 2009 (-0.57%) when high beta and low price stocks outperformed the broader market.

Figure 17 – Quality Model: Historical Year Average Monthly Quintile Return Spread
Russell 3000 Universe (January 1987 – December 2017)



Source: S&P Global Market Intelligence Quantamental Research. All returns and indices are unmanaged, statistical composites and their returns do not include payment of any sales charges or fees an investor would pay to purchase the securities they represent. Such costs would lower performance. It is not possible to invest directly in an index. Past performance is not a guarantee of future results. Data as of 12/31/2017.

4. Price Momentum Model

The Price Momentum Model ("PMM") was constructed to capture relative strength in stocks based on trailing price momentum and trading volume data. The model is made up of Short-Term and Long-Term components: the short-term component uses a lookback window of 1 to 3 months, while the longer-term component is based on a window of 3 to 12 months. We detail the summary performance statistics for the PMM in Table 12.

Table 12 – Summary Historical Performance Statistics for Price Momentum Model
Russell 3000 (January 1987 – December 2017)

	Q1	Q2	Q3	Q4	Q5	Long-Short Quintile Return Spread
Average Monthly Absolute Return[10]	1.50%***	1.15%***	0.80%***	0.31%	-0.39%	1.90%***
Annualized Absolute Return	19.63%	14.74%	10.07%	3.82%	-4.63%	25.32%
Annualized Information Ratio[11]	1.01	0.56	-0.95	-2.44	-2.45	0.43

Information Coefficient Summary	
Average 1-Month IC	0.067***
1-Month IC Information Ratio	0.74
1-Month IC Hit Rate[12]	81%***

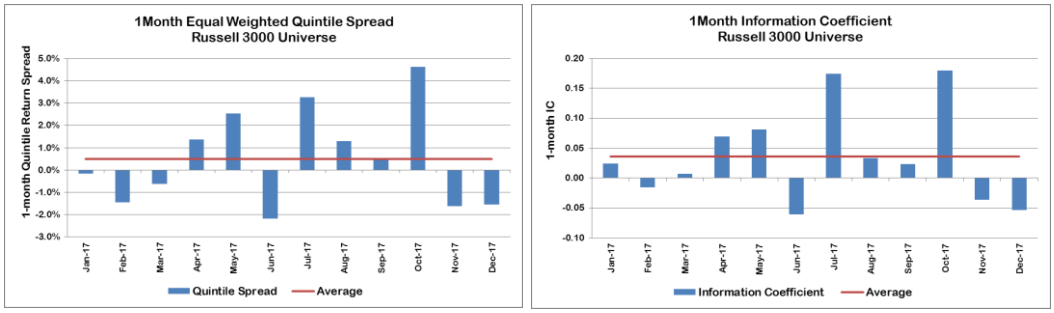
*** 1% significance; **5% significance; *10% significance

Source: S&P Global Market Intelligence Quantamental Research. All returns and indices are unmanaged, statistical composites and their returns do not include payment of any sales charges or fees an investor would pay to purchase the securities they represent. Such costs would lower performance. It is not possible to invest directly in an index. Past performance is not a guarantee of future results. Data as of 12/31/2017.

4.1 Model Performance in 2017

Figure 18 shows the 1-month equal weighted return spread and IC for the PMM over the Russell 3000 universe in 2017. The average monthly return spread and IC were 0.49% and 0.036, respectively, for the year. The model turned in variable performance with half of the months posting positive return spreads.

Figure 18 - Price Momentum Model:
Historical 1-Month Equal Weighted Quintile Return Spread and Information Coefficient
Russell 3000 (January 2017 – December 2017)



Source: S&P Global Market Intelligence Quantamental Research. All returns and indices are unmanaged, statistical composites and their returns do not include payment of any sales charges or fees an investor would pay to purchase the securities they represent. Such costs would lower performance. It is not possible to invest directly in an index. Past performance is not a guarantee of future results. Data as of 12/31/2017.

[10] Average Monthly Returns are absolute returns based on a monthly rebalance portfolio.

[11] Information Ratio calculated on monthly excess returns relative to equal-weighted benchmark.

[12] IC Hit Rate is defined as the percentage of monthly where the IC is positive.

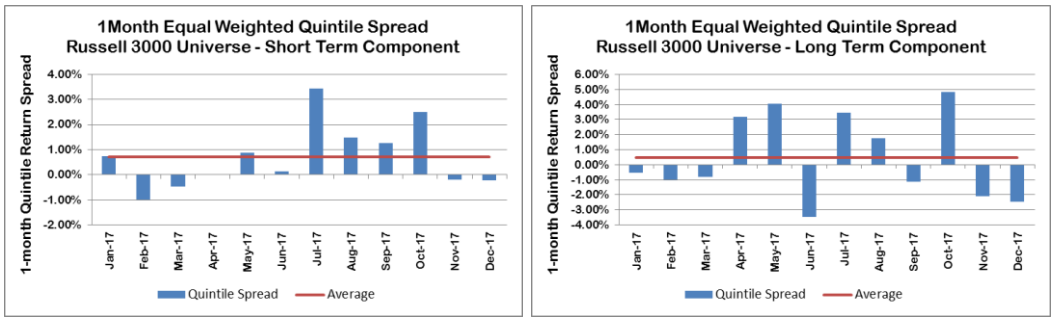
Table 13 and Figure 19 show the average 1-month quintile spread and IC for both the short- and long-term components of the Price Momentum Model. The performance of the short-term component was very strong, with positive returns spreads (ICs) of 0.71% (0.034). The short term component posted a solid four month period from July through October.

Table 13 - Summary Historical Performance Statistics for Price Momentum Model Subcomponents
Russell 3000 (January 2017 – December 2017)

Component	Average 1-Month Quintile Return Spread	Average 1-Month IC
Short-Term Component	0.71%	0.034
Long-Term Component	0.49%	0.028

Source: S&P Global Market Intelligence Quantamental Research. All returns and indices are unmanaged, statistical composites and their returns do not include payment of any sales charges or fees an investor would pay to purchase the securities they represent. Such costs would lower performance. It is not possible to invest directly in an index. Past performance is not a guarantee of future results. Data as of 12/31/2017.

Figure 19 - Price Momentum Model Subcomponents:
Historical 1-Month Equal Weighted Quintile Return Spread
Russell 3000 (January 2017 – December 2017)

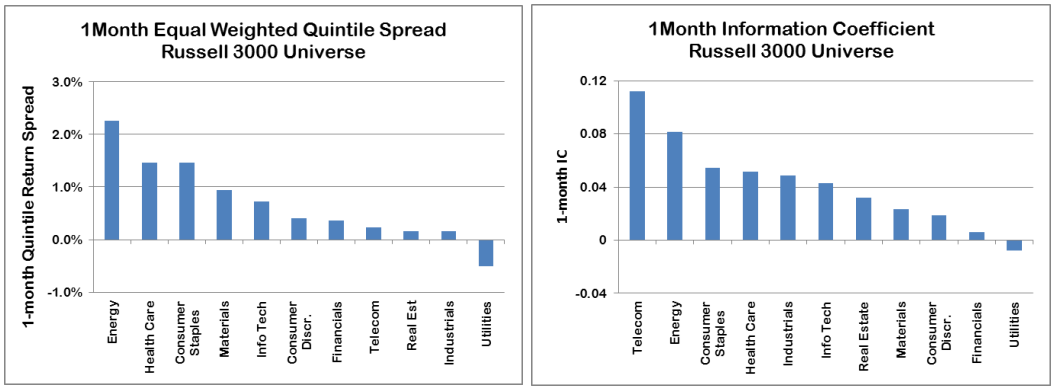


Source: S&P Global Market Intelligence Quantamental Research. All returns and indices are unmanaged, statistical composites and their returns do not include payment of any sales charges or fees an investor would pay to purchase the securities they represent. Such costs would lower performance. It is not possible to invest directly in an index. Past performance is not a guarantee of future results. Data as of 12/31/2017.

4.2 Sector Performance in 2017

Figure 20 breaks out the average monthly quintile return spread and information coefficient of the model by GICS sector. The PMM generated average positive return spreads in all sectors with the exception of Utilities during 2017.

Figure 20 - Price Momentum Model Sector:
1-Month Equal Weighted Historical Quintile Spread and Information Coefficient
Russell 3000 Universe (January 2017 – December 2017)



Source: S&P Global Market Intelligence Quantamental Research. All returns and indices are unmanaged, statistical composites and their returns do not include payment of any sales charges or fees an investor would pay to purchase the securities they represent. Such costs would lower performance. It is not possible to invest directly in an index. Past performance is not a guarantee of future results. Data as of 12/31/2017.

4.3 Quintile Portfolio Characteristics and Portfolio Tilt Neutralization

Table 14 shows the median market capitalization and 60-month CAPM beta of the top and bottom quintile portfolios. Similar to the other models, the PMM has a large capitalization bias. The median market capitalization of the Quintile 1 portfolios was $2.49 billion, compared with $1.11 billion, for the short (Quintile 5) portfolio. The CAPM beta difference was also material, with the PMM favoring lower beta stocks in the Quintile 1 portfolio (1.0) relative to the short portfolio (1.15). When neutralizing for CAPM beta and size, the average long-only performance of the PMM was reduced from 0.49% per month to 0.15%, indicating that nearly two-thirds of the PMM model may be attributed to exposure to beta and size.

Table 14 - Price Momentum Model: Median Market Cap and 60-Month CAPM Beta Quintile 1 – Quintile 5
Russell 3000 Universe (January 2017 – December 2017)

Median Measure	Quintile 1	Quintile 5
Market Cap ($ Million)	2,493	1,112
60M CAPM Beta	1.00	1.15

Table 15 - Price Momentum Model: Original and Beta/Size Neutralized Historical Performance
Russell 3000 Universe (January 2017 – December 2017)

Model	Average 1-Month Quintile Return Spread	Average 1-Month IC
Original PMM	0.49%	0.036
Beta/Size Neutral PMM	0.15%	0.023

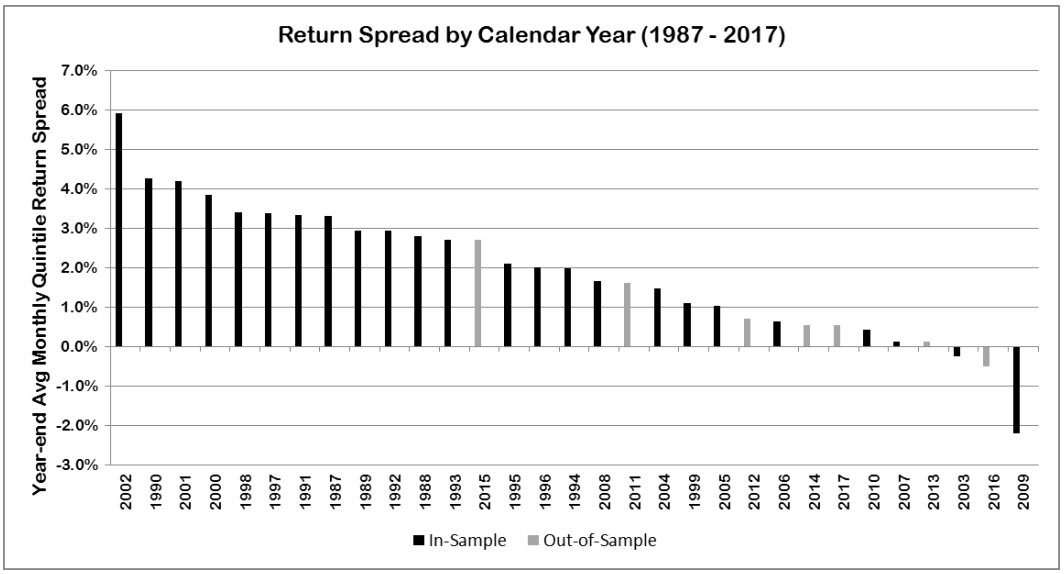
Source For Table 14 and 15: S&P Global Market Intelligence Quantamental Research. All returns and indices are unmanaged, statistical composites and their returns do not include payment of any sales charges or fees an

investor would pay to purchase the securities they represent. Such costs would lower performance. It is not possible to invest directly in an index. Past performance is not a guarantee of future results. Data as of 12/31/2017.

4.4 Historical Comparison

The PMM model's 2017 monthly quintile return spread of 0.49% was the 7th lowest across all calendar years. The worst performing year for the model was in 2009 when price momentum as a theme failed dramatically as the financial crisis ended.

Figure 16 - Price Momentum Model: Historical Year Average Monthly Quintile Return Spread
Russell 3000 Universe (January 1987 – December 2017)



Source: S&P Global Market Intelligence Quantamental Research. All returns and indices are unmanaged, statistical composites and their returns do not include payment of any sales charges or fees an investor would pay to purchase the securities they represent. Such costs would lower performance. It is not possible to invest directly in an index. Past performance is not a guarantee of future results. Data as of 12/31/2017.

5. Model Stability

We measure model stability in 2017 using the autocorrelation of monthly ranks, shown in Table 17. The correlations were in line with what were observed during backtests. The relatively high autocorrelation for the GBM, VBM, and QM suggest that there was limited turnover in the quantile portfolios formed based on these models. This is a favorable characteristic as it indicates reduced portfolio turnover and trading costs.

Table 17- Model 1-Month Rank Autocorrelation
Russell 3000 Growth / Russell 3000 Value / Russell 3000
(January 2017 – December 2017)

Model	1-month Rank Autocorrelation
Growth Benchmark Model	0.90
Value Benchmark Model	0.91
Quality Model	0.89
Price Momentum Model	0.59

Source: S&P Global Market Intelligence Quantamental Research. All returns and indices are unmanaged, statistical composites and their returns do not include payment of any sales charges or fees an investor would pay to purchase the securities they represent. Such costs would lower performance. It is not possible to invest directly in an index. Past performance is not a guarantee of future results. Data as of 12/31/2017.

6. Conclusions

The year 2017 marked the return of security selection, as correlation among securities and co-movement across strategies fell. The S&P 500 has notched 14 consecutive months of positive total returns, a feat only surpassed one other time since the index inception. Three of the four models tracked in this paper- Growth, Quality, and Price Momentum fared well, although Value did not. Though the models' performance was strong, the performance was muted from a historical context.

Appendix A

Definitions of Strategy Style Composites

Style Composites	Description
Analyst Expectations	A combination of analyst forecast based factors that reflect the sentiment among the analysts.
Capital Efficiency	A combination of factors that measure a firm's ability to deliver excess returns over its cost of capital.
Earnings Quality	A combination of factors that measure the persistence and stability of a firm's earnings.
Historical Growth	A combination of growth in a firm's earnings, cash flows and turnover.
Price Momentum	A combination of short- and long-term stock price movements.
Size	A combination of market capitalization and sales of a firm.
Valuation	A combination of six valuation metrics to assess the relative attractiveness of a firm based on its fundamentals.
Volatility	A combination of stock return dispersions and beta.

Appendix B

The Global Industry Classification Standard (GICS®) was jointly developed by Standard & Poor's and MSCI Barra to meet the global financial community's need for one complete, consistent set of global sector and industry definitions. The GICS methodology has helped pave the way for sector-based investing by providing transparency and efficiency to the investment process. With GICS, sell-side research and reporting can be organized around industry data without geographic limitations.

The GICS methodology has been commonly accepted as an industry analysis framework for investment research, portfolio management and asset allocation. The GICS classification system currently consists of 11 sectors, 24 industry groups, 68 industries and 157 sub-industries. The GICS sectors are:

- Consumer Discretionary
- Consumer Staples
- Energy
- Financials
- Health Care
- Industrials
- Information Technology
- Materials
- Telecommunication Services
- Utilities
- Real Estate

Our Recent Research

September 2017: **Natural Language Processing, Part I: Primer**

Given the growing interest in NLP among investors, we are publishing this primer to demystify many aspects of NLP and provide three illustrations, with accompanying Python code, of how NLP can be used to quantify the sentiment of earnings calls. In our first example below, sector-level sentiment trends are generated providing insights around inflection points and accelerations. The other two illustrations are: i) stock-level sentiment changes and forward returns ii) language complexity of earnings calls

July 2017: Natural Language Processing Literature Survey

In client conversations, Natural Language Processing (NLP) and the analysis of unstructured data is a topic of regular conversation. S&P Global Market Intelligence offers several unstructured datasets garnering market attention. The first is earnings call transcripts, with unique speaker id's to identify who is speaking on the call. The second data set is the text content in the 10-K. In advance of a publication of Quantamental primer on NLP next month which will take readers through the process of handling unstructured data and generating sentiment scores, we offer this literature survey. What follows are ten papers that the team has identified as being of particular interest to investors on this topic.

June 2017: Research Brief: Four Important Things to Know About Banks in a Rising Rate Environment

With the Fed signaling further rate hikes ahead, bank investors may want to know which investment strategies have worked best in a rising rate environment historically. This paper leverages our empirical work on the SNL Bank fundamental data to aid investors in selecting bank stocks as rates rise.

April 2017: Banking on Alpha: Uncovering Investing Signals Using SNL Bank Data

This study leverages S&P Global Market Intelligence's SNL Financial data to answer three questions of importance to bank investors: 1. Which widely-used investment strategies have historically been profitable? 2. Which lesser-known strategies deserve wider attention? 3. How do these strategies perform across varying macro environments: rising vs. falling interest rates and above- vs. below-average financial stress?

March 2017: Capital Market Implications of Spinoffs

Spinoff activities have picked up in recent years. In 2015, more than $250 billion worth of spinoff transactions were closed globally - the highest level in the last 20 years. This report analyzes the short- and long-term performance of spun-off entities and their parent companies in the U.S. and international markets. We also examine a related but distinct corporate restructuring activity – equity carve-outs, which separate a subsidiary through a public offering.

January 2017: U.S. Stock Selection Model Performance Review 2016

2016 proved to be a challenging year for active investing. Against a backdrop of a sharp selloff in equities at the beginning of the year and political uncertainty over the course of the year, valuation was the only fundamental investing style that delivered positive excess returns. In this report, we review the performance of S&P Global Market Intelligence's four U.S. stock selection models in 2016.

November 2016: Electrify Stock Returns in U.S. Utilities

October 2016: **A League of their Own: Batting for Returns in the REIT Industry - Part 2**

September 2016: **A League of their Own: Batting for Returns in the REIT Industry - Part 1**

August 2016: Mergers & Acquisitions: The Good, the Bad and the Ugly (and how to tell them apart)

July 2016: Preparing for a Slide in Oil Prices -- History May Be Your Guide

June 2016: Social Media and Stock Returns: Is There Value in Cyberspace?

April 2016: An IQ Test for the "Smart Money" – Is the Reputation of Institutional Investors Warranted?

March 2016: Stock-Level Liquidity – Alpha or Risk? - Stocks with Rising Liquidity Outperform Globally

February 2016: U.S. Stock Selection Model Performance Review - The most effective investment strategies in 2015

January 2016: What Does Earnings Guidance Tell Us? – Listen When Management Announces Good News

December 2015: Equity Market Pulse – Quarterly Equity Market Insights Issue 6

November 2015: Late to File - The Costs of Delayed 10-Q and 10-K Company Filings

October 2015: Global Country Allocation Strategies

September 2015: Equity Market Pulse – Quarterly Equity Market Insights Issue 5

September 2015: Research Brief: Building Smart Beta Portfolios

September 2015: Research Brief – Airline Industry Factors

August 2015: Point-In-Time vs. Lagged Fundamentals – This time i(t')s different?

August 2015: Introducing S&P Capital IQ Stock Selection Model for the Japanese Market

July 2015: Research Brief – Liquidity Fragility

June 2015: Equity Market Pulse – Quarterly Equity Market Insights Issue 4

May 2015: Investing in a World with Increasing Investor Activism

April 2015: Drilling for Alpha in the Oil and Gas Industry – Insights from Industry Specific Data & Company Financials

March 2015: Equity Market Pulse – Quarterly Equity Market Insights Issue 3

February 2015: U.S. Stock Selection Model Performance Review - The most effective investment strategies in 2014

January 2015: Research Brief: Global Pension Plans - Are Fully Funded Plans a Relic of the Past?

January 2015: Profitability: Growth-Like Strategy, Value-Like Returns - Profiting from Companies with Large Economic Moats
November 2014: Equity Market Pulse – Quarterly Equity Market Insights Issue 2

October 2014: Lenders Lead, Owners Follow - The Relationship between Credit Indicators and Equity Returns

August 2014: Equity Market Pulse – Quarterly Equity Market Insights Issue 1

July 2014: Factor Insight: Reducing the Downside of a Trend Following Strategy

May 2014: Introducing S&P Capital IQ's Fundamental China A-Share Equity Risk Model

April 2014: Riding the Coattails of Activist Investors Yields Short and Long Term Outperformance

March 2014: Insights from Academic Literature: Corporate Character, Trading Insights, & New Data Sources

February 2014: Obtaining an Edge in Emerging Markets

February 2014: U.S. Stock Selection Model Performance Review

January 2014: Buying Outperformance: Do share repurchase announcements lead to higher returns?

October 2013: Informative Insider Trading - The Hidden Profits in Corporate Insider Filings

September 2013: Beggar Thy Neighbor – Research Brief: Exploring Pension Plans

August 2013: Introducing S&P Capital IQ Global Stock Selection Models for Developed Markets: The Foundations of Outperformance

July 2013: Inspirational Papers on Innovative Topics: Asset Allocation, Insider Trading & Event Studies

June 2013: Supply Chain Interactions Part 2: Companies – Connected Company Returns Examined as Event Signals

June 2013: Behind the Asset Growth Anomaly – Over-promising but Under-delivering

April 2013: Complicated Firms Made Easy - Using Industry Pure-Plays to Forecast Conglomerate Returns.

March 2013: Risk Models That Work When You Need Them - Short Term Risk Model Enhancements

March 2013: Follow the Smart Money - Riding the Coattails of Activist Investors

February 2013: Stock Selection Model Performance Review: Assessing the Drivers of Performance in 2012

January 2013: Research Brief: Exploiting the January Effect Examining Variations in Trend Following Strategies

December 2012: Do CEO and CFO Departures Matter? - The Signal Content of CEO and CFO Turnover

November 2012: 11 Industries, 70 Alpha Signals -The Value of Industry-Specific Metrics

October 2012: Introducing S&P Capital IQ's Fundamental Canada Equity Risk Models

September 2012: Factor Insight: Earnings Announcement Return – Is A Return Based Surprise Superior to an Earnings Based Surprise?

August 2012: Supply Chain Interactions Part 1: Industries Profiting from Lead-Lag Industry Relationships

July 2012: Releasing S&P Capital IQ's Regional and Updated Global & US Equity Risk Models

June 2012: Riding Industry Momentum – Enhancing the Residual Reversal Factor

May 2012: The Oil & Gas Industry - Drilling for Alpha Using Global Point-in-Time Industry Data

May 2012: Case Study: S&P Capital IQ – The Platform for Investment Decisions

March 2012: Exploring Alpha from the Securities Lending Market – New Alpha Stemming from Improved Data

January 2012: S&P Capital IQ Stock Selection Model Review – Understanding the Drivers of Performance in 2011

January 2012: Intelligent Estimates – A Superior Model of Earnings Surprise

December 2011: Factor Insight – Residual Reversal

November 2011: Research Brief: Return Correlation and Dispersion – All or Nothing

October 2011: The Banking Industry

September 2011: Methods in Dynamic Weighting

September 2011: Research Brief: Return Correlation and Dispersion

July 2011: Research Brief - A Topical Digest of Investment Strategy Insights

June 2011: A Retail Industry Strategy: Does Industry Specific Data tell a different story?

May 2011: Introducing S&P Capital IQ's Global Fundamental Equity Risk Models

May 2011: Topical Papers That Caught Our Interest

April 2011: Can Dividend Policy Changes Yield Alpha?

April 2011: CQA Spring 2011 Conference Notes

March 2011: How Much Alpha is in Preliminary Data?
February 2011: Industry Insights – Biotechnology: FDA Approval Catalyst Strategy

January 2011: US Stock Selection Models Introduction

January 2011: Variations on Minimum Variance

January 2011: Interesting and Influential Papers We Read in 2010

November 2010: Is your Bank Under Stress? Introducing our Dynamic Bank Model

October 2010: Getting the Most from Point-in-Time Data

October 2010: Another Brick in the Wall: The Historic Failure of Price Momentum

July 2010: Introducing S&P Capital IQ's Fundamental US Equity Risk Model

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