

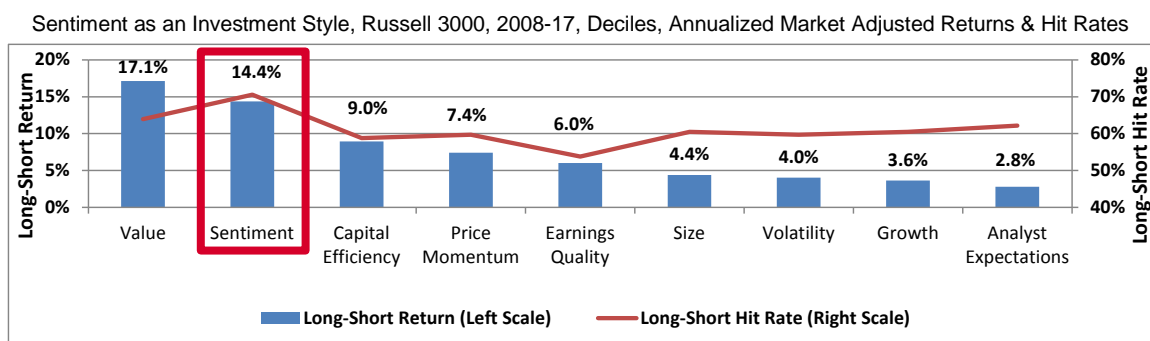
Their Sentiments Exactly:

Sentiment Signal Diversity Creates Alpha Opportunity

Author
Richard Tortoriello
Quantamental Research
(212) 438-9506
richard.tortoriello@spglobal.com

Investors sometimes view sentiment signals as interchangeable: one indicator is the same as the next. Our research shows that this is far from the case. In this report we show that: a) sentiment-based signals from different types of market participants (management, analysts, hedge funds) have each been historically predictive; b) such signals have low correlations with each other; and c) combining sentiment indicators in a simple two-factor framework produces historically strong results. In fact, sentiment as a “style” of investing¹ compares favorably to other quantitative investment styles over our test period (see graph below). Our findings for the Russell 3000 include:

- **Companies where management is both positive/optimistic and fact-focused outperform historically.** Combining two earnings call transcript factors – percent positive words and numbers to words – produces a strategy with an annualized long-only active return of 5.7%, a hit rate of 72%,² and an information ratio of 2.0 (Table 4).
- **Hedge fund sentiment confirms and complements management sentiment.** Combining management percent positive words, from earnings calls, with a hedge fund strategy (ownership level minus short interest) results in an annualized long-only active return of 5.1%, a long-short return of 10.7%, and a long-short hit rate of 75% (Table 5).
- **Market sentiment surrounding earnings calls amplifies the effectiveness of earnings transcript-based signals.** A blend of management percent positive words and earnings announcement return results in a 5.3% annualized long-only active return, a 71% hit rate, and a 1.8 information ratio (Table 6).
- **Analyst sentiment, as reflected in target price/recommendation changes, adds an important voice to ownership-based signals.** Combining analyst recommendation change with a hedge fund ownership strategy results in a 5.0% long-only active return, an 10.9% long-short return, and a long-short information ratio of 2.2 (Table 8).



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 07/31/2018.

¹ “Sentiment Style” is an equal-weighted blend of the six sentiment factors presented in this paper. All other style factors are from S&P Global Market Intelligence’s Alpha Factor Library (see Appendix B).

² All returns and hit rates shown in the text of this page are significant at the 1% level. Long-only active return is the annualized average return in excess of the equal-weighted index for the “top” portfolio. Hit rate is the percentage of times a portfolio outperforms the index.

1. Introduction

Investor sentiment reflects a mental attitude regarding the *outlook* for an individual stock or for the stock market as a whole. Although not visible itself, investor sentiment is revealed through *action*: word choice, share purchases and sales, stock price action, estimate changes, etc. Stock-level sentiment indicators include:

- Retail investor sentiment (e.g., from social media posts)
- Institutional investor sentiment (e.g., the level or change of holdings)
- Analyst sentiment (earnings forecast, target price, or recommendation changes)
- Market sentiment (price reaction to news events, earnings releases, etc.)
- Managerial sentiment (earnings call transcript tone, etc.)

Sentiment may be based on facts or emotions or a mix of both. Research has shown that emotionally-based sentiment acts as a contrary indicator, particularly at extremes (e.g., see Simon & Wiggins, 2001). Similarly, retail investor sentiment is typically seen as an emotionally-based contrary indicator (see Hvidkjaer 2006, Burghardt et al. 2008). Our research shows that stock-level sentiment signals derived from corporate management, institutional investors, and sell-side analysts have historically had a *non*-contrarian payoff, where strong positive sentiment is associated with outperformance and strong negative sentiment with underperformance.

This paper focuses on interactions among four types of sentiment: managerial, institutional investor, sell-side analyst, and overall market. [Zhao \(2018\)](#) identified several managerial sentiment and behavioral signals derived from earnings call transcripts, including the percentage of positive words used by management and analysts and the percentage of numbers used to total words (both used in this paper). His research builds on the work of Loughran and McDonald (2011 and 2015), among others.

[Ning et al. \(2016\)](#) explored the S&P Global Institutional Ownership (IO) database, presenting four classes of IO signals that have demonstrated historical efficacy. Their research on net arbitrage trading, a factor used in this report, is based on an earlier draft of [Chen et al. \(2018\)](#). This paper also examines [Oyeniyi and Fruin's \(2012\)](#) research, which found that stock market returns around a firm's earnings announcement date ("earnings announcement return") are both significant and superior to earnings surprise in the post Regulation FD era (see also [Kishore et al. 2006](#)).

This paper also includes two analyst estimate-related factors: 1-month target price change and recommendation change. Both use analyst consensus data. The power of analyst sentiment in terms of analyst EPS estimate revisions has been well documented: e.g., [Givoly & Lakonishok \(1979\)](#), [Stickel \(1991\)](#), and [Barth and Hutton \(2004\)](#). Research on analyst target price and recommendations *revisions*, however, is less common. [Asquith et al. \(2005\)](#) note that "changes in the summary earnings forecasts, stock recommendations, and price targets all provide independent information." Our research confirms this finding.

2. Univariate Factor Definitions and Results

Our research includes six univariate signals that cover managerial, hedge fund, analyst, and overall market sentiment (Table 1).

Table 1. Univariate Sentiment Factor Definitions

Factor	Definition	Sentiment Type
% Positive Words	Number of positive words divided by total number of words (entire earnings call transcript).	Managerial sentiment
% Numbers to Words	Numerical tokens divided by total word tokens (entire earnings call transcript).	Managerial sentiment
Earnings Announcement Return	The price movement of a stock from one day before to two days after an earnings release.	Market sentiment
Net Arbitrage Trading	Hedge fund ownership as a percentage of shares outstanding minus short interest as a percentage of shares outstanding.	Hedge Fund / Short Seller Sentiment
1-Month Change in Target Price	Current consensus mean target price divided by the mean target price 1 month ago.	Analyst sentiment
Analyst Recommendation Change	((analyst # of strong buys and buys minus analyst # of strong sells and sells) divided by the total # of analyst recommendations) minus the 12-month exponential moving average of the same ratio .	Analyst sentiment

Source: S&P Global Market Intelligence Quantamental Research

All univariate sentiment signals produced historically significant results over the test period (Table 2). All but one signal (net arbitrage trading) have statistically significant annualized long and long-short active returns and hit rates. Note especially the analyst recommendation change factor, which has a 77% long-short hit rate with an information ratio of 1.66, unusually high for an individual factor.

Table 2. Univariate Sentiment Factor Results, Deciles, Russell 3000, Carhart 4-Factor Adjusted Returns, Start Date through 2017³

Factor/Signal	Sort Order	Start Date	Avg Portfolio Count	Average 1-Month IC	Ann Long-Only Active Rtrn	Long-Only Hit Rate	Ann Long-Only Info Ratio	Ann Long-Short Active Rtrn	Long-Short Hit Rate	Ann Long-Short Info Ratio
% Positive Words	D	Jan-08	235	0.017***	3.46%***	67.2%***	1.10	3.98%**	60.5%**	0.78
% Numbers to Words	D	Jan-08	209	0.010***	3.34%***	64.7%***	1.33	5.69%***	63.9%***	1.20
Earnings Announcement Return	D	Jan-08	281	0.018***	2.95%***	65.5%***	0.92	7.46%***	63.9%***	1.02
Net Arbitrage Trading	D	Jan-04	284	0.018***	1.35%	56.3%	0.37	9.52%***	72.5%***	1.53
Target Price 1 Month Change	D	Jan-04	239	0.020***	6.48%***	66.5%***	1.42	11.93%***	64.7%***	1.08
Analyst Recommendation Change	D	Jan-04	260	0.018***	3.49%***	67.7%***	1.24	8.10%***	76.6%***	1.66

*** = Significant at the 1% level; ** = Significant at the 5% level; * = Significant at the 10% level; Sort Order D = Descending

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 07/31/2018.

³ Returns are adjusted for returns attributable to four commonly-recognized risk factors: market, size, value, and price momentum.

Correlations among individual sentiment signals are low (Table 3). Only two pairs have a statistically significant correlation: 1-month target price change & analyst recommendation change (0.17, significant at the 10% level) and 1-month target price change & earnings announcement return (0.25, significant at the 1% level).

Table 3. Univariate Sentiment Factor Rank Correlations, January 2008 through November 2017

		%PstvWrds	%NmbrWrds	RecChange	NetArbTrd	ErnAnnRtrn	1MTgtChg
% Positive Words	%PstvWrds	1.00					
% Numbers to Words	%NmbrWrds	-0.12	1.00				
Analyst Recommendation Change	RecChange	0.06	0.02	1.00			
Net Arbitrage Trading	NetArbTrd	0.05	0.04	0.07	1.00		
Earnings Announcement Return	ErnAnnRtrn	0.12	0.03	0.09	0.04	1.00	
Target Price 1-Month Change	1MTgtChg	0.09	0.02	0.17	0.04	0.25	1.00

Source: S&P Global Market Intelligence Quantamental Research, Data as of 07/31/2018.

3. Bivariate Sentiment Interactions

This section illustrates the strong historical results obtained by simple two-factor sentiment interactions. We use a 3 X 3 independent sort for all factor interaction results reported in this paper.

All returns shown are annualized Carhart 4-factor adjusted⁴ and Winsorized to three standard deviations. Returns shown are “active,” or excess, returns: returns in excess of the equal-weighted benchmark return. Factor ranks are calculated on a sector-neutral (GICS level I) basis. Portfolios are rebalanced **monthly**.

Cells in the tables below that are shaded green represent positive returns and/or above 50% hit rates that have statistical significance at the 10% level or better; cells shaded orange have negative returns and/or below 50% hit rates that are significant.

NOTE: All combined strategies have active returns that are significantly better than those of the individual factors that form the combination. See the [Appendix A](#) for combined strategy vs. univariate factor differential returns and the statistical significance of those returns.

⁴ Returns are adjusted to remove that portion of return attributable to four commonly-recognized “risk factors:” size (market capitalization), market beta, value (book to price), and price momentum (12-month minus 1-month momentum).

3.1 Percent Numbers to Words & Percent Positive Words

Two different earnings call sentiment signals provide a strong historical combination.

The combined signal selects companies where managers/analysts express enthusiasm about corporate results (% positive words) and accompany that enthusiasm by a focus on facts (% numbers to words). The average rank correlation between the factors is -0.12.

The numbers to words factor is, strictly speaking, a “behavioral” signal. However, the choice to focus more-on-numbers or more-on-words may also reflect management’s sentiment regarding quarterly results (confidence or lack-of-confidence).

A glowing earnings call narrative can be used to disguise mediocre performance; thus, the combination of a positive narrative accompanied by a numerical (factual) focus is a good one. The strategy is particularly strong on the long side (Table 4), with a 5.7% long-only return, a 72% hit rate (both significant at the 1% level), and an information ratio (IR) of 2.03 – the highest long-only IR of all interactions tested. Average monthly two-way turnover⁵ is moderate, at approximately 27% for the top and bottom portfolios (cell 1,1 and cell 3,3, respectively).

Table 4. % Numbers to Words & % Positive Words, Russell 3000, Carhart 4-Factor Adjusted Returns, January 2008 – December 2017

		Portfolio Active Returns			Average Portfolio Size			
		% Positive Words (1 = Most Positive)			Average Portfolio Size			
Quantile		1	2	3	Quantile	1	2	3
Numbers to Words (1 = Most Numbers)	1	5.67%***	1.24%	1.61%**	1	198	222	279
	2	3.22%***	-0.06%	-0.80%	2	240	244	212
	3	1.62%	-1.28%	-3.72%***	3	264	236	195

		Portfolio Level Hit Rates			Average Monthly Two-Way Turnover			
		% Positive Words (1 = Most Positive)			Average Monthly Two-Way Turnover			
Quantile		1	2	3	Quantile	1	2	3
Numbers to Words (1 = Most Numbers)	1	72.3%***	52.9%	55.5%	1	27%	31%	22%
	2	67.2%***	52.1%	41.2%*	2	31%	35%	32%
	3	58.8%*	42.0%*	37.8%***	3	23%	30%	26%

*** = Significant at the 1% level; ** = Significant at the 5% level; * = Significant at the 10% level

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 07/31/2018.

⁵ Two-way turnover accounts for both stocks portfolio stocks sold and new stocks purchased. For example, if the entire portfolio was sold and the same number of new stocks was purchased in any given period the two-way turnover would be 200%.

3.2 Percent Positive Words & Net Arbitrage Trading

Hedge fund sentiment effectively complements managerial sentiment. Hedge funds “vote through ownership,” while managers express their sentiment publicly on earnings calls, at conferences, etc. Importantly, hedge fund sentiment alone is improved when combined with short sale data, to determine how much of that sentiment is being “arbitraged away.”

The “net arbitrage trading” strategy subtracts the percentage of a firm’s shares outstanding sold short from the percentage of shares held by hedge funds. A high net percentage of hedge fund shares may indicate an arbitrage opportunity, while a low net percentage may indicate that the opportunity is fully arbitrated. (See [Ning et al. 2016](#) and [Chen et al. 2018](#).)

Positive managerial sentiment backed up by positive hedge fund sentiment means that some of the savviest investors (hedge funds) agree with management’s favorable outlook. The short-side of this combination (Table 5) is equivalent in strength to the long side, with 5.1% long-only active return vs. a -5.6% short-side return, with respective 70% / 30% hit rates (all significant at the 1% level). The combined long-short hit rate is 75%, and the annualized long-short information ratio is 1.93. Two-way turnover is also moderate.

Table 5. Percent Positive Words & Net Arbitrage Trading, Russell 3000, Carhart 4-Factor Adjusted Returns, January 2008 – December 2017

		Portfolio Active Returns					Average Portfolio Size		
		Net Arbitrage Trading (1 = Least Arbitrated)					Average Portfolio Size		
		Quantile	1	2	3	Quantile	1	2	3
% Positive Words (1 = Most Positive)	1		5.09%***	4.45%***	-0.15%	1	263	288	236
	2		1.79%	0.92%	-2.87%***	2	247	264	270
	3		2.31%**	1.20%	-5.59%***	3	247	235	295

		Portfolio Level Hit Rates					Average Monthly Two-Way Turnover		
		Net Arbitrage Trading (1 = Least Arbitrated)					Average Monthly Two-Way Turnover		
		Quantile	1	2	3	Quantile	1	2	3
% Positive Words (1 = Most Positive)	1		69.7%***	70.6%***	53.8%	1	20%	24%	22%
	2		58.0%*	56.3%	37.0%***	2	28%	33%	28%
	3		56.3%	58.8%*	30.3%***	3	21%	28%	20%

*** = Significant at the 1% level; ** = Significant at the 5% level; * = Significant at the 10% level

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 07/31/2018.

3.3 Percent Positive Words & Earnings Announcement Return

Market sentiment surrounding earnings announcements confirms management sentiment from the earnings call. Research (see [Oyeniya & Fruin, 2012](#) and Kishore et al., 2006) shows that earnings announcement return (EAR) – the market return surrounding an earnings report – is a stronger signal than earnings surprise alone.

Earnings surprise lacks a forward-looking component, and may also not reflect other important information, whereas EAR captures all public information surrounding the earnings release. Earnings announcement return is calculated as the percentage price return from one day prior to two days following an earnings release. There is a non-significant rank correlation (0.12) between EAR and % positive words.

Positive earnings call sentiment along with a positive market reaction to earnings means investors share management’s belief that the quarterly results and outlook are good. The combined % positive words & EAR interaction (Table 6) produces a long-only return of 5.3% (71% hit rate) and a long-short return of 8.0% (68% hit rate), all significant at the 1% level. The long-only information ratio is 1.82 and the long-short IR is 1.23.

Table 6. % Positive Words & Earnings Announcement Return, Russell 3000, Carhart 4-Factor Adjusted, January 2008 – December 2017

		Portfolio Active Returns					Average Portfolio Size		
		Earnings Announcement Return (1 = Highest)					Average Portfolio Size		
		Quantile	1	2	3	Quantile	1	2	3
% Positive Words (1 = Most Positive)	1		5.32%***	2.83%***	1.04%	1	306	262	217
	2		1.57%	0.01%	-1.96%	2	263	254	259
	3		0.76%	-0.68%	-2.64%*	3	226	244	304

		Portfolio Level Hit Rates					Average Monthly Two-Way Turnover		
		Earnings Announcement Return (1 = Highest)					Average Monthly Two-Way Turnover		
		Quantile	1	2	3	Quantile	1	2	3
% Positive Words (1 = Most Positive)	1		71.4%***	68.9%***	53.8%	1	29%	31%	33%
	2		60.5%**	49.6%	41.2%*	2	35%	36%	35%
	3		53.8%	46.2%	39.5%**	3	32%	32%	29%

*** = Significant at the 1% level; ** = Significant at the 5% level; * = Significant at the 10% level

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 07/31/2018.

3.4 Net Arbitrage Trading & 1-Month Target Price Change

Changes in sell-side analyst views provide strong confirmation to hedge-fund ownership signals. Analysts provide a pivotal voice in the stock market. Although consensus target prices and recommendations lack predictive power themselves, our research shows that short-term *changes* in target prices and recommendations have been historically predictive. While more sophisticated factors can be built, the simple 1-month change in consensus target price provides a relatively strong signal.

Improving analyst sentiment, along with substantial hedge fund holdings (net of short sales), show that two sophisticated market participants hold positive views on a stock. The combined net arbitrage trading & 1-month target price change interaction (Table 7) produces a long-only return of 6.2% (73% hit rate) and a long-short return of 11.5% (74% hit rate), all significant at the 1% level. The long-only information ratio is 1.57 and the long-short ratio is 1.60.

However, monthly two-way turnover is very high, at 66% for the top portfolio (cell 1,1) and 56% for the bottom portfolio (cell 3,3). This is due to the target price strategy, which has monthly turnover of 86% for the first decile and 84% for the 10th decile. (Analysts make frequent target price changes, particularly with stocks that are trending.)

Table 7. Net Arbitrage Trading & 1-Month Target Price Change, Russell 3000, Carhart 4-Factor Adjusted, January 2004 – December 2017

		Portfolio Active Returns			Average Portfolio Size			
		1-Month Target Price Change (1 = Highest)			Average Portfolio Size			
	Quantile	1	2	3	Quantile	1	2	3
Net Arbitrage Trading (1 = Least Arbitrage)	1	6.17%***	2.34%***	0.78%	1	215	300	264
	2	3.62%***	2.36%***	1.29%	2	208	330	258
	3	1.24%	-2.89%***	-5.37%***	3	207	307	302
		Portfolio Level Hit Rates			Average Monthly Two-Way Turnover			
		1-Month Target Price Change (1 = Highest)			Average Monthly Two-Way Turnover			
	Quantile	1	2	3	Quantile	1	2	3
Net Arbitrage Trading (1 = Least Arbitrage)	1	72.5%***	66.5%***	54.5%	1	66%	61%	58%
	2	63.5%***	58.7%**	52.7%	2	71%	61%	64%
	3	52.1%	36.5%***	31.7%***	3	69%	62%	56%

*** = Significant at the 1% level; ** = Significant at the 5% level; * = Significant at the 10% level

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 07/31/2018.

3.5 Net Arbitrage Trading & Analyst Recommendation Change

Substituting analyst recommendation change for target price change produces a more stable and much lower-turnover strategy. Although the rank correlation between consensus target price and recommendation change is statistically significant (10% level), it is also relatively low (0.17). Because recommendation changes occur much less frequently than target price changes, a recommendation-based strategy has significantly lower turnover than a target price-based one.

Analyst recommendation change is calculated by adding strong buys and buys, subtracting strong sells and sells, and dividing the difference by the total number of recommendations (percent buys minus sells). The 12-month exponential moving average of this ratio (percent buys minus sells) is then subtracted from the ratio itself. The resulting difference represents the recent change in consensus analyst sentiment.

The net arbitrage trading / analyst recommendation change combination is ideal in that recommendation change improves the interaction on the long side, while net arbitrage trading improves the short side. The net arbitrage trading strategy contains short-sale data, which is most effective for the short portfolio, while increases in analyst recommendations are effective on the long side.

The combined strategy (Table 8) has a 5.00% long-only return (70% hit rate), and a 10.9% long-short return (75% hit rate), all significant at the 1% level. The annualized information ratios are 1.68 for long-only and 2.17 for long-short, the latter being the highest IR for any factor pair tested. Monthly turnover is moderate, at 26% for the top portfolio (cell 1,1) and 28% for the bottom portfolio (cell 3,3).

Table 8. Net Arbitrage Trading & Analyst Recommendation Change, Russell 3000, Carhart 4-Factor Adjusted Returns, January 2004 – December 2017

Portfolio Active Returns				Average Portfolio Size				
Analyst Recommendation Change (1 = Most Positive)				Average Portfolio Size				
		1	2	3	Quantile	1	2	3
Net Arbitrage Trading (1 = Least Arbitrage)	1	5.00%***	2.75%***	0.02%	1	299	295	259
	2	3.61%***	1.26%**	1.36%**	2	287	319	264
	3	-0.56%	-2.63%***	-5.86%***	3	261	292	318

Portfolio Level Hit Rates				Average Monthly Two-Way Turnover				
Analyst Recommendation Change (1 = Most Positive)				Average Monthly Two-Way Turnover				
		1	2	3	Quantile	1	2	3
Net Arbitrage Trading (1 = Least Arbitrage)	1	70.1%***	66.5%***	53.3%	1	26%	33%	29%
	2	71.9%***	52.1%	55.7%	2	34%	38%	36%
	3	47.3%	35.3%***	24.6%***	3	30%	36%	28%

*** = Significant at the 1% level; ** = Significant at the 5% level; * = Significant at the 10% level

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 07/31/2018.

4. Russell 1000 and Russell 2000 Universe Results

As is typical with many investment strategies, **sentiment confirmation results are much weaker for large cap stocks (Russell 1000) than for small caps (Russell 2000)**. However, several factors have statistically significant active returns and hit rates for the Russell 1000 (Table 9).

The strongest overall Russell 1000 interaction is net arbitrage trading & 1-month target price change, which has an 8.5% long-short return with a 65% hit rate (both significant at 1%). However, the strategy suffers from high turnover, with monthly two-way turnover of 62% for the top portfolio and 55% for the bottom. The second strongest interaction, in our view, is positive words & net arbitrage trading. Turnover is much lower for this strategy (about 21% each for both top and bottom portfolios).

Table 9. Sentiment Confirmation Summary, Russell 1000, 3 X 3 Matrix, Long-Only and Long-Short, Carhart 4-Factor Adjusted Returns, Start Date through 2017

Factor/Signal	Sort Order	Start Date	Avg Portfolio Count	Ann Long-Only Active Rtrn	Long-Only Hit Rate	Ann Long-Only Info Ratio	Ann Long-Short Active Rtrn	Long-Short Hit Rate	Ann Long-Short Info Ratio
% Numbers to Words & % Positive Words	D	Jan-08	98	2.07%**	57.1%	0.70	2.61%*	51.3%	0.53
% Positive Words & Net Arbitrage Trading	D	Jan-08	103	3.12%***	59.7%**	0.98	5.51%***	62.2%***	0.84
% Positive Words & Earnings Announcement Return	D	Jan-08	102	1.70%	59.7%**	0.52	1.07%	61.3%**	0.15
Net Arbitrage Trading & 1-Month Target Price Change	D	Jan-04	105	3.64%***	62.9%***	0.92	8.46%***	65.3%***	1.03
Net Arbitrage Trading & Analyst Recommendation Change	D	Jan-04	108	2.37%***	56.3%	0.72	5.81%***	61.1%***	0.86

*** = Significant at the 1% level; ** = Significant at the 5% level; * = Significant at the 10% level; Sort Order: D = descending

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 07/31/2018.

Results for Russell 2000 stocks (Table 10) are very strong, due most likely to their lower efficiency in incorporating new information into the stock price. All strategies have returns and hit rates significant at the 1% level.

In particular, the net arbitrage trading / analyst recommendation change and % positive words / earnings announcement return strategies stand out as having very high historical returns and high information ratios.

Table 10. Sentiment Confirmation Summary, Russell 2000, 3 X 3 Matrix, Long-Only and Long-Short, Carhart 4-Factor Adjusted Returns, Start Date through 2017

Factor/Signal	Sort Order	Start Date	Avg Portfolio Count	Ann Long-Only Active Rtrn	Long-Only Hit Rate	Ann Long-Only Info Ratio	Ann Long-Short Active Rtrn	Long-Short Hit Rate	Ann Long-Short Info Ratio
% Numbers to Words & % Positive Words	D	Jan-08	143	6.78%***	74.8%***	1.60	12.60%***	71.4%***	1.26
% Positive Words & Net Arbitrage Trading	D	Jan-08	163	7.09%***	71.4%***	1.54	14.53%***	73.1%***	1.97
% Positive Words & Earnings Announcement Return	D	Jan-08	165	7.59%***	75.6%***	1.92	10.74%***	69.7%***	1.15
Net Arbitrage Trading & 1-Month Target Price Change	D	Jan-04	169	8.24%***	66.5%***	1.64	14.81%***	71.9%***	1.66
Net Arbitrage Trading & Analyst Recommendation Change	D	Jan-04	185	6.45%***	70.1%***	1.69	14.24%***	76.0%***	2.20

*** = Significant at the 1% level; ** = Significant at the 5% level; * = Significant at the 10% level; Sort Order: D = descending

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 07/31/2018.

5. Data & Methodology

5.1 Earnings Call Transcript Data

Transcript data is a recent addition to the S&P Global Market Intelligence's Xpressfeed™ product. Historical coverage in the Russell 3000 universe starts in calendar Q1 2008. Among its key features, the data set captures the different segmentations of earnings calls by sections (e.g., prepared remarks vs. Q&A), by speaker types (e.g., managers, sell-side analysts, shareholders, etc.) and by professionals (e.g., Tim Cook) where the individual professional identifiers serve as a unique key that connects the Transcripts data set with the Professionals and Estimates data sets.

We impose a lag of three trading days on the transcript data to sufficiently account for the latency between an earnings call and its transcription. In the past five years, 99% of all earnings call transcripts are transcribed and in the database within 24 hours of a call.

Within the Russell 3000 universe, there is an average of 2400+ distinct firms since 2008 that have earnings call transcripts. The main reason for a missing earnings call transcript is that a firm does not hold earnings calls (e.g., Berkshire Hathaway).

5.2 Institutional Ownership Data

The S&P Global Ownership database covers over 55,000 public and private companies comprised of more than 25,000 institutional investment firms and 44,000 mutual funds. Historical data begins in 2004 for most items. In the U.S., ownership information is sourced from Form 13F. Since Form 13F is required to be filed within 45 days of the end of the calendar quarter, we lag the period-end-date based ownership data by 2 months in all backtests.

5.3 Analyst Estimate Data

S&P Global Estimates data is a comprehensive, standardized database of global, real-time financial forecasting measures on upgrades/downgrades, target price revisions, market-moving news or significant developments for public companies worldwide, and estimates based on the projections, models, analysis, and research of analysts, brokers, and the companies themselves. Estimates are sourced from research reports, research contributors, and news releases. Both consensus and detail data is available for company financial estimates, target prices, and recommendations.

6. Conclusion

Stock-level sentiment indicators from different market participants have low correlations with each other. In particular, sentiment signals from earnings call transcripts, hedge fund, analyst target price and recommendation changes, and market-based earnings surprise indicators interact well together. Two-factor combinations such as percent numbers to words & percent positive words and net arbitrage trading & analyst recommendation change make

strong historical investment strategies on their own, even after adjustment for commonly recognized risk factors.

Sentiment confirmation returns are much stronger for small-caps (Russell 2000 issues) than large caps (Russell 1000). However, active returns and hit rates have statistical significance for large cap stocks, as well. Thus, **we believe that a combination of sentiment factors that confirm and complement each other can add significant value to a multi-factor model.**

Appendix A – Differential Returns and Statistical Significance

Table A1 shows the differential long-only and long-short returns (last two columns) between the combined and univariate strategies, along with statistical significance.

Table A1. Differential Returns for Combined vs. Univariate Strategies, with Statistical Significance, Russell 3000, Carhart 4-Factor Adjusted Returns, Start Date – December 2017

Factor/Signal	Start Date	Ann Long-Only Active Return	Ann Long-Short Active Return	Long-Only Differential Return	Long-Short Differential Return
% Numbers to Words & % Positive Words	Jan-08	5.67%***	9.39%***		
% Numbers to Words	Jan-08	3.34%***	5.57%***	2.33%**	3.82%**
% Positive Words	Jan-08	3.46%***	3.96%**	2.21%**	5.43%***
% Positive Words & Net Arbitrage Trading	Jan-08	5.09%***	10.67%***		
% Positive Words	Jan-08	3.46%***	3.96%**	1.62%	6.71%***
Net Arbitrage Trading	Jan-08	1.01%	8.72%***	4.08%***	1.96%
% Positive Words & Earnings Announcement Return	Jan-08	5.32%***	7.95%***		
% Positive Words	Jan-08	3.46%***	3.96%**	1.85%**	3.99%***
Earnings Announcement Return	Jan-08	2.95%***	7.17%***	2.36%*	0.78%
Net Arbitrage Trading & 1-Month Target Price Change	Jan-04	6.17%***	11.54%***		
Net Arbitrage Trading	Jan-04	1.35%	8.86%***	4.83%***	2.68%
1-Month Target Price Change	Jan-04	6.48%***	11.39%***	-0.30%	0.15%
Net Arbitrage Trading & Analyst Recommendation Change	Jan-04	5.00%***	10.86%***		
Net Arbitrage Trading	Jan-04	1.35%	8.86%***	3.65%***	2.00%
Analyst Recommendation Change	Jan-04	3.49%***	7.78%***	1.51%	3.08%**

*** = Significant at the 1% level; ** = Significant at the 5% level; * = Significant at the 10% level

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 07/31/2018.

Appendix B – Alpha Factor Library Style Factor Definitions

Style factors are equal-weighted combinations of several constituent factors.

Price Momentum Style

12 Month – 1 Month Price Momentum

1 Month Price Reversal

1 Month Price High – 1 Month Price Low

9 Month Price Momentum

5 Day Price Reversal

Historical Growth Style

1 Year Change in Asset Adjusted Free Cash Flow

1 Year Change in Asset Adjusted Operating Cash Flow

1 Year Change in Sales Turnover

1 Year Change in Earnings per Share

Sustainable Growth Rate

Analyst Expectations

Expected Long-Term Growth

Analyst Earnings Estimate Diffusion

Standardized Unexpected Earnings

Number of EPS FY1 Revisions

Earnings Quality

Cash Conversion Cycle (Ascending sort)

Net Profit Margin

Working Capital Accruals (Ascending sort)

Accrual Ratio – Cash Flows (Ascending sort)

Net Income Stability

Valuation

Book to Price

Free Cash Flow to Price

EBITDA to Enterprise Value

Earnings to Price

Dividends to Price

Sales to Enterprise Value

Capital Efficiency

Return on Equity

Cash Flow Return on Invested Capital

Long-Term Debt to Equity (Ascending sort)

Capital Acquisition Ratio

1 Year Change in Shares Outstanding (Ascending sort)

Size

Log of Market Cap (Ascending sort)

Log of Trailing Twelve Month Sales (Ascending sort)

Volatility

12 Month Realized Price Volatility

1 Month Realized Price Volatility

60 Month CAPM Beta

90 Day Coefficient of Variation

References

- Asquith, P., Mikhail, M. B., & Au, A. S. (2005). Information Content of Equity Analyst Reports. *Journal of Financial Economics*, 245-282.
- Barber, B. M., Lehavy, R., & Trueman, B. (2010). Ratings Changes, Ratings Levels, and the Predictive Value of Analysts' Recommendations. *Financial Management*.
- Barth, M. E., & Hutton, A. P. (2004). Analyst Earnings Forecast Revisions and the Pricing of Accruals. *Review of Accounting Studies*, 59-96.
- Bradshaw, M. T., Brown, L. D., & Huang, K. (2013). Do Sell-Side Analysts Exhibit Differential Target Price Forecasting Ability? *Review of Accounting Studies*, 930-955.
- Brav, A., & Lehavy, R. (2003). An Empirical Analysis of Analysts' Target Prices: Short-term Informativeness and Long-term Dynamics. *The Journal of Finance*, 1933-1968.
- Burghardt, M., Czink, M., & Riordan, R. (2008). *Retail Investor Sentiment and the Stock Market*. Retrieved from SSRN: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1100038
- Chen, Y., Da, Z., & Huang, D. (2018). Arbitrage Trading: The Long and the Short of It. *The Review of Financial Studies*.
- Da, Z., Hong, K. P., & Lee, S. (2016). What Drives Target Price Forecasts and Their Investment Value? *Journal of Business Finance & Accounting*, 487-510.
- Feldman, R., Livnat, J., & Zhang, Y. (2012). Analysts' Earnings Forecast, Recommendation and Target Price Revisions. *The Journal of Portfolio Management*.
- Fisher, K. L., & Statman, M. (2000). Investor Sentiment and Stock Returns. *Financial Analysts Journal*, 16-23.
- Givoly, D., & Lakonishok, J. (1979). The information content of financial analysts' forecast of earnings. *Journal of Accounting and Economics*, 165-185.
- Hvidkjaer, S. (2006). *Small Trades and the Cross-Section of Stock Returns*. Retrieved from SSRN: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=869983
- Kishore, R., Brandt, M. W., Santa-Clara, P., & Venkatachalam, M. (2006). *Earnings Announcements are Full of Surprises*. Retrieved from SSRN: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=909563
- Loughran, T., & McDonald, B. (2011). When is a Liability not a Liability? Textual Analysis, Dictionaries, and 10-Ks. *Journal of Finance*, 66, 35-65.
- Loughran, T., & McDonald, B. (2015). The Use of Word Lists in Textual Analysis. *Journal of Behavioral Finance*, 16, 1-11.
- Ning, V., Ma, L., & Pope, D. (2016, April). *An IQ Test for the "Smart Money": Is the Reputation of Institutional Investors Warranted?* Retrieved from capitaliq.com.
- Oyenyi, T., & Fruin, P. (2012, September). *Factor Insight: Earnings Announcement Return - Is A Return Based Surprise Superior to an Earnings Based Surprise?* Retrieved from capitaliq.com.
- Simon, D. P., & Wiggins, R. A. (2001). S&P futures returns and contrary sentiment indicators. *The Journal of Futures Markets*, 447-462 .
- Stickel, S. (1991). Common stock returns surrounding earnings forecast revisions. *Journal of Accounting Research*, 1-42.
- Walker, M. M., & Claasen, B. A. (2006). What drives sell-side recommendation announcement return? *Financial Services Review*, 315-333.
- Zhao, F. (2018, September). *Natural Language Processing - Part II: Stock Selection: Alpha Unscripted: The Message within the Message in Earnings Calls*. Retrieved from capitaliq.com.

Our Recent Research

September 2018: Natural Language Processing – Part II: Stock Selection: Alpha Unscripted: The Message within the Message in Earnings Calls

Highlights include:

- Sentiment-based signals: Firms whose executives and analysts exhibited the highest positivity in sentiment during earnings calls outperformed their counterparts. Firms with the largest year-over-year positive sentiment change and firms with the strongest positive sentiment trend outperformed their respective counterparts.
- Behavioral-based signals: Firms whose executives provided the most transparency by using the simplest language and by presenting results with numbers outperformed their respective counterparts.
- Sentiment- and behavioral-based signals are not subsumed by commonly used alpha and risk signals.
- Positive language from the unscripted responses by the executives during the Q&A drove the overall predictability of the positive sentiment signal.
- The sentiment of CEOs has historically been more important than the sentiment of other executives.
- The aggregate sentiment of analysts historically enhanced the predictability of the 3-month FY1 EPS analyst revision signal.

July 2018: A Case of ‘Wag the Dog’? - ETFs and Stock-Level Liquidity

Highlights include:

- We present an ETF price impact model, which posits single-day impact of up to 370 bps / day on an individual security and up to 250 bps / day on the index itself. Analyses indicate the effect is transitory and reverses over a period of 3-5 trading days.
- The Feb 2018 market correction was accompanied by a \$25B outflow of assets from ticker SPY, the SSGA S&P 500 Trust ETF. Modeling suggests that as much as one-third of the pullback was due to price pressure from ETF trading and that securities more sensitive to ETF flow underperformed.
- Sensitivity to ETF flow is used to build a risk model, which generates improved performance in a historical optimization. We offer a method for estimating ETF sensitivity for funds, using the S&P Global Ownership dataset.

June 2018: The (Gross Profitability) Trend is Your Friend

Trend strategies based on changes in stock price or earnings are widely used by investors. In this report, we examine the performance of a trend strategy derived from gross profitability (“GP”). Gross profitability trend (“GPtrend”), was proposed by Akbas et al. who argued that the trajectory of a firm’s profitability is just as important as the level (GP). We define GPtrend as the year-on-year difference in either quarterly or trailing twelve month GP, where GP is calculated as revenue minus cost of goods sold, divided by total assets. Our back-tests confirm that GPtrend has historically been an effective stock selection signal globally, with the added benefit of low to moderate correlation with commonly used investment strategies.

May 2018: Buying the Dip: Did Your Portfolio Holding Go on Sale?

'Buy the Dip' ("BTD"), the concept of buying shares after a steep decline in stock price or market index, is both a Wall Street maxim, and a widely used investment strategy. Investors pursuing a BTD strategy are essentially buying shares at a "discounted" price, with the opportunity to reap a large pay-off if the price drop is temporary and the stock subsequently rebounds. BTD strategies are especially popular during bull markets, when a market rally can be punctuated by multiple pullbacks in equity prices as stock prices march upwards.

March 2018: In The Money: What Really Motivates Executive Performance?

CEO compensation has soared over the past four decades, aided by consultants, compensation committees, the CEOs themselves, and an extended bull market (1982-1999). "Pay for performance" has become dogma and large equity grants de rigueur. But there is a cost to such largesse. Figure 1 shows that realized pay¹ for a company's top five executives can approach 6%-11% of earnings before interest and taxes (EBIT), on the index level, for small and mid-cap firms. What types of compensation motivate top executives to boost shareholder returns? And what are the fundamental characteristics of companies in which executives are motivated to boost stock performance?

February 2018: The Art of (no) Deal: Identifying the Drivers of Cancelled M&A Deals

Terminated deals impact capital market participants in various ways. Predicting deals that are likely to be canceled is of interest to both M&A advisers and equity investors. This report identifies several drivers of cancelled deals, including size, deal proportionality, perceived price discount, CEO age, and regulatory risk, and concludes with a model built from four of these drivers.

January 2018: U.S Stock Selection Model Performance Review

Starting with the U.S. Election in November 2016, the S&P 500 Index has registered 14 consecutive months of positive returns. Only once has the S&P 500 had a longer run of positive returns since 1959. 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. All 4 of our U.S strategy models returned positive long-only returns in 2017. This report reviews the performance of all 4 models during the year.

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. The paper is laid out into four sections:

- **What is NLP:** We demystify common NLP terms and provide an overview of general steps in NLP.
- **Why is NLP Important:** Forty zettabytes (10^{21} bytes) of data are projected to be on the internet by 2020, out of which more than eighty percent of the data are unstructured in nature, requiring NLP to process and understand

- **How can NLP help me:** We derive insights from earnings call transcripts measuring industry-level trends or language complexity.
- **Where do I start:** Code for each use is enclosed, enabling users to replicate the sentiment analysis

July 2017: Natural Language Processing Literature Survey

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

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

March 2017: Capital Market Implications of Spinoffs

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

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

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

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

October 2015: Global Country Allocation Strategies

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

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

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

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

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

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

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](#)

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](#)

Copyright © 2018 by S&P Global Market Intelligence, a division of S&P Global Inc. All rights reserved.

These materials have been prepared solely for information purposes based upon information generally available to the public and from sources believed to be reliable. No content (including index data, ratings, credit-related analyses and data, research, model, software or other application or output therefrom) or any part thereof (Content) may be modified, reverse engineered, reproduced or distributed in any form by any means, or stored in a database or retrieval system, without the prior written permission of S&P Global Market Intelligence or its affiliates (collectively, S&P Global). The Content shall not be used for any unlawful or unauthorized purposes. S&P Global and any third-party providers, (collectively S&P Global Parties) do not guarantee the accuracy, completeness, timeliness or availability of the Content. S&P Global Parties are not responsible for any errors or omissions, regardless of the cause, for the results obtained from the use of the Content. THE CONTENT IS PROVIDED ON "AS IS" BASIS. S&P GLOBAL PARTIES DISCLAIM ANY AND ALL EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE, FREEDOM FROM BUGS, SOFTWARE ERRORS OR DEFECTS, THAT THE CONTENT'S FUNCTIONING WILL BE UNINTERRUPTED OR THAT THE CONTENT WILL OPERATE WITH ANY SOFTWARE OR HARDWARE CONFIGURATION. In no event shall S&P Global Parties be liable to any party for any direct, indirect, incidental, exemplary, compensatory, punitive, special or consequential damages, costs, expenses, legal fees, or losses (including, without limitation, lost income or lost profits and opportunity costs or losses caused by negligence) in connection with any use of the Content even if advised of the possibility of such damages.

S&P Global Market Intelligence's opinions, quotes and credit-related and other analyses are statements of opinion as of the date they are expressed and not statements of fact or recommendations to purchase, hold, or sell any securities or to make any investment decisions, and do not address the suitability of any security. S&P Global Market Intelligence may provide index data. Direct investment in an index is not possible. Exposure to an asset class represented by an index is available through investable instruments based on that index. S&P Global Market Intelligence assumes no obligation to update the Content following publication in any form or format. The Content should not be relied on and is not a substitute for the skill, judgment and experience of the user, its management, employees, advisors and/or clients when making investment and other business decisions. S&P Global Market Intelligence does not act as a fiduciary or an investment advisor except where registered as such. S&P Global keeps certain activities of its divisions separate from each other in order to preserve the independence and objectivity of their respective activities. As a result, certain divisions of S&P Global may have information that is not available to other S&P Global divisions. S&P Global has established policies and procedures to maintain the

confidentiality of certain non-public information received in connection with each analytical process.

S&P Global may receive compensation for its ratings and certain analyses, normally from issuers or underwriters of securities or from obligors. S&P Global reserves the right to disseminate its opinions and analyses. S&P Global's public ratings and analyses are made available on its Web sites, www.standardandpoors.com (free of charge), and www.ratingsdirect.com and www.globalcreditportal.com (subscription), and may be distributed through other means, including via S&P Global publications and third-party redistributors. Additional information about our ratings fees is available at www.standardandpoors.com/usratingsfees.