Their Sentiments Exactly:

Sentiment Signal Diversity Creates Alpha Opportunity

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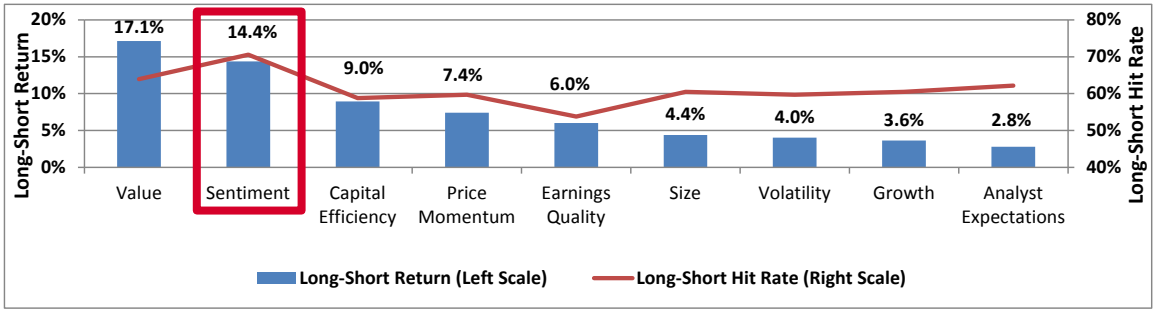
Investors sometimes view sentiment signals as interchangeable: one indicator is the same as the next. Our research shows that this is far from the case. In this report we show that: a) sentiment-based signals from different types of market participants (management, analysts, hedge funds) have each been 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 investing[1] 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).

Sentiment as an Investment Style, Russell 3000, 2008-17, Deciles, Annualized Market Adjusted Returns & Hit Rates



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 2017[3]

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 Announcment 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 adjusted [4] 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 turnover[5] 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

Numbers to Words (1 = Most Numbers) \ **% Positive Words** (1 = Most Positive)	**1**	**2**	**3**
1	**5.67%*****	1.24%	**1.61%****
2	**3.22%*****	-0.06%	-0.80%
3	1.62%	-1.28%	**-3.72%*****

Average Portfolio Size

Numbers to Words (1 = Most Numbers) \ **% Positive Words** (1 = Most Positive)	**1**	**2**	**3**
1	198	222	279
2	240	244	212
3	264	236	195

Portfolio Level Hit Rates

Numbers to Words (1 = Most Numbers) \ **% Positive Words** (1 = Most Positive)	**1**	**2**	**3**
1	**72.3%*****	52.9%	55.5%
2	**67.2%*****	52.1%	**41.2%***
3	**58.8%***	**42.0%***	**37.8%*****

Average Monthly Two-Way Turnover

Numbers to Words (1 = Most Numbers) \ **% Positive Words** (1 = Most Positive)	**1**	**2**	**3**
1	27%	31%	22%
2	31%	35%	32%
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 arbitraged. (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

% Positive Words (1 = Most Positive) \ Net Arbitrage Trading (1 = Least Arbitraged)	1	2	3
1	**5.09%*** **	**4.45%*** **	-0.15%
2	1.79%	0.92%	**-2.87%*** **
3	**2.31%** **	1.20%	**-5.59%*** **

Average Portfolio Size

% Positive Words (1 = Most Positive) \ Net Arbitrage Trading (1 = Least Arbitraged)	1	2	3
1	263	288	236
2	247	264	270
3	247	235	295

Portfolio Level Hit Rates

% Positive Words (1 = Most Positive) \ Net Arbitrage Trading (1 = Least Arbitraged)	1	2	3
1	**69.7%*** **	**70.6%*** **	53.8%
2	**58.0%***	56.3%	**37.0%*** **
3	56.3%	**58.8%***	**30.3%*** **

Average Monthly Two-Way Turnover

% Positive Words (1 = Most Positive) \ Net Arbitrage Trading (1 = Least Arbitraged)	1	2	3
1	20%	24%	22%
2	28%	33%	28%
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 Oyeniyi & 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

% Positive Words (1 = Most Positive) \ Earnings Announcement Return (1 = Highest)	1	2	3
1	**5.32%*** **	**2.83%*** **	1.04%
2	1.57%	0.01%	-1.96%
3	0.76%	-0.68%	**-2.64%***

Average Portfolio Size

% Positive Words (1 = Most Positive) \ Earnings Announcement Return (1 = Highest)	1	2	3
1	306	262	217
2	263	254	259
3	226	244	304

Portfolio Level Hit Rates

% Positive Words (1 = Most Positive) \ Earnings Announcement Return (1 = Highest)	1	2	3
1	**71.4%*** **	**68.9%*** **	53.8%
2	**60.5%** **	49.6%	**41.2%***
3	53.8%	46.2%	**39.5%** **

Average Monthly Two-Way Turnover

% Positive Words (1 = Most Positive) \ Earnings Announcement Return (1 = Highest)	1	2	3
1	29%	31%	33%
2	35%	36%	35%
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

		1-Month Target Price Change (1 = Highest)		
	Quantile	1	2	3
Net Arbitrage Trading (1 = Least Arbitrage)	1	6.17%***	2.34%***	0.78%
	2	3.62%***	2.36%***	1.29%
	3	1.24%	-2.89%***	-5.37%***

Average Portfolio Size

Quantile	1	2	3
1	215	300	264
2	208	330	258
3	207	307	302

Portfolio Level Hit Rates

		1-Month Target Price Change (1 = Highest)		
	Quantile	1	2	3
Net Arbitrage Trading (1 = Least Arbitrage)	1	72.5%***	66.5%***	54.5%
	2	63.5%***	58.7%**	52.7%
	3	52.1%	36.5%***	31.7%***

Average Monthly Two-Way Turnover

Quantile	1	2	3
1	66%	61%	58%
2	71%	61%	64%
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

Analyst Reccomendation Change (1 = Most Positive)

Net Arbitrage Trading (1 = Least Arbitrage)	Quantile 1	Quantile 2	Quantile 3
1	**5.00%*****	**2.75%*****	0.02%
2	**3.61%*****	**1.26%****	**1.36%****
3	-0.56%	**-2.63%*****	**-5.86%*****

Average Portfolio Size

Quantile	1	2	3
1	299	295	259
2	287	319	264
3	261	292	318

Portfolio Level Hit Rates

Analyst Reccomendation Change (1 = Most Positive)

Net Arbitrage Trading (1 = Least Arbitrage)	Quantile 1	Quantile 2	Quantile 3
1	**70.1%*****	**66.5%*****	53.3%
2	**71.9%*****	52.1%	55.7%
3	47.3%	**35.3%*****	**24.6%*****

Average Monthly Two-Way Turnover

Quantile	1	2	3
1	26%	33%	29%
2	34%	38%	36%
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

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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

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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**.

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

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