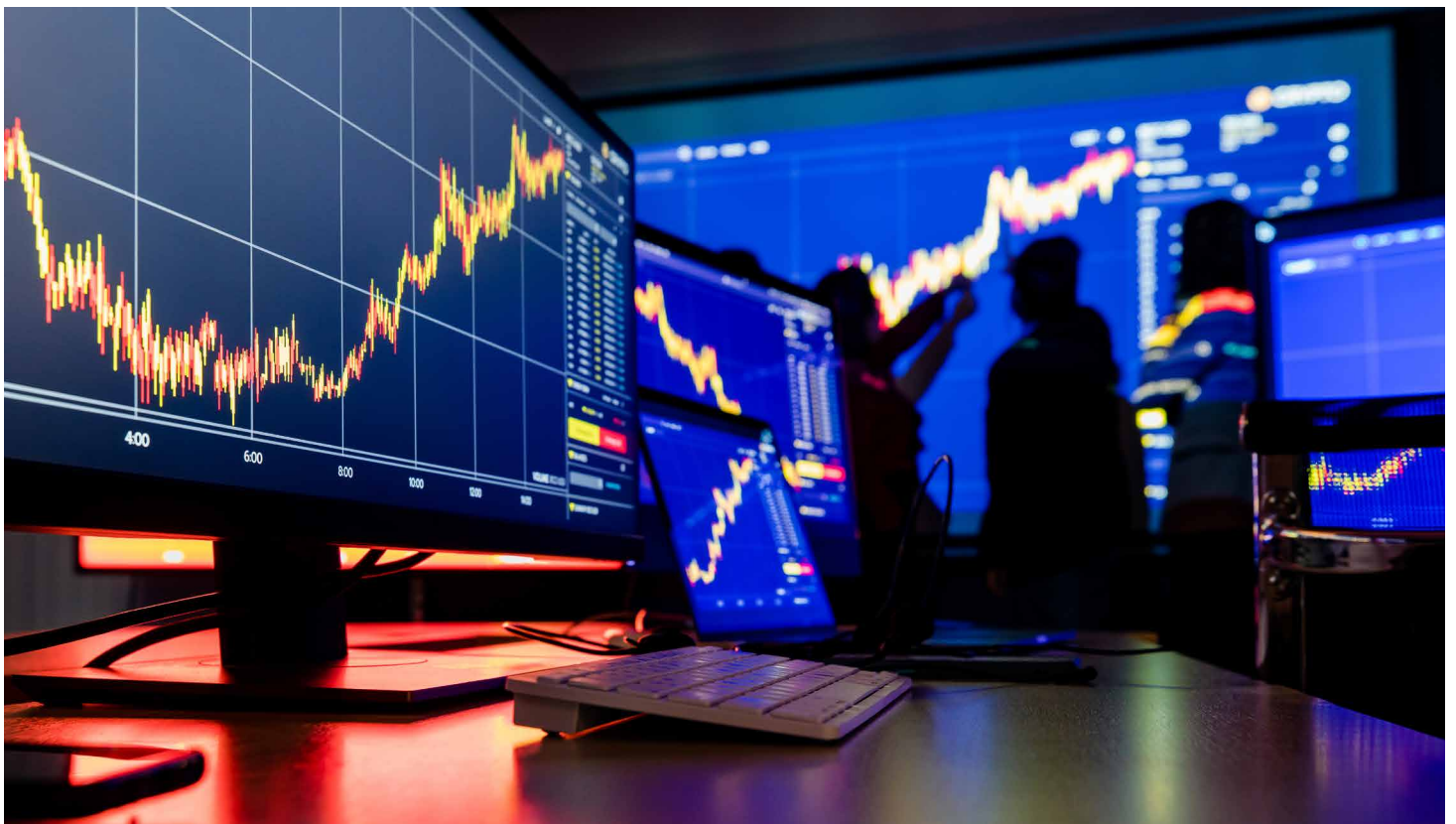


Earnings conference call tone and stock returns: evidence across the globe

By Tarun Gupta, Ph.D., and Yifei Shea, Ph.D.

We show how the tone on display during earnings calls can help predict stock returns. Our result is based on evidence from five investment regions: United States, Canada, Europe (ex-United Kingdom), United Kingdom and Australia.



Coverage of earnings call transcripts has improved considerably over time and, as we will show, long and short factor portfolios based on the textual tone signal demonstrate favorable risk/return profiles. Supported by several studies of robustness, our findings suggest that the manager tone signal, despite being correlated with momentum, is an implementable source of value-add in a global equity portfolio.

Corporate managers possess superior information about a company (e.g., Healy and Palepu, 2001), and earnings conference calls are widely followed by investors. The Q&A segment, when managers address probing questions from analysts who closely follow the company, can be especially revealing given its unscripted nature. Moreover, research (e.g., Price et al., 2012) shows that information extracted from the Q&A segment of the call (as opposed to the prepared statement) is less likely to be already contained in the press release.

Most academic research on earnings call tone focuses on the US market, deriving the tone signal from both analysts' questions and managers' answers (e.g., Price et al., 2012 and Druz et al., 2020). Indeed, previous evidence of whether investors react more to analyst tone or manager tone is mixed: Using data from a 16-quarter sample period for US stocks, Brockman et al. (2015) find that analyst tone leads to stronger investor reaction; however, Brockman et al. (2017) note precisely the opposite when they investigate earnings conference call transcripts of companies with securities trading in the Stock Exchange of Hong Kong.

Our earnings call tone signal aims to capture sentiment expressed by corporate managers that is potentially predictive of a company's future stock performance. In a robustness study, we also examine the sentiment expressed by analysts and managers

combined. Different from most academic literature focusing on tone derived from earnings calls in one region (mainly the United States), and sometimes over a short time span, we investigate the predictive power of the manager tone signal on stock returns in five regions across the globe over a decade.

In this article, we first look at the coverage and characteristics of English-language conference call transcripts across all regions of interest. Next, we outline our rationale and steps for constructing a manager tone signal which is implementable in a multi-factor portfolio management framework. Then, we discuss the signal's stand-alone performance as well as its relationship with common equity factors. Finally, we conduct several robustness tests, including alternative methods of signal construction.

Characteristics of earnings call transcripts

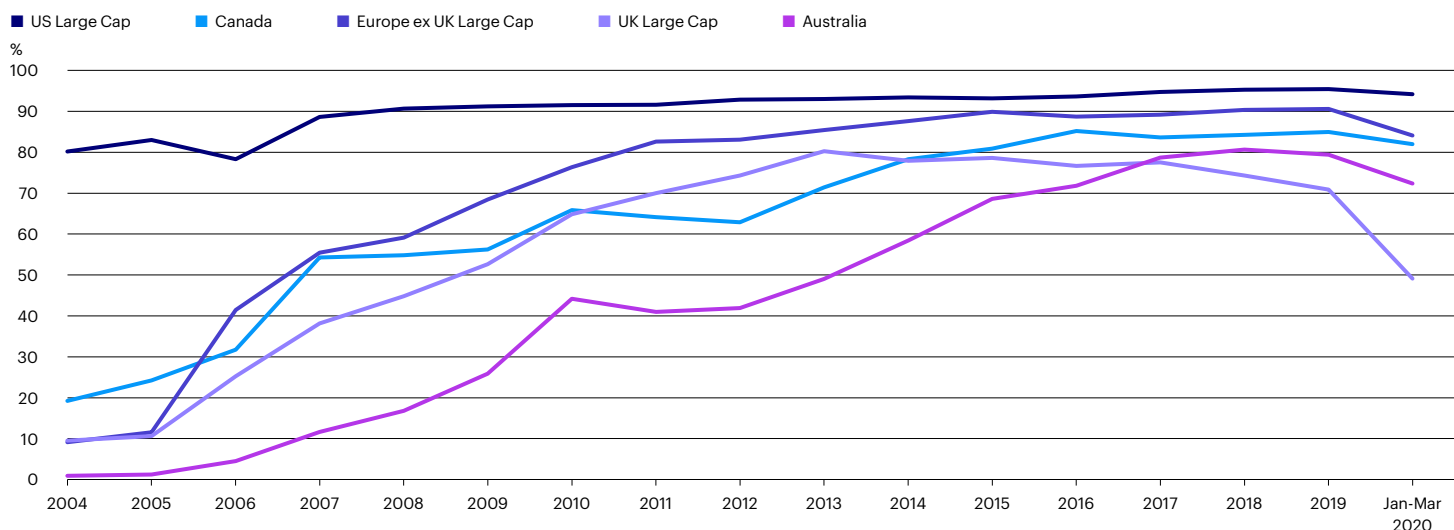
As a first step, we investigate the historical coverage of English-language earnings call transcripts for companies in five regions: United States (US), Canada (CA), Europe excluding United Kingdom (EXU), United Kingdom (UK) and Australia (AU) – sourced from FactSet Research Systems, Inc. We find that US has the best coverage, while coverage in other regions has improved over time. Additionally, we note that the coverage is generally better for larger than for smaller companies; for instance, on average only 55.7% of companies with securities included in the UK All Cap universe have earnings call transcripts available over the decade from January 1, 2010 to December 31, 2019, whereas transcript coverage is 74.5% for the companies with securities included in the UK Large Cap universe.¹

To balance the market breadth and transcripts coverage, we chose to investigate manager tone in the following investable universes:



Our earnings call tone signal aims to capture sentiment expressed by corporate managers that is potentially predictive of a company's future stock performance.

Figure 1
Coverage of earnings call transcripts through time by region



Source: FactSet, Invesco calculations.

US Large Cap, CA All Cap, EXU Large Cap, UK Large Cap and AU All Cap.² Figure 1 shows the percentage of companies with English transcripts available by year, from January 1, 2004 to March 31, 2020. Note that the coverage-decline in 2020 is artificial since our sample only includes transcripts until end of Q1 2020. Based on figure 1, it seems reasonable to investigate a tone signal extracted from earnings call transcripts starting from the end of 2009, which provides us with over a decade of consistent history across all five sample universes. In practice, coverage based on market cap is also important, which works in our favor given our observation that larger companies tend to have better transcripts coverage.

Interestingly, figure 1 also shows that companies with securities in the EXU Large Cap universe have higher coverage of English-language transcripts than all other universes investigated, except for US Large Cap. This is likely because those are typically large global companies with good analyst coverage. We further examined transcripts coverage of these companies by country and through time: e.g., during 2019, 94% of French companies and 86% of German companies have earnings call transcripts available in English, though the actual number of English earnings call transcripts is higher for German companies than for French due to the more frequent earnings releases in Germany. In addition to frequency, we inspected the timing of

earnings transcripts, which corresponds with reporting cycles, as expected. For instance, most earnings call transcripts for Australian companies become available in February and August each year.

To proceed, we parsed the transcripts available in XML format to identify call participants and their associated sentences in the Q&A segment. We used a strict multi-step filtering process to ensure that the identified text indeed came from a specific participant, given that it is possible for one person to be mapped into multiple identifiers (detailed steps for identifying managers and their answers can be found in Fraikin and Gerard, 2018). To gain a more comprehensive overview of all call participants and to facilitate robustness testing, we also identified each analyst and associated question(s). We report statistics to capture characteristics of conference calls for each of the five stock universes in our sample; table 1 illustrates such sample statistics for the UK Large Cap universe, annually from January 1, 2004 to March 31, 2020, as well as summary statistics across the same period. We can see that, on average, 2 to 3 managers are on each call. The most active manager speaks 110 sentences and the least active manager speaks 37 sentences. On average, 162 sentences are extracted from all managers speaking in each call. By comparison, 6 to 7 analysts participate in a conference call on average, with the most active analyst speaking 17 sentences

Table 1
Characteristics of call participants during Q&A, UK Large Cap

	Number of conference calls	Managers per call	Sentences per call: most active manager	Sentences per call: least active manager	Sentences per call: all managers	Sentences analyzed: Managers	Analysts per call	Sentences per call: most active analyst	Sentences per call: least active analyst	Sentences per call: all analysts	Sentences analyzed: analysts
2004	1.80	1.96	94	47	132	238					
2005	1.89	1.94	105	48	142	269	10.00	18	5	110	110
2006	1.65	2.15	93	41	135	223	4.00	9	4	27	27
2007	1.93	2.12	97	42	138	266	5.50	14	4	51	67
2008	2.23	2.09	104	46	147	329	6.20	16	4	58	64
2009	2.42	2.36	110	42	161	390	6.60	16	6	61	69
2010	2.23	2.80	113	34	173	384	7.30	17	5	69	154
2011	2.28	2.76	114	35	173	393	7.43	17	5	71	159
2012	2.27	2.73	118	33	175	398	7.37	17	5	73	168
2013	2.22	2.74	124	36	182	405	7.41	18	5	76	169
2014	2.23	2.60	120	36	176	392	7.21	18	5	75	166
2015	2.23	2.59	115	35	171	381	6.66	17	5	70	156
2016	2.16	2.52	112	37	167	361	6.78	17	5	70	152
2017	2.18	2.47	101	34	149	324	6.39	17	5	66	145
2018	2.15	2.43	100	37	149	321	6.21	17	5	64	138
2019	2.02	2.48	102	35	150	303	6.22	16	5	64	130
2020*	1.02	2.57	106	32	158	161	5.72	17	5	61	62
Total	2.17**	2.52	110	37	162	351**	6.81	17	5	69	149**

*as of Q1 2020; ** only includes data from January 1, 2004 to December 31, 2019.
Source: Invesco. Before August 2009 few analysts were tagged in the transcripts.

and the least active analyst 5 sentences. The questions from all analysts total an average of 69 sentences per call. Since there are around 2 conference calls per UK company per year, this gives us a total of 351 sentences from managers' answers and 149 sentences from analysts' questions on average each year from 2004 to 2019. We also observed that, across regions, analysts were tagged only very occasionally before August 2009.

Capturing manager tone from earnings call transcripts

In order to capture manager tone from the Q&A section of the transcripts, we use a modified version of the Loughran and McDonald (LM) financial dictionary,³ coupled with simple rules. Figure 2 shows two word clouds for positive and negative sentiment words from the LM dictionary based on manager answers extracted from sample 2019 earnings call transcripts in the UK Large Cap universe. Modifications were made to better reflect the context of our study: e.g., we do not consider the word 'good' positive if it appears in phrases such as 'good morning' or 'good afternoon', and the words 'question' and 'questions' most likely do not have negative meaning. We also implement rules to address negation words detected in the sentences.

Our first tone signal is the sentiment expressed by all managers during Q&A. Each sentence is counted as positive, negative or neutral when checked against our sentiment dictionary and rules. The total score is calculated as the difference between the number of positive and negative sentences, scaled by the total number of sentences spoken by the managers. To construct the sentiment signal, we aggregate information conveyed from earnings calls of a given firm over previous 12 months, instead of focusing on the most recent earnings call. We also assume a conservative five-day lag between earnings call and transcript availability date. This setup not only results in implementable trading signals with moderate turnover, but also allows more

sensible cross-sectional comparison of manager sentiment for firms with different call timings and/or call frequencies.

A sentiment signal constructed as such, however, is known to suffer from several drawbacks. To begin, Demers and Vega (2008) argue that it is the unanticipated component of sentiment that drives abnormal returns. Accordingly, we also introduce a second tone signal – change in sentiment – which is a natural and simple proxy for sentiment surprise. Taking into account the change in sentiment also greatly mitigates the issue that cross-sectional comparisons of sentiment levels may be affected by the choice of words in an industry,⁴ as highlighted in previous literature such as Feldman et al. (2010) and Loughran and McDonald (2016). Last but not least, the sentiment signal may lose efficacy over time if more managers are trained to speak optimistically (see, for instance, Cao et al., 2020). This concern is alleviated to some extent by looking at change in sentiment, since any inflation in sentiment change driven by adjustments of linguistic style should only be transitory.

Consistent with our rationale for the sentiment signal, we construct year-over-year (y-o-y) change in sentiment, calculated as the difference between aggregate sentiment over the past year and aggregate sentiment over the year prior. In addition to reducing signal turnover, our change in sentiment signal is robust to potential seasonality associated with earnings call sentiment, as compared to alternative approaches such as taking the difference in manager sentiment between two consecutive calls.

Based on our examination of transcript coverage (see previous section), we compute monthly sentiment and change in sentiment scores for all five regions from December 31, 2009 to March 31, 2020.⁵ Figure 3 shows the histograms of calculated sentiment and y-o-y change in sentiment scores for all stocks in the UK Large Cap universe from December 31, 2009 to March 31, 2020. As expected, the average



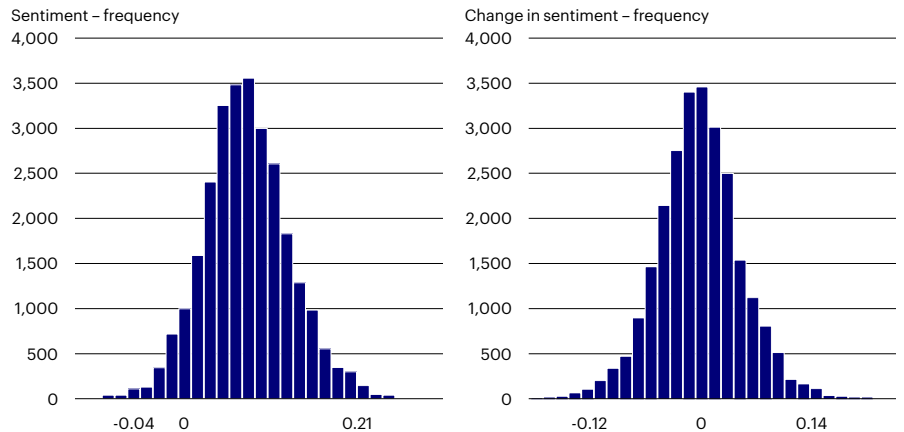
Our first tone signal is the sentiment expressed by all managers during Q&A. We also introduce a second tone signal – change in sentiment – which is a natural and simple proxy for sentiment surprise.

Figure 2
Word clouds of positive and negative sentiment words



For illustrative purposes only. Based on frequency of word hits in manager answers extracted from UK Large Cap earnings call transcripts in 2019. The word 'good' is excluded from the positive sentiment word cloud due to its special treatment (e.g., 'good' in 'good morning' does not have positive meaning). Source: Invesco, Loughran McDonald dictionary.

Figure 3
Histogram of sentiment and change in sentiment
 UK Large Cap universe, December 31, 2009 to March 31, 2020



The sentiment signal has a 1st percentile of -0.04, a median of 0.07 and a 99th percentile of 0.21; the change in sentiment signal has a 1st percentile of -0.12, a median of 0 and a 99th percentile of 0.14.
 Source: Invesco.

manager sentiment is positive (0.07), while the average change in sentiment is 0.

We recognize that our y-o-y change in sentiment signal, like the sentiment signal itself, is not a perfect metric on its own. For instance, it is not an exact measurement of 'true' sentiment surprise. Indeed, we attempt to address some of these concerns in the 'robustness study' section of this article. Rather than replacing sentiment with sentiment change, we believe both signals are reasonable proxies of manager tone, and each adds value on top of the other. Therefore, we studied the performance efficacy of both the sentiment and change in sentiment signals before building a parsimonious manager tone signal as a simple 50/50 combination of the two. In the next section, we investigate the performance of our manager tone signal as well as its relationship with traditional equity factors.

Evaluating the manager tone signal

To construct the manager tone signal each month for every stock, we first convert sentiment and change in sentiment scores into percentiles within the respective universe and then take the average. Next, we transform the manager tone signal into dollar-neutral portfolio weights (100% long

and 100% short). The portfolios are also constructed to ensure no active bets on market or sector within each region,⁶ resembling how our factor portfolios are managed in practice.

Table 2 presents the performance of such portfolios in all five sample universes based on the textual tone signal, rebalanced monthly from December 31, 2009 to March 31, 2020. Information Ratio (IR), defined as the ratio of annualized return and annualized standard deviation of a portfolio, measures the risk and reward trade-off of the associated strategy. In all our sample universes, portfolios based on the manager tone signal demonstrate positive IRs; IR in UK Large Cap (close to 1) is the highest during this period and the lowest IR (close to 0) is in CA. In addition, t-statistics⁷ and corresponding p-values of the strategy returns indicate that the average monthly portfolio returns are significantly different from 0 in US Large Cap, EXU Large Cap and UK Large Cap, at a 0.05 level of significance. In unreported results, we also find that, while the efficacy of manager tone signal comes mainly from the short side in the US Large Cap universe, it was the long side of the signal that drives performance in EXU Large Cap and UK Large Cap.



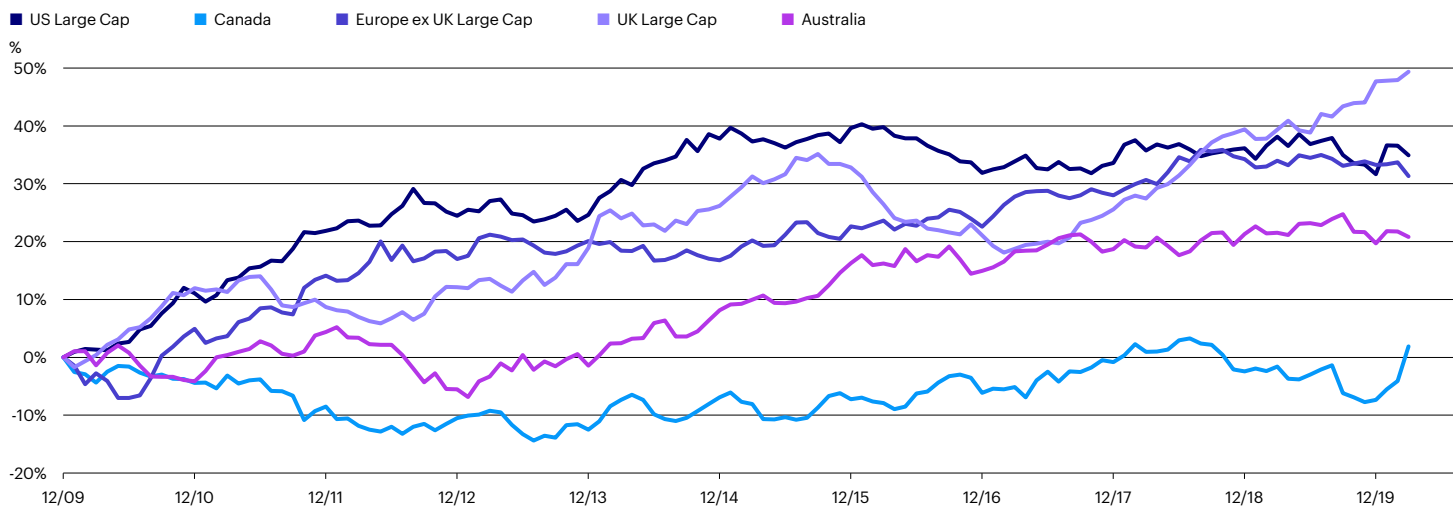
A long/short factor portfolio based on tone generated statistically significant returns in liquid large cap universes of US, Europe (ex-UK) and UK.

Table 2
Performance and coverage of manager tone signal

Stock universe	Performance					Coverage	
	Annualized return	Annualized standard deviation	Information Ratio	t-statistic	p-value	By number of stocks	By market cap
US Large Cap	1.5%	2.1%	0.73	2.34	0.02	90.6%	90.5%
Canada	0.3%	5.3%	0.06	0.18	0.86	70.8%	81.5%
Europe ex UK Large Cap	2.3%	3.4%	0.68	2.19	0.03	78.2%	85.7%
UK Large Cap	3.9%	3.9%	0.99	3.20	0.00	64.4%	87.7%
Australia	2.5%	5.7%	0.43	1.39	0.17	48.7%	78.3%

Manager tone signal is defined as 50/50 combination of sentiment and change in sentiment. The signal is transformed into a market and sector-neutral portfolio within each universe; in the US Large Cap universe, the portfolio is additionally industry-neutral. The portfolios are rebalanced monthly from December 31, 2009 to March 31, 2020. **Past performance is not a guide to future returns.**
 Source: Invesco.

Figure 4
Cumulative returns of Long/Short factor portfolios based on manager tone signal



Manager tone signal is defined as 50/50 combination of sentiment and change in sentiment. The signal is transformed into a market and sector-neutral portfolio within each universe; in the US Large Cap universe, the portfolio is additionally industry-neutral. The portfolios are rebalanced monthly from December 31, 2009 to March 31, 2020. Monthly strategy returns are rescaled ex-post so that all portfolios have annual risk of 5% from December 31, 2009 to April 30, 2020 (last portfolio formation on March 31, 2020). **Past performance is not a guide to future returns.**
 Source: Inveco.

Table 2 also shows manager tone signal coverage as measured by either number of stocks or market capitalization, averaged from December 31, 2009 to March 31, 2020. As expected, transcript coverage based on market cap is generally higher than coverage based on the number of stocks.

Next, we look at the performance of the manager tone signal over time, presented in figure 4. Since our long/short portfolios based on the textual tone signal manifest different ex-post risk levels in each region (see Annualized standard deviation in table 2), we rescale the monthly returns such that all strategies have the same ex-post volatility of 5% per annum. Therefore, in figure 4, the strategies showing higher cumulative returns are also those with higher IRs.

Given the relatively low transcript coverage in the initial years of our sample period, especially for the AU universe (figure 1), performance during these years should also be taken with a grain of salt (except for US Large Cap, where there was already

decent coverage). Figure 4 suggests that, excluding the first few years in our testing period, the performance of the manager tone signal is reasonably consistent across all regions, except for CA.⁸ In more recent years, signal performance in UK Large Cap is particularly strong, in contrast with the lackluster performance in US Large Cap since 2015.

In practice, we are interested not only in the performance of the tone signal as a stand-alone factor, but also its value-added above traditional equity factors. Table 3 shows Pearson correlations between monthly returns from factor portfolios based on the manager tone signal and those from common factor portfolios, such as quality, momentum and value (QMV)⁹ over the period from December 31, 2009 to April 30, 2020. Note that we separate the momentum factor into price momentum and earnings momentum¹⁰ to potentially gain additional insights.

As expected, manager tone across regions exhibits moderately high correlations with both price and earnings momentum, while

Table 3
Return correlations between manager tone and quality, momentum and value (QMV) factor portfolios

	Price momentum	Earnings momentum	Quality	Value
US Large Cap	0.25	0.22	0.07	-0.12
Canada	0.23	0.20	0.00	-0.23
Europe ex UK Large Cap	0.34	0.34	0.10	-0.13
UK Large Cap	0.14	0.15	-0.04	0.00
Australia	0.16	0.21	0.22	0.15

Pearson correlations between monthly returns from portfolios based on manager tone signal and QMV factor portfolios for the period from December 31, 2009 to April 30, 2020 in each stock universe (last portfolio formation on March 31, 2020). Momentum signals are separated into price momentum and earnings momentum to form separate factor portfolios.
 Source: Inveco.



Manager tone exhibits moderately high correlations with both price and earnings momentum, while the correlations with quality and value are low to negative.

the correlations with quality and value are low to negative. Interestingly, the only exception is Australia, where manager tone has a moderately high correlation with quality as well as a positive correlation with value. Additionally, it is the only universe in which manager tone appears to have a slightly higher return correlation with earnings momentum than with price momentum.

In general, our analysis shows it is reasonable to consider manager tone a momentum type of factor, which is consistent with our rationale for the signal. In unreported results, we show that the textual tone signal provides added value above and beyond traditional momentum factors for a multi-factor portfolio, driven by both its stand-alone performance and diversification benefits.

Finally, strategies based on manager tone also demonstrate lower portfolio turnover than traditional momentum factor portfolios, and only moderately higher turnover compared to value and quality factor portfolios. This is as expected since our construction of the manager tone signal was intended to generate implementable trading strategies.

Robustness studies

We performed a number of robustness tests for the manager tone signal. First and foremost, we used the same construction of tone signal across all five sample universes, and observed relatively consistent results – which is implicitly a robustness test on its own. We also used an alternative proprietary sentiment dictionary and associated rules and found similar results across regions.

Next, we conducted two robustness studies on signal construction. In finance literature, most dictionary-based sentiment approaches use words as units (e.g., Loughran and McDonald, 2011; Price et al., 2012; Druz et al., 2020). We adopted a different approach by using sentences as units for computing the sentiment score, which we think is reasonable; it is also consistent with linguistics literature (e.g., Ordenes et al., 2017). To make sure our results are not specific to this choice, we constructed two word-count-based tone signals¹¹ and observed similar yet overall slightly weaker performance compared to our original construction.

Another signal construction-related robustness test was inspired by academic studies which find that some managers are more optimistic than others (Davis et al., 2015) and, more generally, that managers have different tone styles.¹² A natural question is thus whether it makes sense to calculate change in sentiment for each manager and then aggregate into a signal at company level. The rationale for such a signal construction method, however, appears flawed given that each manager's tone is influenced by the specific questions they address during a call. Additionally, for calculating a sensible sentiment score,

a sufficiently large number of total sentences is required in the denominator. Therefore, sentiment information from managers who do not speak many sentences in a call may be lost in such manager-specific sentiment calculation. In the end, we decided to test sentiment and change in sentiment signals defined by aggregating individual manager information¹³ only as a robustness study instead of a competing signal construction methodology. As expected, such signals demonstrated slightly poorer coverage compared to our original company-based signals. We also observed similar yet slightly worse performance across regions when we define sentiment and sentiment change by aggregating individual manager information.

Finally, we examined the predictability of cross-section stock returns based on overall tone from analysts and managers during Q&A, as opposed to manager tone alone. This study is also motivated by the fact that manager tone can be related to questions asked by analysts and their tone. Additionally, analysts who ask questions during earnings calls tend to follow the company closely, and their sentiment is potentially a leading indicator for subsequent forecast revisions and stock performance. Indeed, we find generally similar performance of sentiment and change in sentiment signals derived from only managers or all participants during the Q&A. We also note that, on average, sentiment expressed by managers alone is more positive compared to that expressed by managers and analysts combined – an observation which is unsurprising and robust across all five regions investigated.

Summary and concluding remarks

We mined textual data, more specifically earnings call transcripts, to extract a tone signal which captures manager sentiment that is unlikely already priced into the stock. Our construction of the tone signal yields generally consistent performance across five sample universes over the recent decade. A long/short factor portfolio based on tone generated statistically significant returns in liquid large cap universes of US, Europe (ex-UK) and UK. The manager tone signal is diversifying and adds value atop traditional QMV factors. Furthermore, it comes with a moderately low turnover rate, which leads to implementable trading strategies. We have also shown that the tone signal is robust to the sentiment dictionary and several alternative signal definitions.

A number of off-the-shelf rule-based or machine learning algorithms are available for generating sentiment scores. Some of these are not specific to the financial context. Others, such as FinBert,¹⁴ are trained on financial textual data and sometimes directly based on earnings call transcripts. While we think a machine learning approach may augment the tone signal, a simple dictionary and rule-based sentiment approach offers great transparency and is not fitted to any data – thus truly out-of-sample.



The tone signal is robust to the sentiment dictionary and several alternative signal definitions.

Notes

- 1 UK All Cap universe is constructed based on FTSE All Shares ex InvTrust and further expanded to capture 99% of free float market cap, and UK Large Cap universe is constructed based on FTSE 100 ex InvTrust and further expanded to capture 98% of free float market cap in UK.
- 2 The investable universes are constructed to include the largest and most liquid stocks. For the period of January 31, 2004 through March 31, 2020, the monthly average number of stocks is 1,278 in the US Large Cap universe, 317 in CA All Cap, 520 in EXU Large Cap, 315 in UK Large Cap and 305 in AU All Cap.
- 3 Available online at: <https://sraf.nd.edu/textual-analysis/resources/>
- 4 For instance, words such as 'waste', 'casualty', 'catastrophe' do not have negative meaning for certain industries.
- 5 This means we utilize earnings call information from December 2008 for calculation of the sentiment signal. Similarly, for the y-o-y change in sentiment signal, earnings call information from as early as December 2007 may be incorporated.
- 6 In the US Large Cap universe, we also ensure the portfolio has no active bets at industry level. We use our own industry/sector definitions, which closely follow GICS classifications, as well as Axioma predicted betas for enforcing ex-ante market neutrality.
- 7 Defined as average monthly returns divided by its standard error. Therefore, t-statistic is mathematically equivalent to the product of IR and $\sqrt{N/12}$, where N is the number of months in our sample, which is 124.
- 8 The relatively flat performance of the manager tone signal in CA is driven by the 'change in sentiment' component, which yields slightly negative and statistically insignificant monthly returns during the testing period. In one of the robustness studies, we also construct 'change in sentiment' by aggregating individual manager sentiment change, and find that such constructed sentiment change signal has a positive IR of 0.2 for CA stocks, but the mean return is still not significantly different from 0.
- 9 Quality (Q) consists of factors such as external financing and return on equity. Momentum (M) is a combination of various price momentum and earnings momentum factors. Value (V) includes free-cash-flow yield and gross profit yield, etc.
- 10 Price momentum includes factors such as specific and risk-adjusted momentum; earnings momentum includes earnings revision, sales revision and earnings surprise, etc.
- 11 Both versions use the difference in number of positive and negative sentiment words in the numerator; in one version, total number of sentiment words is the denominator, and in the other version, total number of words spoken is the denominator.
- 12 For instance, Dzieliński et al., (2017) find that managers display distinct styles during earnings calls, e.g., the 'vague talkers' (as opposed to 'straight talkers') often use words indicating uncertainty such as 'probably' and 'maybe'.
- 13 We use average number of sentences spoken as weights for aggregation of individual manager sentiment and change in sentiment.
- 14 For instance, see Araci (2019) and Huang et al. (2020).



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