The impact of analyst sentiment on UK stock recommendations and target prices

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The aim of this paper is to investigate the relationship between narrative sentiment in analysts' company reports and their recommendation and target price outputs. We study an industry-balanced sample of 275 UK quoted company sell-side analyst reports over the period 2006-2010 using a content analysis methodology to measure net sentiment for a range of themes. We then model analysts' outputs against themed sentiment scores to analyse the impact of the Global Financial Crisis. We find that themed sentiments impact upon analysts' outputs, but their magnitude and direction vary over the pre-crisis, crisis and post-crisis periods. In particular, before the crisis we find a strong negative relationship between the macroeconomic and regulatory environment and report outputs, though this effect diminishes somewhat with the onset of the crisis, to be restored thereafter. Growth sentiment exerts a weak positive impact before the crisis which disappears thereafter. Financial performance sentiment becomes a significant positive driver of outputs following the crisis. There is evidently a 'back to basics' approach following the crisis which restores financial fundamentals to the heart of stock analysis. Our findings provide some insight into the thought processes of analysts by identifying the dynamic relation between analysts' outputs and themed sentiments.

Keywords: analyst recommendations; target price; sentiment; content analysis; financial crisis

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1.   Introduction

The primary aim of our paper is to investigate the relationship between the narrative sentiment in analysts' company reports and the recommendation and target price outputs produced by their authors for a given stock. In so doing, we provide some insight into the thought processes of such analysts in relation to the gathering, analysis, and evaluation of company stock information.

Analysts' reports are an essential tool in the operation of equity markets, providing an important information channel, increasing information efficiency and ultimately the speed at which public information is incorporated into share prices. Such reports bring together a range of equity investment analysis techniques in a structured manner so that the reader, whether an individual investor or a professional fund manager, can make a more informed stock investment decision. The literature on analysts' reports has grown significantly over the last two decades, with seminal contributions from authors such as Schipper (1991) who focuses on earnings forecasts and analysts' decision processes and Ramnath *et al.* (2008) who provide a far more detailed taxonomy of studies regarding the role of analysts in financial markets.

In this paper we examine the relationship between two key analysts' outputs, target prices and recommendations, and the themes and tonality (themed sentiment) of the narrative that analysts produce in company stock reports, drawing upon advances in content analysis. We also take into account the possibility that the effect of themed sentiment on analysts' outputs is contingent upon the state of the wider macroeconomic environment by examining these inputs and outputs before, during and after the Global Financial Crisis.

There has been a strong focus of financial analyst research on the production and capital market impact (informativeness) of earnings forecasts (Landsman and Maydew, 2002). There is evidence that such forecasts contribute to the information reflected in future annual reports (Anderson *et al.*, 2007), that they play both an information discovery and interpretative role (Chen *et al.*, 2010), and that they contain significant macroeconomic information (Hann *et al.*, 2012). In this paper we focus on analysts' target prices and recommendations both individually and when taken together. Ryan and Taffler (2006) and Jegadeesh and Kim (2006) find that share prices react significantly to recommendation changes, with the latter study evidencing a greater reaction to new sell than to new buy recommendations. However, Bradshaw (2002) finds that the majority of the reports they study justify recommendations

with target prices, and that higher target prices are associated with more favourable stock recommendations. Evidence shows that analysts' reports are more informative when analysts arguments are stronger (Hirst *et al.*, 1995), when potential brokerage profits are higher and when processing costs are lower (Frankel *et al.*, 2006), when the annual report is complex (Lehavy *et al.*, 2011), and in bad times with greater uncertainty (Loh and Stultz, 2014). These findings indicate that analysts' reports provide valuable information to the market and that the nature and the precise impact of this information is dependent on factors ranging from external factors, analyst information processing ability, and analyst characteristics and biases.

The process followed by analysts has been a significant focus in the literature, though it is recognised that it remains something of a 'black box' (Bradshaw, 2011), with academics instead examining correlations between inputs (stock prices and fundamental information), outputs (earnings forecasts and recommendations), and conditioning variables to understand this process. Bouwman and Frishkoff (1987) examine the decision-making processes of analysts in a novel experimental setting, using protocol analysis. Much of the process is geared towards target price determination, with analysts tending to focus on simpler rather than more developed methods (Block, 1999; DeFond and Hung, 2003), though Imam *et al.* (2008) observe evidence of an increasing emphasis on more complex models, leading to greater target price accuracy (Demirakos *et al.*, 2010).

Content analysis research in the accounting and finance field has grown significantly in importance in recent years, with comprehensive reviews on corporate disclosures provided by Li (2010), the broader finance field provided by Kearney and Liu (2014), and the broader financial reporting information environment provided by Beyer *et al.* (2010). In the analyst reports discipline, many studies tend to focus on the makeup of such reports, and in particular the analysis of financial statement figures (Previts *et al.*, 1994; Govindarajan, 1980; Breton and Taffler, 2001; Amir *et al.*, 2003; Abdolmohammadi *et al.*, 2006; García-Meca and Martínez, 2007) and earnings quality (Barker and Imam, 2008). Other studies concern the attention paid by analysts to non-financial information (Previts *et al.*, 1994; Breton and Taffler, 2001; Orens and Lybaert, 2007) and the firm and market factors that drive this (Campbell and Slack, 2007; Orens and Lybaert, 2010; Coram *et al.*, 2011).

There is a growing body of research on the impact of tone or sentiment on asset prices and returns. Examples include Tetlock *et al.* (2008) and Garcia (2013) who find evidence of financial media sentiment impacting on US stock returns, Boukus and Rosenberg (2006) who show that Federal Open Market Committee minutes impact on US Treasury yields, and Hanley and Hoburg (2010) who study US IPOs and find that greater informative content

reduces under-pricing. Studies find that higher quality disclosure, conservatism and readability reduce the probability of litigation risk (Mohan, 2007; Rogers *et al.*, 2011).

The importance of narrative commentary in analysts' reports is well documented in the literature (Asquith *et al.*, 2005; Barton and Mercer, 2005; Huang *et al.*, 2010). Both the detail and tonality of analysts' reports have incremental information content, and investor reaction to analyst reports is more pronounced when the reports are more complex (Twedt and Rees, 2012). Huang *et al.* (2010) find that analyst report narrative reflects the favourableness of a stock conveyed by quantitative output signals including recommendations, target prices and earnings forecasts. Evidence from Huang *et al.* underlines the incremental information value of analyst report narrative in explaining firm values, and they find that investors react twice as much to negative analysts' opinions as they do to positive opinions. Thus, the extant research reveals that not only are analysts' target prices and recommendations informative to capital markets, but so too is the narrative which accompanies these key outputs.

In this study we examine the themed sentiment of analyst reports to assess whether there is a link between the sentiment related to the themes and the outputs of analyst reports, and further, whether this relationship strengthens or diminishes in response to changing macroeconomic conditions. We study 275 sell-side analyst reports between January 2006 and December 2010. We separate our sample into three periods, pre-crisis, crisis and post-crisis, and use content analysis to separate the analyst reports into six pre-determined themes. To do this we develop our own theme dictionary by using a training sample of 84 out-of-sample reports. To measure the sentiment in these themes we use the Harvard-IV-4 psychosocial dictionary and a version of this dictionary that is adapted to a financial context by Loughran and McDonald (2011).

In our univariate analysis, we find that around 80 percent of the content of analysts' reports concerns financial performance, the industry and market environment, growth and the macroeconomic and regulatory environment. During and following the crisis we see an increasing focus on the macroeconomic and regulatory environment themes, but a decreasing emphasis on the growth and management and strategy themes. However, the sentiment related to these latter two themes has not changed significantly over the study periods. For all the other themes, we observe more negative sentiment with the onset of the crisis, followed in general by reversal thereafter.

We hypothesise that the themed sentiment in analysts' reports should be consistent with the outputs they produce, and we expect to see some evolution in the strength of themes over the crisis period. Our multivariate model results provide a more complex picture than we might

expect from theory. Across all of our model specifications we find a strong negative relationship between the macroeconomic and regulatory environment and the report outputs, though this effect is partially reversed during the crisis to give an insignificant effect. In contrast, before the crisis we see a positive impact of growth sentiment which disappears during the crisis period and thereafter. There is some limited evidence that management and strategy sentiment exerts a negative impact during the crisis which dissipates in the post-crisis period. The industry and market environment appears to have little association with analysts' outputs. Finally, following the financial crisis, we see a marked increase in focus on financial performance sentiment, with a positive association with analysts' outputs.

In our additional analyses, when we explore the deviation of recommendations and target price premia from consensus, we find qualitatively similar results, except that macroeconomic and regulatory environment sentiment is positively associated with the deviation from consensus recommendation though has no impact on the deviation from consensus target premium. Further, we estimate a series of additional specifications, including separating positive and negative sentiment scores, controlling for industry type, and employing rank scores and standardised scores, though we find that the results are qualitatively similar to those arising from our main models.

Drawing from the previous literature, there is established evidence that as well as the quantitative outputs, the qualitative attributes of analyst reports such as tone and detail provide incremental information content to the market. It is therefore important to provide evidence on how analysts' outputs (stock recommendations and target prices) and the themed sentiment in analyst report narrative, are interrelated. Our paper seeks to contribute to the analysts' report literature by addressing this issue and seeks to provide evidence on whether the outputs and the qualitative content that justifies the outputs remain stable or vary over changing market conditions. Building on the work of Breton and Taffler (2001), we include the theme categories developed in this earlier work but also add a new macroeconomic and regulatory environment variable, recognising that not only do the firm-specific and industry level environments impact upon analysts' outputs, but so too does the wider macroeconomic environment to which all firms are subject. A further innovation is that we explicitly allow for changing market conditions rather than assuming that the impact of the external environment on the analyst's report is stationary across all states of the economy, in contrast to studies such as Breton and Taffler, Asquith *et al.* (2005), and Twedt and Rees (2012). We study three periods, including the crisis, across which we seek to understand the change in analysts' focus when determining their investment outputs for a stock. Building upon the

existing literature, we expect that analysts' narrative sentiment will map less clearly on to report outputs during a period of economic volatility due to behavioural influences which may make analysts less effective and their forecast accuracy poorer. We contribute to the literature concerning analysts' reports during the crisis, not by only examining analysts' outputs (Ke and Yu, 2009; Ang and Ma, 2001; Loh and Mian, 2003; Sidhu and Tan, 2011; Loh and Stulz, 2014), but also by modelling the sentiment themes that drive those outputs.

An important finding of our study is that the narrative concerning the external environment diminishes in its effect on analysts' outputs during the crisis to be restored thereafter, while the narrative relating to financial fundamentals emerges as a key driver following the crisis, suggesting a 'back to basics' approach to analysis in response to the shock. A more indirect contribution of our paper is to provide further insight to the analysts' bias literature. Analysts who provide unfavourable investment advice on a stock which is quantifiable and observable by market participants might balance or temper this in their narrative in order to stay on good terms with management. On the other hand, analysts who give favourable investment advice on a stock might also use their narrative to communicate critical risk factors in order to protect their reputation in the event of that advice proving to be inaccurate.

The structure of the paper is as follows. Section 2 develops our hypotheses and section 3 discusses the analyst report data sample, as well as the content analysis and econometric methods applied. Section 4 discusses the results, and section 5 provides additional analyses and robustness checks. Section 6 discusses the general results arising from our analysis and concludes.

2.   Hypothesis development

2.1   *Theory context*

This paper adopts the approach of Breton and Taffler (2001) to explore the relationship between the tone of language used and the themes employed to justify stock recommendations. Previous research suggests that market reaction to analysts' recommendations increases with the strength of the argument justifying the recommendation (Asquith *et al.*, 2005; Twedt and Rees, 2012). Therefore, investors read analysts' reports to derive incremental economic information about companies from their commentary. Thus, consistent with Breton and Taffler, we expect that analysts carefully choose their language when generating report outputs, and that there is a relationship between the themed sentiment in analyst reports and stock recommendations.

We also test whether themed sentiment exhibits a similar relationship with target price premia (defined as the difference between target price and current market price scaled by current market price). Target price premia arguably provide a more precise and continuous measure than rather coarse stock recommendations (Huang *et al.*, 2009). For example, stocks with both high and low positive premia may be treated as a buy recommendation, while the former clearly offer a higher expected return to investors. Within the same recommendation category, analyst narrative can express a stronger tone for companies with higher target premia. Indeed, Brav and Lehavy (2003) find that target price revisions provide significant incremental information over stock recommendations, while Huang *et al.* (2009) find that a trading strategy that combines both recommendations and target price premia outperforms a strategy that relies on recommendations or target price premia alone. Furthermore, Kerl *et al.* (2012) find that recommendation changes are driven largely by events concerning company strategy and business development, in addition to market trends, whereas target price changes are triggered more by information on company management and the operating environment. Therefore, we expect to observe differences in the relationship between the themed sentiments in our study and analyst recommendations and target premia outputs, with the latter capturing more modelled variability.

Analysts' target price premia and stock recommendations are contingent upon the market prices of the companies they analyse. If an analyst believes that a company can generate good future financial performance and growth then the target price set should be higher, though if this sentiment is shared by investors then the market price will also increase, leaving little upside potential to exploit. The role of analysts is to identify stocks that are mispriced and to write a commentary justifying this position which is in general then reflected in a target price and recommendation on a stock. As information intermediaries, the role of analysts is to forecast firm potential over a longer term horizon, while investors may be affected by changes in market sentiment over a shorter horizon. Therefore, analysts' views may at times contrast with market sentiment and expectations which can in turn lead to optimistic or pessimistic forecasts.

Prior research evidences this issue and finds that analysts exhibit a tendency towards optimism in their forecasts and recommendations. Walther and Willis (2013) find that analyst forecasts are the most optimistic and inaccurate when investor sentiment peaks. They define investor sentiment as "an overly favorable or unfavorable view about stocks in general that is unwarranted given fundamentals" (p.208). Hann *et al.* (2012) find a significant association between aggregate earnings forecasts errors and real GDP growth forecast revisions,

suggesting that analysts under-react to negative macroeconomic news. Further, they find that market (investor) reaction to earnings announcements is more negative than that of analysts following weaker macroeconomic news which suggests a difference between analyst and investor sentiment dynamics. The bias of optimism may be due to the asymmetric loss function facing analysts (Clatworthy *et al.*, 2012), the augmented career prospects and access to firm management of optimistic analysts (Francis and Philbrick, 1993; Francis *et al.*, 1997; Mikhail *et al.*, 1999; Hong and Kubik, 2003; Mayew, 2008; Beyer *et al.*, 2010), or the maximisation of trading commissions and other corporate services (Lin and McNichols, 1998; Beyer *et al.*, 2010). An optimism bias in analysts' outputs is compounded by a similar bias in annual report and other corporate information arising from management performance attribution bias (Aerts, 2001; Clatworthy and Jones, 2003), and positive impression management (Hooghiemstra, 2010), though markets reward corporate transparency and increased risk disclosure (Kothari *et al.*, 2009; Kravet and Muslu, 2013).

In contrast, other research shows that analysts desire to maintain their credibility by issuing conservative forecasts (Brown e*t al.,* 2014). Cowen *et al.* (2006) show that analysts that work at 'full service banks' issue less optimistic earnings forecasts and recommendations compared to analysts in other firm types, especially in brokerage houses. Such conservative analysts generate a greater impact on stock returns (Hugon and Muslu, 2010).

In the next section we present the hypotheses of this study. Even though we expect internal consistency in the analysts' reports and expect the themed sentiment to inform the recommendations and target price premia, and thereby state hypotheses consistent with theory, we may in practice observe relations between certain themes and analyst report outputs which are contrary to expectations and potentially driven by state-contingent dynamics.

2.2 *Themed sentiments*

We define six major themes in this paper, similar to those in Breton and Taffler (2001), though with the addition of a theme which captures the macroeconomic and regulatory environment. Given its impact on financial markets during the recent crisis, the purpose of this additional theme is to gauge how analysts incorporate changing economic environment conditions into their commentary to justify their stock recommendations and target prices.

The first two of our themes relate to the external environment of the company, and they concern macroeconomic and regulatory conditions, and the industry and market environment. Analysis of the external environment is an essential component of the equity analyst's

research as favourable changes in this environment improve the outlook for growth in earnings and future cash flows, whereas unfavourable changes cause a deterioration in such flows and/or increasing discount rates. Breton and Taffler (2001) do not find a significant impact of industry and market conditions on buy/hold/sell recommendations, but after dropping the hold category they find that fewer mentions of negative market conditions lead to a buy recommendation. Therefore our general expectation is as follows:

H1: External environment (including industry and market, and macroeconomic and regulatory environment) sentiment has a positive association with stock recommendations and target price premia.

Our third theme is growth which we define as any action that is intended to increase company operating capacity. Mergers, acquisitions, capital expenditures, and strategic investments are all included in this category. Favourable growth sentiment is likely to have a positive association with both stock prices and target price premia. Analysts tend to focus on growth as a key parameter in their stock valuation methodologies and therefore reflect it rapidly in both target prices and recommendations. After all, it drives both horizon cash flows and the terminal value multiplier. Fogarty and Rogers (2005) document that analyst narrative is predominantly positive about growth-related plans, and more specifically they find that positive comments about mergers are 13 times as frequent as negative comments. However, Breton and Taffler (2001) do not find a significant relationship between growth sentiment and recommendations. We hypothesise that growth sentiment has a positive association with analyst stock investment advice:

H2: Growth sentiment has a positive association with stock recommendations and target price premia.

Our fourth theme, management and strategy, attempts to capture the sentiment of analysts in relation to management actions and the strategy they set in order to compete and generate shareholder value. Previous research shows that analysts rely upon information supplied by management (Fogarty and Rogers, 2005) and that they prefer direct personal contact with a subject company to standard information releases (Barker, 1998). Furthermore, Breton and Taffler (2001) find that the more approving and neutral references are to company management and strategy in analyst report narratives, the more likely is a buy recommendation. In contrast to Breton and Taffler, we do not split sentiment into positive, neutral and negative, but instead examine net themed sentiment so are unable to replicate their results with the same degree of granularity. However, we can argue, more broadly, that more positive sentiment in relation to management and strategy reflects more favourable

analyst narrative analysis concerning management acumen and strategic direction. Intuitively, this should in turn lead to a greater stock price premium and likelihood of a buy recommendation on a given stock:

H3: Management and strategy sentiment has a positive association with stock recommendations and target price premia.

Our final two themes relate to the financial statements. Favourable sentiment in relation to key firm fundamentals should give rise to a significant positive impact upon stock price premia and stock recommendations. Stronger company performance leads to greater current and future cash flows which in turn should lead to growing stock values. However, stock value growth is also contingent upon the risk to those cash flows, an important indication of which can be observed in balance sheet strength. The soundness of the balance sheet, in terms of the balance of assets, liabilities and capital, enables the analyst to gauge financial distress risk going forward, and whether it might arise through liquidity or solvency problems. A positive earnings outlook accompanied by a more approving discussion of balance sheet strength should lead to a greater likelihood of both a buy recommendation and a higher target price premium. Breton and Taffler (2001) find a positive relationship between favourable commentary on financial performance and stock recommendations, though they fail to find an impact of financial position sentiment. We therefore state the following hypothesis:

H4: Financial statement (financial position and performance) sentiment has a positive association with stock recommendations and target price premia.

2.3   *Period effects*

We study three periods in our empirical study – the pre-crisis period, the crisis period and the post-crisis period, across which we seek to understand the change in analyst focus when determining their investment outputs for a stock. Previous studies on the narrative content of analysts' reports focus on relatively stable or bull markets, including Breton and Taffler (2001) who examine the period 1989-1990, Asquith *et al.* (2005) who study the period 1997-1999, and Twedt and Rees (2012) who examine the year 2006. Previts *et al.* (1994) collect their reports from the three distinct periods of the 1987 stock market crash, the early 1990s US recession, and subsequent bull market period, though they do not discuss the impact of period differences on the use of narrative themes by analysts.

The skills and judgement of analysts are arguably most challenged in times of market volatility and in particular during and following financial crises. Ke and Yu (2009) find that the effectiveness with which analysts translate their earnings forecasts into recommendations

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is lower when investor sentiment is extreme (when there are large swings in investor sentiment). Ang and Ma (2001) find that analysts failed to anticipate underlying firm weaknesses before the Asian Financial Crisis and to make appropriate adjustments as the crisis hit. Further, Loh and Mian (2003) find that Singaporean analysts' earnings forecasts during the Asian financial crisis were systematically optimistic, and that analysts' earnings forecast changes exceeded actual earnings changes, and did not incorporate negative earnings-related news. However, Sidhu and Tan (2011) find that analysts sharply revised earnings forecast levels downwards in response to the Global Financial Crisis, tending towards over-pessimism, though observed an upward trend in buy recommendations thereafter as stocks had greater upside price potential. Loh and Stulz (2014) find that during crises and recessions, analysts' earnings forecast accuracy deteriorates. However, during these times analyst research becomes more influential in that their recommendation changes and earnings forecast revisions generate a greater market response when compared to normal periods. Thus, there is some prima facie evidence that investors rely more on analysts' guidance during times of economic uncertainty.

These studies indicate that during volatile market events, analysts are less effective, their forecast accuracy deteriorates, and report outputs are reactionary and lag behind market changes. Drawing upon these empirical findings, we might expect that analysts' commentary is also subject to behavioural change, and thus narrative sentiment will map less clearly on to report outputs during the crisis. We therefore expect that the association between report outputs and analyst narrative sentiment will be diminished during the crisis, to then be restored thereafter:

H5: The association between themed sentiment and stock recommendations and target premia diminishes during the crisis period compared to the pre-crisis and post-crisis periods.

3. Sample and methodology

3.1 *Sample selection*

This study focuses on UK quoted companies listed on the London Stock Exchange and drawn from the FTSE 350 index. We examine sell-side analyst reports for a panel of 57 companies drawn from 14 non-financial sectors, as presented in Table 1. Our sample selection process starts with identifying the weights of the 14 sectors in FTSE 350. We then rank each company within its respective industry based on its market capitalisation, and download analyst reports for that company from the *Thomson Reuters Investext* database.

[Insert Table 1 here]

We aim to collect a total of six analysts' reports for each company, two reports for each of the pre-crisis, crisis and post-crisis periods. We capture all reports that are longer than 15 pages in length and are produced within the period January 2006 to December 2010. Consistent with Barker and Imam (2008), we restrict our sample to reports exceeding 15 pages in order to focus on those that provide a more comprehensive analysis of the subject companies, in preference to short research notes or updates which often contain limited narrative discussion. We eliminate reports that: (i) are shorter than 15 pages; (ii) do not present a clear recommendation and a target price; or (iii) present analysis for multiple companies in the same report. To minimise the effects of variation in the report styles of different brokerage houses, we capture reports from as wide a range of investment banks as possible. After eliminating the reports that do not fit our sample criteria, our final sample is reduced from 342 to 275 reports. Table 2 provides information on the distribution of the reports and companies across the brokerage houses. Around 85% of the reports are produced by the nine largest brokerage houses which is to be expected as they have the resources required to cover a wider range of stocks. There is an average of between one and two reports for each company per brokerage house.

[Insert Table 2 here]

For the purposes of the study, we distinguish three periods: the pre-crisis period, the (within) crisis period, and the post-crisis period. To ascertain these periods in terms of date ranges we identify periods of advance, decline and recovery based on the FTSE100 index (within which most of the companies are positioned). Based on this analysis, the pre-crisis reports are drawn from the period January 2006 to March 2007, the crisis period reports from June 2007 to March 2009, and the post-crisis reports from September 2009 to December 2010. We leave two months between pre-crisis and crisis, and five months between crisis and post-crisis periods to allow for analysts adjusting to the changing market regimes. Whilst this appears a somewhat imprecise approach, it is based upon share price which is arguably the most sensitive of equity market metrics. We recognise that there is some debate concerning the precise date of commencement and end of the Global Financial Crisis. Defining the pre-crisis period as ending in early 2007 and the crisis commencing in mid-2007 is consistent with Cecchettie (2008), Ivanisha and Scharfstein (2008), Buiter (2009), Loh and Stulz (2014), and the NBER, and defining the crisis period as ending in early 2009 and the post crisis commencing in later 2009 is consistent with Kacperczyk and Schabl (2009) and Balakrishnan *et al.* (2014). Some authors see the early signs of the crisis appearing as early as 2006

(Doogar *et al.*, 2014), and ending as early as 2008 (Erkens *et al.*, 2012), though these studies tend to focus on financial sector firms and the subprime aspect of the crisis.

From the sample of 275 reports, 78 reports relate to the pre-crisis period, 93 reports to the crisis period, and 104 reports to the post-crisis period. Table 3 displays the recommendation structure for each period in panel A, the change in the recommendations in panel B, and the change in target prices in panel C.

[Insert Table 3 here]

In our sample, approximately 59% of the reports give buy recommendations and 10% reports give sell recommendations[1]. Our finding of a buy/sell ratio of 5.75 times is within the range evidenced in the existing literature which finds a buy/sell ratio of between 3.6 times (Imam *et al.*, 2008) and 7.6 times (Barber *et al.*, 2001). Further, Balboa *et al.* (2008) study UK analyst recommendations between 1994 and 2006, and observe 50.5% buy, 37.1% hold, and 12.4% sell recommendations, again consistent with the distribution in our sample. When we divide our sample into sub-periods, we observe that during the crisis period there was a decline of around 6 percentage points in reports with a buy recommendation and an increase in sell recommendation reports of 4 percentage points. Hold recommendations remained roughly the same during the crisis with only a 2 percentage point increase. In the post-crisis period there was a marked increase in buy recommendations of around 17 percentage points, with buy recommendations approximately 11 percentage points higher when compared with the pre-crisis period. Hold and sell recommendations also declined markedly in this latter period when compared with the pre-crisis period[2]. Thus, in the post-crisis period, analysts were evidently more optimistic about the upside potential of the stocks followed than before the crisis, and viewed stocks as in general undervalued at that point in time.

Panels B presents changes in stock recommendations over the study period[3]. Across the whole sample, around 75% of the reports reiterate the previous recommendation. However, upgrades decrease by around 12 percentage points during the crisis and then subsequently increase by around 8 percentage points following the crisis. The opposite trend is observed in relation to recommendation downgrades: an increase of around 5 percentage points during the

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[1] We classify the reports with a positive recommendation such as *buy*, *overweight*, *outperform* and *add* under the buy category, reports with a neutral recommendation such as *hold*, *equalweight*, *marketperform* and *neutral* under the hold category, and reports with a negative recommendation such as *sell*, *underperform*, *underweight* and reduce under the sell category.
[2] To check whether analysts forecasted the crisis at the start of 2007, we eliminate reports from 2007 but observe no discernible difference in the recommendation structure.
[3] These changes are computed in relation to the previous recommendation given by the same analyst (brokerage house) for a given company.

crisis and then a decline of around 8 percentage points following the crisis. Panel C reveals that whilst the majority of the reports reiterate a recommendation, analysts are generally positively disposed towards companies when target price changes are considered[4]. Indeed, target prices are revised upwards in approximately 70% of reports both before and after the crisis. A similarly symmetrical distribution is observed before and after the crisis with reiterated and downgraded target prices. However, the crisis period itself shows a rather different picture: the proportion of reports with upgraded target prices declined to around 39% during this period and downgrades increased to around 34%.

Table 4 presents descriptive statistics and *t*-statistic tests to enable the comparison of target price premia before, during and after the crisis. The mean target price premium increased markedly during the crisis, and remained at this higher level during the post-crisis period. The differences between the crisis and post-crisis versus the pre-crisis period are significant, though there is no significant difference between crisis and post-crisis premia.

[Insert Table 4 here]

3.2   *Methodology*

3.2.1   *Content analysis*

In this paper we conduct a content (textual) analysis of the narrative in analysts' stock reports to measure the impact of themed sentiment on stock recommendations and target price premia. Content analysis is defined as "any technique for making inferences by systematically and objectively identifying special characteristics of messages" (Holsti, 1968, p.68). By sentiment we refer to textual sentiment which Kearney and Liu (2014) define as "the degree of positivity or negativity in texts" (p.172), otherwise known as 'tone', and by themes we refer to "clusters of words with different meanings or connotations" (Weber, 1990, p.37). The content analysis literature focuses on the narratives produced by firms, analysts, and others. Such an approach is valuable in the context of empirical research in the finance field as it aids the researcher in the investigation of different types or "levels" of communication as defined by the meanings of the words employed (Kothari *et al.*, 2009).

The stock reports are downloaded in pdf format, converted into plain text, and then uploaded to the *QSR NVivo 9* content analysis software package. Consistent with Breton and Taffler (2001), we choose not to include report tables or figures in our analysis as analysts

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[4] These changes are computed in relation to the previous target price produced by a given analyst (brokerage house) for that company. Please note that sample size reduced in this table due to the previous target prices being omitted in 8 reports.

provide commentary on them in their narrative anyway. We conduct the textual analysis by: (i) identifying themes as well as sentences that contain these themes to form our text units, in order to calculate thematic variable scores; and then (ii) counting the positive and negative words in sentences to derive tonality scores for each theme.

Thematic variable scores

In order to calculate the thematic variable scores, we first construct a theme dictionary, a critical element of our approach as the sentiment scores for each theme are fundamental to our research design. It is important to carefully identify words which are both meaningful and which capture the associated text units.

We define six major equity analysis themes in this paper on the basis of a synthesis of the approaches of Breton and Taffler (2001), Abdolmohammadi *et al.* (2006), Orens and Lybaert (2010), and innovations of our own analysis. Table 5 illustrates the themes, along with the number of keywords identified and examples of keywords and phrases associated with each theme.

[Insert Table 5 here]

To identify the keywords for each theme, we examine 84 out-of-sample reports, two for each of the 14 industries and the three periods of our study. We choose not to include our test sample in our final sample to avoid bias of fit in our final results. We conduct a word frequency query for this sub-sample to derive a technical word set typically employed within analyst stock reports. This query commenced with approximately 7,000 non-numerical keywords that are longer than two letters which are then sorted on the basis of frequency of appearance, and from which the top 1,000 words are selected. To illustrate, the most common keyword is "growth" which appears 1,169 times, and the least common word is "jobs" which appears only six times. We then make an initial classification of these words into the six themes, eliminating any words that cannot be assigned, thereby reducing the list to 432 keywords. We proceed to search for these thematic keywords within the full sample of reports. The results are manually validated and keywords that do not capture the intended meaning are either reclassified or deleted, whilst also adding different variations of the keywords to capture further thematic meaning. For example, the keyword "credit" might be used to describe financial position as in "credit facility" or might be used in a broader

economic sense as in "credit crunch". The thematic dictionary thus yields 621 words or phrases[5].

The next stage of our approach is to search for the thematic keywords within the text of each report in our sample and then classify each sentence by theme. The score for each thematic variable for each report is as follows

$$Thematic\ Variable\ Score\ = \frac{NW}{TNW}$$

(1)

where *NW* is the number of words in a sentence that contains a keyword from each theme, and *TNW* is the total number of words in the text[6]. If a sentence contains more than one defined keyword category, we classify that sentence into each category that applies.

To check whether the theme dictionaries capture the intended meaning we conduct both a manual and an automated text analysis for the purposes of comparison. We draw a sample of 27 analysts' reports from our final study sample, manually code each report, and then calculate the thematic scores for each. We then compare these manual scores with the computer coded results and calculate Cronbach's alpha both for the aggregate coding and for each theme separately. Cronbach's alpha measures how well a dataset measures an underlying construct. An aggregate Cronbach's alpha score of 0.940 shows that, overall, our manual and computer coding results are highly consistent. For each separate theme we compute Cronbach's alpha scores ranging from a high of 0.904 (financial position) to a low of 0.736 (management and strategy), with the remaining themes are all higher than 0.80. The scores exceed the generally acceptable 0.70 threshold and are comparable to other studies in accounting and finance (Elshandidy and Neri, 2014; Elshandidy, *et al.,* 2014; Abraham and Cox, 2007; Botosan, 1997).

Sentiment scores

We then proceed to compute thematic sentiment scores. To achieve this, we search for positive and negative keywords in our sample to determine word frequency scores. Here, we use keywords that are based upon the *Harvard-IV-4* psychosocial dictionary (and *General Inquirer* software) which is commonly used in content analysis in the accounting and finance field (Kothari *et al.*, 2009; Tetlock *et al.*, 2008). However Loughran and McDonald (2011)

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[5] In our study, the maximum number of words in a phrase is three, as in "like for like".
[6] For example, in a given analyst report, if there are 10 sentences that contain keywords relating to financial performance and if these sentences have a total of 80 words then *NW* = 80. We then divide this by the total number of words in a report; if a report has 1,000 words then we compute a thematic variable score of 0.08.

find that some of the negative keywords in the Harvard dictionary are not necessarily negative in a financial context, and they modify the negative keyword list in the Harvard dictionary to better reflect the tone in financial text. There is an increasing preference for the Loughran and McDonald (LM) dictionary in finance research; for example, Rogers *et al.* (2011) use this revised dictionary to measure the impact of disclosure tone on shareholder litigation, Garcia (2013) to measure sentiment in financial news, and Huang *et al.* (2014) use it to analyse how investors react to abnormal tone in earnings press releases. We therefore employ both the Harvard-IV-4 positive and negative words list and the LM lists in the measurement of sentiment scores for the sake of completeness. The net sentiment score for each category is simply the difference between the frequency of positive and negative words as follows

$$Net\ Sentiment\ Score\ = \frac{P-N}{TNW}$$

(2)

where P is the frequency of positive keywords and N is the frequency of negative keywords in sentences that contain thematic keywords within each report, and TNW is the total word count in each report.

3.2.2 *Research design*

We estimate two types of model in our analysis: (i) an ordinal regression to examine the impact of themed sentiments, periods and their interaction effects on the buy, hold and sell recommendation given by analysts; and (ii) an ordinary least squares regression of the target price premium on the same set of independent variables.

Model 1 examines the drivers of analysts' stock recommendations as detailed on the front or tear-sheet of a stock report. The recommendations are coded as follows: 2 = "buy"; 1 = "hold"; and 0 = "sell", thereby converting a text-based variable into a quantitative ordinal variable. The model enables us to estimate the relationship between the ordinal dependent variable, X_i, the probability of the recommendation category, and the six themed sentiments. We employ dummies to control for period (pre-crisis, crisis, and post-crisis) with the pre-crisis period as the default time period.

In our ordinal model, for each case i, the following equation describes the explanatory index, X_i, that influences the probability of various states:

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$$X_i = \alpha + \beta_1 SIndEnv_i + \beta_2 SManStr_i + \beta_3 SMacro_i + \beta_4 SGrowth_i + \beta_5 SFinPos_i$$

$$+\beta_6 SFinPerf_i + \beta_7 DCrisis_i + \beta_8 DPostCrisis_i + \beta_9 (DCrisis_i * SIndEnv_i)$$

$$+ \beta_{10}(DCrisis_i * SManStr_i) + \beta_{11}(DCrisis_i * SMacro_i) + \beta_{12}(DCrisis_i * SGrowth_i)$$

$$+\beta_{13}(DCrisis_i * SFinPos_i) + \beta_{14}(DCrisis_i * SFinPerf_i) + \beta_{15}(DPostCrisis_i * SIndEnv_i)$$

$$+\beta_{16}(DPostCrisis_i * SManStr_i) + \beta_{17}(DPostCrisis_i * SMacro_i)$$

$$+\beta_{18}(DPostCrisis_i * SGrowth_i) + \beta_{19}(DPostCrisis_i * SFinPos_i)$$

$$+\beta_{20}(DPostCrisis_i * SFinPerf_i) + \sum_{k=1}^{4} \beta_k Controls_{ki} + \varepsilon_i \qquad (3)$$

where X_i is the probability of a buy/hold/sell recommendation, Rec_i; $SIndEnv_i$ is industry and market environment sentiment; $SManStr_i$ is management and strategy sentiment; $SMacro_i$ is macroeconomic environment sentiment; $SGrowth_i$ is growth sentiment; $SFinPos_i$ is financial position sentiment; and $SFinPerf_i$ is financial performance sentiment. $DCrisis_i$ and $DPostCrisis_i$ equal one during the crisis and post-crisis periods, respectively, and equal zero otherwise. Interaction dummies are identified by terms containing an asterisk. $Controls_i$ are firm level control variables. We compute the natural logarithm of market capitalisation ($LogMCap_i$) to control for firm size, the price to book ratio (PB_i) to control for growth opportunities and unrecorded goodwill, the return on common equity (ROE_i) to control for performance, and total debt to equity (DE_i) to control for leverage.

Model 2 examines the drivers of the target premium, using the same set of independent variables as in model 1. Here, we attempt to determine the factors that drive the degree of upside (or target premium) as measured in Equation 4:

$$Target\ premium = \frac{Target\ price - Current\ price}{Current\ price}$$

$$(4)$$

Model 2 thus estimates in turn the relationship between the target premium and the six themed sentiments, period dummies, and interaction effects. The model is obtained by replacing X_i with $TPrem_i$ in Equation 3. For both models we first report the sentiment with control variables specification and period dummies, and then a specification which also includes the interaction effects. In both models, z-statistics (t-statistics) are calculated using White robust standard errors and are clustered by company to control for dependency in error terms.

A further specification of Model 2 is obtained by including the stock recommendation as an additional control variable. This specification captures the impact of sentiment on target premia that is not captured by stock recommendations.

4. Results

4.1 *Descriptive statistics*

Table 6 presents the frequency of words by theme within the text units as a proportion of the overall report word count (NW/TNW in Equation 1). On average, sentences that give reference to financial performance and the industry and market environment account for more than half of the analyst reports. The ranking observed in our data is consistent with the findings of Breton and Taffler (2001) where these themes account for the majority (67%) of theme words.

[Insert Table 6 here]

Breakdown of these results by period reveals that reference to these two themes, along with the financial position theme, is not significantly different across the three periods of our study. Therefore, it is evident that analysts consistently focus upon the industry and market environment and financial accounting information in their reports. Commentary relating to the macroeconomic and regulatory environment increased significantly with the onset of the financial crisis and persisted thereafter, with an insignificant change between the crisis and post-crisis periods, indicating a persistent shift in analysts' decision frames with the onset of the crisis. The industry and market environment related themes feature prominently, with roughly 20% of the reports containing narrative focusing on industry-associated keywords, and the pattern is time invariant, giving rise to insignificant *t*-test results.

During the pre-crisis period, analysts employed growth-related narrative with greater frequency, though the onset of the crisis appeared to curtail reference to growth-related activities with a statistically significant decline of more than 5 percentage points. Following the crisis, there is an insignificant 1.39 percentage point increase in word frequency score. The significant difference between the pre-crisis and post-crisis periods suggests a persistent reduction in growth narrative following the crisis. A similar trend to that for growth is observed for the management and strategy theme. The significant decline with the onset of the crisis implies a greater focus on external factors, thereby decreasing the weight of firm-specific, internal factors such as management and strategy and this effect is persistent following the crisis.

Analysts have traditionally focused on the financial performance of companies given investor preoccupation with the "bottom line", and our results bear this out with discussion of financial performance constituting around 36% of the narrative. In contrast, analysts are considerably less interested in financial position, with only around 4% of the reports discussing financial position. In general, results for financial accounting factors do not

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change markedly across the periods, excepting the comparison of the pre- and post-crisis periods for financial position.

Table 7 reports net sentiment score ($(P - N)/TNW$ in Equation 2) by theme for the two word dictionaries. The net sentiment scores from the LM dictionary are less than the Harvard dictionary scores, evidencing a general tendency of the LM dictionary to pick up more negative keywords compared to the Harvard dictionary. Both dictionary results reveal that all of the scores decline during the crisis period, and then revert back to almost pre-crisis scores thereafter. Indeed, the difference between pre-crisis and post-crisis period net sentiment is insignificant in each theme, whilst the difference between pre-crisis and crisis (and between crisis and post-crisis) net sentiment is significant for all themes except for the growth theme and the management and strategy theme.

[Insert Table 7 here]

Panel A shows that the analysts maintain a negative sentiment on the macroeconomic environment over the three sample periods, and that they focus on this theme more when the outlook is negative, though the standard deviation points to an increased and persistent spread of scores with the onset of the crisis. The sentiment for the industry and market environment theme shown in Panel B is positive in the pre-crisis period, falling to neutral (negative in the LM dictionary) during the crisis and reverting to the pre-crisis level once the crisis dynamics worked through. Panel C shows that sentiment concerning growth is positive throughout, reflecting the effects of the crisis through decline and subsequent recovery, though the difference across time is insignificant. Similarly, the sentiment shown in Panel D evidences a positive assessment of company management and strategy through time, a result consistent with Breton and Taffler (2001) who find that negative narrative here is rare and is in general offset by more positive narrative elsewhere. However, using the LM dictionary we observe negative net sentiment throughout, in sharp contrast to the Breton and Taffler results. Sentiment concerning financial performance, shown in Panel E, is positive throughout, though deteriorates markedly during the crisis (turning to negative in the LM dictionary), consistent with poor company performance during this time. Finally, financial position shown in Panel F deteriorates to become negative during the crisis, perhaps reflecting wider concerns about solvency or liquidity, to return to a positive sentiment in the post-crisis period.

[Insert Table 8 and 9 here]

Table 8 and Table 9 present Pearson and Spearman correlations for the model variables using the LM and Harvard-IV-4 dictionaries, respectively. The correlation coefficients from

both dictionaries are in general very close, with the Harvard-IV-4 dictionary generating slightly higher correlation coefficients for most of the net sentiment scores. As expected, target premia and recommendations are strongly correlated. Target premium is positively correlated with financial position. The recommendation level is also positively correlated with both of the financial statement sentiment variables, with the addition of growth and the industry and market environment sentiment. All of our net sentiment variables exhibit significant positive correlation coefficients, suggesting that the general tone of analyst reports is consistent. In particular, financial performance is highly correlated with the other independent variables as might be expected, with the industry and market environment correlation coefficient the highest at 0.563. To check for possible multicollinearity issues we calculate variance inflation factors (VIF) and find that they are all below 2, suggesting that there is no risk of problematic multicollinearity in our regressions[7].

4.2 *Multivariate results*

Table 10 presents the results of the recommendation model (Model 1) using the two dictionaries. We discuss the model results across the specifications by variable, focusing on themed sentiments and associated interaction effects.

[Insert Table 10 here]

The LM dictionary captures only a weak positive association between financial performance (*SFinPerf*) and stock recommendations (column 1), though the specification employing the Harvard dictionary (column 3) shows that sentiment related to financial position (*SFinPos*) and performance (*SFinPerf*) is positively associated with stock recommendations in the base model. Thus, more positive analyst sentiment in relation to financial statement items leads to a greater probability of a better recommendation. The period dummies are not significant, showing that while we observe some recommendation change over the three time periods, the period effects alone are not significant in a multivariate setting. We also find that the control variable, debt to equity (*DebtEquity*), exhibits a negative impact, indicating that high leverage and thus increased financial risk leads to a lower recommendation. We did not see a similar impact for the other control variables so we have excluded them from the table for brevity purposes.

When the interaction terms are included in the model (columns 2 and 4), the results provide a more interesting story. With regard to the external environment, we find that while the

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[7] The highest VIF is for *SFinPerf* with a value of 1.96.

industry and market environment (*SIndEnv*) fails to explain the recommendations, sentiment related to the macroeconomic and regulatory environment (*SMacro*) has an important relationship with stock recommendations for both dictionary types. During the benchmark pre-crisis period, *SMacro* is negatively related to the recommendation, suggesting that when sentiment in relation to this theme is negative (positive) analysts are on average more likely to give higher (lower) recommendations. The negative coefficient of *SMacro* is contrary to theory expectations, though this may be attributed to the dynamics of stock price reaction to the general macroeconomic environment in addition to how analysts modify their recommendations. When the general macroeconomic outlook is positive then this aggregate sentiment is reflected in higher stock prices, leaving little upside potential for an individual stock, though when general macroeconomic sentiment is negative then analysts promote an opportunity to buy the stocks at a 'bargain' price due to more significant upside potential. A further explanation can be found in analysts' behaviour. We find from our univariate results in Table 7 that even before the crisis, analysts' sentiment on the macroeconomic environment was on average negative. Analysts may employ the macroeconomic environment as a caveat device to couch their recommendations such that if their advice subsequently turns out to be poor then they can point to their external risk (conservative) narrative to maintain their credibility. The findings of Brown *et al.* (2014) and Hugon and Muslu (2010) that document conservatism in forecasts may also be applied to narrative balance rather than outputs as a mechanism to maintain credibility. This defensive strategy is also politically more sensible for the analyst as they balance their overall argument with reference to external factors rather than by criticising company management.

With the onset of the crisis we see an incremental association for *SMacro* with the coefficient changing to positive. This shows that analysts' narrative about the macroeconomic and regulatory environment changed significantly during the crisis compared to the pre-crisis period. The positive coefficient for *SMacro* with the onset of the crisis evidences some behavioural correction as the severe (real) impact of the crisis on companies becomes a material risk factor which impacts upon stock prices and analysts' recommendations. However, during the post-crisis period, the insignificant interaction coefficient shows that analyst sentiment is not significantly different from the pre-crisis period implying that analysts revert back to their pre-crisis position with regard to the relation between *SMacro*

and the recommendations they give. We employ the Wald test for the sum of the coefficients[8] to examine whether *SMacro* is significantly associated with stock recommendations during the crisis and post-crisis periods. The Wald statistic suggests that only the post-crisis period is significant for the LM dictionary. Thus we can infer that during the crisis period the association between *SMacro* and stock recommendations disappears, while during the post-crisis period the negative association between *SMacro* and stock recommendations observed before the crisis re-emerges.

As in Breton and Taffler (2001) we employ growth to capture expansion in the operating capacity of the business, including actions such as acquisitions and capital expenditure. Thus, analysts normally mention firm growth in a positive sense, as such actions are more likely to improve their stock recommendations. Consistent with this expectation, the LM dictionary captures growth related sentiment (*SGrowth*) in the base (pre-crisis) period with a positive sign though with low significance. However, the Harvard dictionary fails to capture this effect. We see a reversal in the sign of growth sentiment to negative in the LM dictionary during the crisis, again with low significance, which persists and strengthens for both dictionaries following the crisis. The negative sign for the crisis and post-crisis periods indicates an incremental, period-contingent change in association between stock recommendations and growth. The Wald statistic for the sum of the coefficients is insignificant for both crisis and post-crisis periods, showing that while commentary on growth might be positively associated with stock recommendations during the pre-crisis (normal growth) period, the onset of the crisis and its aftermath leads to the disappearance of this effect. This may be attributed to analyst behavioural change with regard to attitude towards growth-related risk.

The model using the LM dictionary exhibits a significant negative coefficient for the management and strategy (*SManStr*) related sentiment during the crisis. This result shows that there is an incremental change with regard to this sentiment during the crisis compared to the pre-crisis period. For the LM dictionary, the Wald test for the crisis period suggests that there is a significant and net negative association between *SManStr* and stock recommendations. This might be due to analysts again trying to balance their arguments by providing relatively more positive (or less negative) commentary about management during

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[8] We compute the Wald statistic to test whether the sum of the base (pre-crisis) period and crisis interaction coefficients is significant for the crisis period, and whether the sum of the base (pre-crisis) period and post-crisis interaction coefficients is significant for the post-crisis period. The null hypothesis is that the sum of the coefficients is equal to zero.

the crisis to maintain their lines of communication with company managers, despite their more unfavourable recommendations.

The financial statement related sentiment variables indicate that in the post-crisis period analyst sentiment on the financial fundamentals has more impact when they arrive at their recommendations. The model employing the Harvard dictionary captures a weak positive sign for both financial position (*SFinPos*) and financial performance (*SFinPerf*), whereas the LM dictionary captures only a strong positive sign for *SFinPerf*. The Wald test indicates that there is a significant net positive association between these two sentiment variables and stock recommendations in the post-crisis period. This 'back to basics' behaviour is consistent with analysts again focusing on linking recommendations to fundamental variables as the latter provide the best indication of a company's future cash flows and underlying risk following the crisis.

In terms of period dummies, we do not find a significant impact of the periods on the recommendations as the interaction effects instead allow for theme-specific period effects. In terms of the control variables, only *DebtEquity* exhibits an association with recommendations, showing that more highly levered companies receive a less favourable recommendation.

Table 11 shows the association between themed sentiments and target price premia (Model 2). In the specifications in columns 1 and 4, we examine the base specification and find that *SMacro* is negatively associated with the target premium whereas *SFinPos* has a positive sign. The period coefficients are significant and positive, showing that during the crisis and post-crisis periods target premia significantly increase, consistent with the descriptive statistics.

When we control for stock recommendation in the model in columns 2 and 5, we find that, as expected, the explanatory power of the model increases significantly and the recommendation variable is significant and positive, indicating that target price premia to a great extent map on to the recommendation structure. For both dictionaries we still find that both *SMacro* and *SFinPos* retain their explanatory power, suggesting that less (more) positive sentiment concerning the macroeconomic environment results in a higher (lower) target price premium, and more (less) positive sentiment concerning the financial position results in a higher (lower) target price premium, after controlling for the recommendation category in both cases.

[Insert Table 11 here]

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When the period and interaction effects are included (columns 3 and 6), we find similar results to those discussed for the recommendations model (Model 1). However, we observe stronger significance levels for both dictionaries in our models and the Wald tests. The only exception is management and strategy sentiment (*SManStr*) for which the Wald statistic was significant during the crisis in the recommendations model but not in the target price premia model. We find that target price premia during the crisis enjoy a positive step jump from pre-crisis levels, evidencing a widening differential between market (investor) prices and analysts' valuations. In the Harvard dictionary, this incremental impact is persistent in the post-crisis period with a weak positive coefficient. The Wald tests show that, consistent with the pre-crisis period, during the post-crisis period *SMacro* is also a significant negative driver of target premia, and that financial statement sentiment fundamentals are positively associated with target premia, consistent with the recommendations models. Consistent with our recommendations model, *DebtEquity* is also a negative driver of target price premia.

Across the two models, we can observe that the crisis leads to a disconnection between narrative sentiment and the analyst outputs of stock recommendations and target price premia. The impact of sentiment themes is therefore period-contingent as their precise impact in terms of both magnitude and direction varies across the sample periods. While before the crisis a combination of negative (positive) macroeconomic environment and a positive (negative) growth sentiment results in higher (lower) stock recommendations, the crisis partially reverses and thus leads to the disappearance of such relationships. During the post-crisis period we observe that *SMacro* re-emerges as an important factor, together with financial statement sentiments, especially *SFinPerf*.

In summary, we find a negative sign for *SMacro* for the pre-crisis and post-crisis periods alone in both the recommendations and target premia models, which do not provide support for H1. For *SGrowth*, the pre-crisis period provides some support for H2, though no support thereafter. For *SManStr*, our results do not provide support for H3. With regard to *SFinPos* and *SFinPerf*, we find support for H4, though only following the crisis period.

In general we find significant deterioration of association between the themed sentiments and the analyst report outputs during the crisis period compared to the pre-crisis and post-crisis periods. The only exception to this is management and strategy related sentiment (*SManStr)* for the recommendation model with the LM dictionary. These results provide support for our overarching hypothesis H5. Thus, the Global Financial Crisis does indeed impact upon analysts' behaviour and we observe a disconnect between analysts' sentiment and the outputs they produce during this period.

5. Additional analyses and robustness tests

5.1 *Themed sentiments and deviation from consensus estimates*

In further analyses, we also model analyst deviation from both consensus target price premia and recommendations. We expect that analysts will more clearly justify and thus strengthen their arguments as they deviate from consensus outputs. To measure deviation from consensus target premia (*DevTP*) we take the difference between analysts' consensus target prices and the target price in an individual analyst's report, and then scale it by the market price. To measure deviation from consensus recommendation (*DevRec*), we take the difference between the consensus recommendation and the analyst's recommendation.

The recommendations deviation model presented in Table 12 shows qualitatively similar results to those observed earlier for Model 1, suggesting that the drivers of stock recommendations remain similar as analysts deviate from the consensus recommendation. However, the Wald test reveals that during the crisis the sentiment for *SMacro* is positively associated and during the post-crisis period *SMacro* is not associated with the deviation from consensus recommendation. The target premia deviation model presented in Table 13 is also qualitatively similar to Model 2. The exception is that the crisis and post-crisis period dummies are not significant, indicating that the deviation from consensus target prices does not on average vary markedly over the study periods. Furthermore, contrary to the earlier model, we find no impact of the macroeconomic and regulatory environment sentiment (*SMacro*) on target premia deviations. Thus, while sentiment in relation to this theme can explain target price premia, we do not find evidence of it impacting upon the analyst versus consensus target premium differential.

[Insert Tables 12 and 13 here]

5.2 *Separating positive and negative sentiment scores*

In the finance literature there is broad agreement on the asymmetric impact of positive and negative news, whereby negative news generates more market reaction than positive news. Tetlock *et al*. (2008) find a similar result when examining the impact of the negative tone in financial news on stock prices. Breton and Taffler (2001) compute sentiment scores which are not aggregated in order to measure the impact of positive, neutral or negative tone on stock recommendations. As a robustness check, we therefore treat positive and negative sentiment scores separately to analyse the association with stock recommendations and target premia. Table 14 presents the models estimated for negative sentiment only as positive

sentiment models fail to capture the impact of individual sentiment scores on either target premia or recommendations.

[Insert Table 14 here]

For the recommendations models, employing only negative sentiment generates less significant model variables compared to using net sentiment scores. In particular, for the benchmark pre-crisis period none of the variables are significant. This might be due to the lack of usage of negative words in the analyst reports during the bull period. However, we find a negative sign for *NegSMacro* during the crisis, and a significant Wald test result, suggesting that the more (less) negative the tone of analysts' narrative in relation to macroeconomic factors, the more likely it is that they issue a lower (higher) recommendation. For the post-crisis period the Wald test confirms that negative tone concerning the industry and market environment (*NegSIndEnv*) is positively associated with stock recommendations, implying that the more frequently that analysts use negative words on this theme the more likely they are to give a higher recommendation. As this theme is related to the external firm environment, the explanation above for the macroeconomic environment may also apply to this theme. Finally, we also observe that negative financial performance sentiment (*NegSFinPerf*) has a negative sign, implying that negative tone is associated with lower stock recommendations, a result confirmed by the Wald test.

In the target premia model, during the pre-crisis benchmark period we find that *NegSMacro* and *NegSGrowth* are significant with signs consistent with those in model 2. The Harvard dictionary also yields a negative sign for *NegSIndEnv* which is consistent with theoretical expectations. As observed in the recommendations model, during the crisis *NegSMacro* is significant and negative, indicating a reversal of the relationship. However, the Wald statistic for the sum of the two coefficients is insignificant and thus the overall effect during the crisis is offset. The results for the post-crisis period in the target premia model are similar to those in the recommendations model.

In summary, while in general we observe consistent results from the negative sentiment models, it is net sentiment which generates more robust results when attempting to explain both recommendations and target price premia.

5.3   *Other specifications and data transformations*

As a robustness check to determine whether our results vary by industry categories, we add dummies to account for (i) cyclical versus defensive industries and (ii) new versus old economy industries. Our results, not tabulated here, show that these added variables are not

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significant and their addition does not impact on our results. Further, instead of using the absolute values of sentiment scores in our models, we rank them and employ the rank scores as model variables. Although we do not present the models here, the results are qualitatively similar to the findings for models 1 and 2, with the exception that financial performance sentiment during the post-crisis period is no longer significant. Finally, as in Tetlock *et al.* (2008), we compute a standardised measurement score for sentiment variables but find (in results not reported here) that it makes no significant impact on our findings.

6.   Conclusion

In this paper we examine the relationship between themed sentiment in analyst report narratives and the outputs generated by the analysts, namely recommendations and target price premia. We also determine whether that relationship changes, or more specifically diminishes, with the onset of the crisis. Prior research on analysts' reports focuses on the impact of their outputs on stock prices and shows that not only the outputs but also the narrative has incremental information content. However there is little research on whether analyst narrative is related or indeed consistent with the outputs. Our paper addresses this shortcoming and provides evidence on how the relationship changes in response to the crisis.

Our results reveal that themed sentiment has an association with analysts' outputs which is far from stable over a period when economic conditions are volatile. Analysts respond to these changing conditions by changing the outputs, though the change in the sentiments is not proportional and indeed can reveal both changes in magnitude and direction. More precisely, we observe that the Global Financial Crisis leads to a diminution of the relationship between narrative sentiment and both stock recommendations and target price premia, thereby confirming that the impact of sentiment themes is period-contingent. Although not tested in this paper, this dynamic might be explained in terms of analysts' bias as they try to balance their arguments by softening unfavourable recommendations/premia or employing certain themes as a (negative) caveat device to qualify favourable outputs. The results might be explained by analysts' optimism with regard to outputs and an under-reaction to negative news.

A broad finding of our study is that the external environment diminishes in its effect on analysts' outputs with the onset of the crisis, only to be restored thereafter. It is possible that during the crisis period, the uncertainty analysts faced leads to a refocus of attention away from less direct towards more direct drivers of recommendations and stock price premia.

Following the crisis there is evidently a new 'back to basics' focus whereby financial fundamentals are placed at the heart of their analysis, with analysts focusing on financial position and performance. This latter result reinforces the importance of accounting numbers to market agents as they are coerced to rediscover more direct fundamental valuation models following a volatile shock.

A further contribution of our study is to document that the relation between the themed sentiment and analysts' report outputs is not stationary and it is contingent upon changing market conditions. Our results are relevant to both practitioners and researchers who are interested in the information search and evaluation behaviour of analysts.

Our research has a number of limitations. First, although we endeavour to control for errors in the coding process, our sentiment data may not fully capture actual sentiment in the reports due to limitations in the application of pre-determined dictionaries. We identify and manually validate our themes and theme dictionary, but it is possible that a more granular theme categorisation may provide some further insights into the behaviour of analysts. We select a balanced sample of 275 reports from the largest firms in each respective industry, though we recognise that this approach may impact upon the generalizability of our results. Future research in this area may investigate how analyst biases and characteristics affect the relationship between sentiment and output as we believe analysts may try to hedge their recommendations with their narrative argument.

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Table 1. Distribution of sample companies across industries

Industry Code (ICB3)	Number of Companies	Distribution (%)
Industrial Goods and Services	13	22.81%
Oil & Gas	6	10.53%
Travel and Leisure	6	10.53%
Basic Resources	5	8.77%
Retail	5	8.77%
Technology	4	7.02%
Food and Beverage	3	5.26%
Media	3	5.26%
Personal and Household Goods	3	5.26%
Chemicals	2	3.51%
Healthcare	2	3.51%
Telecommunication	2	3.51%
Utilities	2	3.51%
Construction and Materials	1	1.75%
Total	57	100.00%

Table 2. Distribution of sample reports across brokerage houses

Brokerage house	Number of reports	Distribution (%)	Number of companies	Ratio of reports per company
Morgan Stanley	56	20.36%	33	1.70
Deutsche Bank	49	17.82%	32	1.53
JPMorgan	39	14.18%	26	1.50
Credit Suisse	28	10.18%	21	1.33
RBS	15	5.45%	12	1.25
HSBC	13	4.73%	13	1.00
Evolution	12	4.36%	12	1.00
Investec	11	4.00%	8	1.38
Panmure Gordon	10	3.64%	9	1.11
ABN Amro	9	3.27%	8	1.13
Bernstein	6	2.18%	6	1.00
Societe Generale	6	2.18%	6	1.00
ING	4	1.45%	4	1.00
Numis	4	1.45%	4	1.00
Canaccord	2	0.73%	1	2.00
Uni Credit	2	0.73%	2	1.00
Arbuthnot	1	0.36%	1	1.00
Collins Steward	1	0.36%	1	1.00
Jefferies	1	0.36%	1	1.00
Landsbanki	1	0.36%	1	1.00
Macquaire	1	0.36%	1	1.00
Raiffeisen	1	0.36%	1	1.00
Seymour Pierce	1	0.36%	1	1.00
West LB	1	0.36%	1	1.00
Williams de Broë	1	0.36%	1	1.00
Total	275	100.00%		

Table 3. Recommendations, recommendation changes and target price changes over the sample period

Outcome	Pre-crisis	%	Crisis	%	Post-crisis	%	Total	%
Panel A: Recommendations								
Buy	44	56.41%	47	50.54%	70	67.31%	161	58.55%
Hold	26	33.33%	33	35.48%	27	25.96%	86	31.27%
Sell	8	10.26%	13	13.98%	7	6.73%	28	10.18%
Total	78	100.00%	93	100.00%	104	100.00%	275	100.00%
Panel B: Change in recommendation								
Up	17	21.79%	9	9.68%	18	17.31%	44	16.00%
Reiterate	54	69.23%	71	76.34%	80	76.92%	205	74.55%
Down	7	8.97%	13	13.98%	6	5.77%	26	9.45%
Total	78	100.00%	93	100.00%	104	100.00%	275	100.00%
Panel C: Change in target price								
Up	51	68.92%	35	38.89%	72	69.90%	158	59.18%
Reiterate	14	18.92%	24	26.67%	18	17.48%	56	20.97%
Down	9	12.16%	31	34.44%	13	12.62%	53	19.85%
Total	74	100.00%	90	100.00%	103	100.00%	267	100.00%

Table 4. Descriptive statistics for the target price premium

Target Price Premium								
	Mean	*StDev*	*Min*	*Q1*	*Median*	*Q3*	*Max*	*t-stat*[a]
Pre-crisis	0.092	0.121	-0.250	0.023	0.108	0.164	0.419	-2.738***
Crisis	0.155	0.178	-0.455	0.069	0.142	0.238	0.697	-0.882
Post-crisis	0.162	0.179	-0.293	0.053	0.154	0.227	0.833	-3.182***

Notes: [a] :The first *t*-statistic of each panel is calculated to compare pre-crisis reports and the crisis reports, the second *t*-statistic is calculated to compare crisis reports and post-crisis reports, and the third *t*-statistic is calculated to compare pre-crisis reports and post-crisis reports.

***, **, *: Significant at 1%, 5% and 10%, respectively.

Table 5. Themes and example keywords and phrases employed in the thematic dictionary

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Macroeconomic and regulatory environment (184 keywords): budget deficit, economic environment, exchange rate, fiscal policy, government spending, macro environment, quantitative easing, unemployment

Industry and market environment (94 keywords): bargaining power, competition, contracts, customers, industry, market share, market condition, substitute products

Growth (80 keywords): acquisition, alliance, capacity expansion, investment programme, merger, new project, organic growth, takeover

Management and strategy (79 keywords): appointment, business model, CEO, core competence, corporate strategy, differentiation, management team, reorganisation

Financial performance (95 keywords): contribution, EBIT, Profit, finance charge, like for like, margin, SG&A, turnover

Financial position (89 keywords): collection period, current ratio, credit facility, debenture, financial distress, gearing, pension scheme, working capital

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Table 6. The major themes employed in the reports

	Mean	StDev	Min	Q1	Median	Q3	Max	*t*-stat[a]
Panel A: Macroeconomic and Regulatory Environment								
Pre-crisis	7.17%	6.67%	0.00%	2.42%	5.38%	10.41%	32.14%	-4.082***
Crisis	11.74%	7.99%	0.85%	4.89%	10.67%	16.50%	42.40%	0.808
Post-crisis	10.88%	6.79%	0.00%	6.64%	9.72%	14.50%	40.34%	-3.694***
Panel B: Industry and Market Environment								
Pre-crisis	20.73%	9.81%	1.01%	14.07%	18.70%	26.26%	55.17%	1.047
Crisis	19.24%	8.55%	0.00%	12.57%	19.19%	24.53%	42.66%	-0.382
Post-crisis	19.73%	9.27%	3.59%	13.38%	17.85%	26.68%	43.70%	0.698
Panel C: Growth								
Pre-crisis	13.75%	11.58%	0.00%	5.35%	11.28%	18.96%	59.48%	3.632***
Crisis	8.24%	7.37%	0.00%	3.44%	6.76%	11.12%	41.31%	-1.214
Post-crisis	9.63%	8.70%	0.00%	3.83%	7.38%	13.42%	51.87%	2.634***
Panel D: Management and Strategy								
Pre-crisis	5.54%	4.64%	0.00%	2.16%	4.40%	7.77%	19.97%	2.604**
Crisis	3.83%	3.78%	0.00%	1.43%	2.68%	4.77%	19.38%	-0.228
Post-crisis	3.95%	3.40%	0.00%	1.21%	3.03%	6.04%	13.79%	2.556**
Panel E: Financial Performance								
Pre-crisis	35.86%	14.46%	5.07%	25.35%	35.70%	48.15%	65.38%	0.027
Crisis	35.81%	13.21%	7.14%	26.64%	35.38%	44.91%	71.84%	-0.476
Post-crisis	36.88%	15.43%	4.16%	25.23%	37.16%	48.01%	79.47%	-0.410
Panel F: Financial Position								
Pre-crisis	3.40%	3.32%	0.00%	0.76%	3.10%	4.66%	15.68%	-0.613
Crisis	3.79%	4.90%	0.00%	0.45%	2.24%	4.86%	21.52%	-0.554
Post-crisis	4.13%	3.58%	0.00%	1.54%	3.52%	5.52%	20.76%	-1.417

Notes: [a] :The first *t*-statistic of each panel is calculated to compare pre-crisis reports and the crisis reports, the second *t*-statistic is calculated to compare crisis reports and post-crisis reports, and the third *t*-statistic is calculated to compare pre-crisis reports and post-crisis reports.

***, **, *: Significant at 1%, 5% and 10%, respectively.

Table 7. Analyst sentiment by theme

	LM Dictionary				Harvard-IV-4 Dictionary			
	Mean	StDev	Median	*t*-stat[a]	Mean	StDev	Median	*t*-stat[a]
Panel A: Macroeconomic and Regulatory Environment (SMacro)								
Pre-crisis	-0.04%	0.14%	-0.02%	4.333***	-0.02%	0.16%	-0.01%	3.183***
Crisis	-0.18%	0.28%	-0.14%	-2.372**	-0.13%	0.29%	-0.08%	-2.229**
Post-crisis	-0.08%	0.31%	-0.04%	1.216	-0.04%	0.32%	0.00%	0.421
Panel B: Industry and Market Environment (SIndEnv)								
Pre-crisis	0.07%	0.37%	0.03%	2.237**	0.14%	0.38%	0.12%	2.504***
Crisis	-0.04%	0.31%	-0.01%	-3.002***	0.01%	0.32%	0.01%	-3.203***
Post-crisis	0.09%	0.30%	0.06%	-0.264	0.15%	0.32%	0.13%	-0.185
Panel C: Growth (SGrowth)								
Pre-crisis	0.03%	0.19%	0.02%	0.902	0.08%	0.22%	0.06%	1.482
Crisis	0.00%	0.28%	0.00%	-1.181	0.02%	0.26%	0.03%	-1.067
Post-crisis	0.04%	0.22%	0.02%	0.312	0.06%	0.26%	0.03%	0.406
Panel D: Management and Strategy (SManStr)								
Pre-crisis	-0.06%	0.20%	0.00%	-1.506	0.05%	0.13%	0.02%	0.979
Crisis	-0.02%	0.13%	0.00%	0.021	0.03%	0.11%	0.00%	-1.038
Post-crisis	-0.02%	0.15%	0.00%	-1.501	0.05%	0.11%	0.03%	0.134
Panel E: Financial Performance (SFinPerf)								
Pre-crisis	0.23%	0.52%	0.13%	3.076***	0.30%	0.58%	0.19%	2.399**
Crisis	-0.03%	0.55%	-0.05%	-2.410**	0.09%	0.58%	0.07%	-2.289**
Post-crisis	0.15%	0.44%	0.12%	1.111	0.26%	0.49%	0.27%	0.445
Panel F: Financial Position (SFinPos)								
Pre-crisis	0.02%	0.12%	0.00%	2.685***	0.03%	0.13%	0.00%	2.201**
Crisis	-0.03%	0.15%	0.00%	-3.294***	-0.02%	0.15%	0.00%	-3.091***
Post-crisis	0.03%	0.12%	0.00%	-0.476	0.04%	0.12%	0.01%	-0.689

Notes: [a]**:**The first *t*-statistic of each panel is calculated to compare pre-crisis reports and the crisis reports, the second *t*-statistic is calculated to compare crisis reports and post-crisis reports and the third *t*-statistic is calculated to compare pre-crisis reports and post-crisis reports.

***, **, *: Significant at 1%, 5% and 10%, respectively.

Table 8. Correlations (Pearson below diagonal and Spearman above diagonal) for LM dictionary

	TPrem	Rec	SIndEnv	SManStr	SMacro	SGrowth	SFinPos	SFinPerf	LogMCap	PB	DE	ROE
TPrem		0.741***	0.104*	0.031	-0.083	0.122**	0.169***	0.095	0.029	-0.076	-0.050	-0.067
Rec	0.670***		0.248***	0.086	0.067	0.199***	0.185***	0.226***	0.032	0.082	0.741***	-0.014
SIndEnv	0.057	0.226***		0.252***	0.274***	0.317***	0.285***	0.551***	-0.141**	0.196**	0.104*	0.008
SManStr	0.010	0.079	0.203***		0.029	0.255***	0.044	0.251***	-0.017	0.063	-0.062	0.026
SMacro	-0.103*	0.085	0.256***	0.131**		0.224***	0.174***	0.383***	0.047	0.317***	-0.083	0.0180***
SGrowth	0.007	0.139**	0.324***	0.235***	0.209***		0.237***	0.378***	-0.022	0.153**	0.122**	0.041
SFinPos	0.196***	0.203***	0.302***	0.106*	0.173***	0.203***		0.386***	0.009	0.117*	0.056	0.104*
SFinPerf	0.071	0.252***	0.563***	0.241***	0.392***	0.385***	0.345***		-0.060	0.252***	-0.16***	0.073
LogMCap	0.045	0.029	-0.081	0.018	0.101*	-0.024	0.026	-0.006		0.130***	-0.005	0.176**
PB	-0.017	0.030	0.038	0.026	0.072	0.009	0.011	-0.015	0.005		0.217***	0.671***
DE	-0.064	-0.127**	-0.066	0.008	-0.242***	-0.008	0.041	-0.203***	-0.074	-0.013		0.274***
ROE	-0.011	-0.021	-0.057	0.036	-0.035	-0.003	0.020	-0.069	0.055	0.667***	0.063	

This Table presents the correlation coefficients for the model variables. Pearson correlations are presented in the lower diagonal and Spearman correlations are presented in the upper diagonal. *TPrem* is a continuous variable and is calculated as the difference between the target price and the current market price scaled by the current market price. *Rec* is an ordinal variable that takes a value of 2 for a Buy, 1 for a Hold and 0 for a Sell recommendation. Analysts' themed sentiment scores are labelled in brackets as follows: industry and market environment (*SIndEnv*), management and strategy (*SManStr*), macroeconomic and regulatory environment (*SMacro*), growth (*SGrowth*), financial position (*SFinPos*), and financial performance (*SFinPerf*). The natural logarithm of market capitalisation (*LogMCap*), the price to book ratio (*PB*), the return on common equity (*ROE*), and the debt to equity ratio (*DebtEquity*) are firm-level level control variables.***, **, and * represent significance at the 1%, 5% and 10% levels, respectively.

Table 9. Correlations (Pearson below diagonal and Spearman above diagonal) for Harvard-IV-4 dictionary

	TPrem	Rec	SIndEnv	SManStr	SMacro	SGrowth	SFinPos	SFinPerf	LogMCap	PB	DE	ROE
TPrem		0.741***	0.089	-0.012	-0.049	0.135**	0.182***	0.160***	0.029	-0.076	-0.050	-0.067
Rec	0.670***		0.223***	0.081	0.079	0.199***	0.179***	0.271***	0.032	0.082	0.741***	-0.014
SIndEnv	0.033	0.209***		0.272***	0.266***	0.392***	0.299***	0.587***	-0.141**	0.196**	0.104*	0.008
SManStr	-0.038	0.064	0.258***		0.086	0.255***	0.010*	0.281***	-0.017	0.063	-0.062	0.026
SMacro	-0.097	0.087	0.238***	0.162***		0.261***	0.121**	0.384***	0.047	0.317***	-0.083	0.0180***
SGrowth	0.036	0.132**	0.359***	0.321***	0.256***		0.272***	0.461***	-0.022	0.153**	0.122**	0.041
SFinPos	0.208***	0.220***	0.281***	0.150**	0.099	0.222***		0.394***	0.009	0.117*	0.056	0.104*
SFinPerf	0.103*	0.262***	0.607***	0.282***	0.401***	0.435***	0.310***		-0.060	0.252***	-0.16***	0.073
LogMCap	0.045	0.029	-0.081	0.018	0.101*	-0.024	0.026	-0.006		0.130***	-0.005	0.176**
PB	-0.017	0.030	0.038	0.026	0.072	0.009	0.011	-0.015	0.005		0.217***	0.671***
DE	-0.064	-0.127**	-0.066	0.008	-0.242***	-0.008	0.041	-0.203***	-0.074	-0.013		0.274***
ROE	-0.011	-0.021	-0.057	0.036	-0.035	-0.003	0.020	-0.069	0.055	0.667***	0.063	

This Table presents the correlation coefficients for the model variables. Pearson correlations are presented in the lower diagonal and Spearman correlations are presented in the upper diagonal. *TPrem* is a continuous variable and is calculated as the difference between the target price and the current market price scaled by the current market price. *Rec* is an ordinal variable that takes a value of 2 for a Buy, 1 for a Hold and 0 for a Sell recommendation. Analysts' themed sentiment scores are labelled in brackets as follows: industry and market environment (*SIndEnv),* management and strategy (*SManStr),* macroeconomic and regulatory environment (*SMacro*), growth (*SGrowth*), financial position (*SFinPos*), and financial performance (*SFinPerf*). The natural logarithm of market capitalisation (*LogMCap*), the price to book ratio (*PB*), the return on common equity (*ROE*), and the debt to equity ratio (*DebtEquity*) are firm-level level control variables.***, **, and * represent significance at the 1%, 5% and 10% levels, respectively.

Table 10. Impact of themed sentiments on stock recommendations

Variables	LM Dictionary (1)	LM Dictionary (2)	Harvard-IV-4 Dictionary (3)	Harvard-IV-4 Dictionary (4)
$SIndEnv$	59.847	159.578	24.075	133.340
	(1.24)	*(1.63)*	*(0.55)*	*(1.07)*
$SManStr$	10.662	35.728	-5.275	-32.415
	(0.13)	*(0.36)*	*(-0.05)*	*(-0.18)*
$SMacro$	-48.860	-311.426	-46.050	-319.774
	(-0.87)	*(-2.02)**\	*(-0.84)*	*(-2.24)**\
$SGrowth$	14.029	284.715	-3.307	190.975
	(0.23)	*(1.76)*\	*(-0.06)*	*(1.37)*
$SFinPos$	140.636	-56.518	225.945	42.032
	(1.12)	*(-0.34)*	*(1.93)*\	*(0.19)*
$SFinPerf$	61.749	-68.061	71.491	-1.244
	(1.66)\	*(-1.11)*	*(2.11)**\	*(0.02)*
$DCrisis$	0.053	0.172	0.0575	0.351
	(0.15)	*(0.44)*	*(0.17)*	*(0.92)*
$DPostCrisis$	0.473	0.221	0.461	0.447
	(1.31)	*(0.52)*	*(1.26)*	*(0.90)*
$DCrisis * SIndEnv$		-59.373		-83.814
		(-0.46)		*(-0.59)*
$DCrisis * SManStr$		-395.672		44.785
		*(-2.07)**\		*(0.15)*
$DCrisis * SMacro$		437.412		429.475
		*(2.47)**\		*(2.41)**\
$DCrisis * SGrowth$		-271.987		-159.808
		(-1.78)\		*(-1.07)*
$DCrisis * SFinPos$		322.699		286.416
		(1.65)		*(1.18)*
$DCrisis * SFinPerf$		115.932		23.267
		(1.49)		*(0.25)*
$DPostCrisis * SIndEnv$		-158.757		-171.875
		(-1.00)		*(-1.02)*
$DPostCrisis * SManStr$		147.887		-123.482
		(0.81)		*(-0.47)*
$DPostCrisis * SMacro$		116.017		173.133
		(0.64)		*(0.96)*
$DPostCrisis * SGrowth$		-632.261		-354.922
		*(-2.10)**\		*(-2.01)**\
$DPostCrisis * SFinPos$		320.624		499.418
		(1.40)		*(1.69)*\
$DPostCrisis * SFinPerf$		301.954		184.528
		*(3.16)***\		*(1.83)*\
$DebtEquity$	-0.003	-0.002	-0.003	-0.003
	*(-2.61)***\	*(-1.65)*\	*(-2.81)***\	*(-2.22)**\
$Pseudo\ R-Sq.$	0.057	0.115	0.062	0.099

This Table measures the impact of themed sentiment on stock recommendations (*Rec*). *Rec* is an ordinal variable that takes a value of 2 for a Buy, 1 for a Hold and 0 for a Sell recommendation. We employ an ordinal logistic regression for this model. The independent variables are analysts' sentiment scores for the industry and market environment (*SIndEnv),* management and strategy (*SManStr),* the macroeconomic and regulatory environment (*SMacro*), growth (*SGrowth*), financial position (*SFinPos*), and financial performance (*SFinPerf*). *DCrisis* and *DPostCrisis* are dummy variables which take a value of 1 when the report is written during the crisis (post crisis) period, and 0 otherwise. The reference category here is the pre-crisis period. The control variables are the natural logarithm of market capitalisation (*LogMCap*), the price to book ratio (*PB*), the return on common equity (*ROE*), and the debt to equity ratio (*DebtEquity*). For brevity, we only report significant control variables. The z-statistics are given in parentheses, and ***, **, and * represent significance at the 1%, 5% and 10% levels, respectively. The z-statistics are calculated using White robust standard errors and are clustered by company to control for dependency in error terms.

Table 11. Impact of themed sentiments on target price premia

Variables	LM Dictionary			Harvard-IV-4 Dictionary		
	(1)	(2)	(3)	(4)	(5)	(6)
$Constant$	0.006	-0.199	0.028	0.009	-0.190	0.026
	(0.08)	*(-3.45)****	*(0.37)*	*(0.13)*	*(-3.34)****	*(0.38)*
$SIndEnv$	0.778	-2.531	3.575	-2.558	-4.277	3.140
	(0.20)	*(-0.81)*	*(0.90)*	*(-0.82)*	*(-1.67)*	*(0.63)*
$SManStr$	-3.124	-3.623	-1.806	-9.921	-7.732	-11.969
	(-0.43)	*(-0.66)*	*(-0.26)*	*(-1.38)*	*(-1.31)*	*(-1.28)*
$SMacro$	-10.319	-7.736	-22.262	-10.474	-8.294	-21.824
	(-1.75)*	*(-1.74)**	*(-2.58)***	*(-1.88)**	*(-1.97)**	*(-2.57)***
$SGrowth$	-1.861	-3.639	17.114	1.460	0.496	17.408
	(-0.21)	*(-0.50)*	*(1.75)**	*(0.21)*	*(0.09)*	*(2.37)***
$SFinPos$	27.165	17.274	7.601	28.778	15.389	6.787
	(2.29)**	*(2.18)***	*(0.77)*	*(2.41)***	*(1.77)**	*(0.84)*
$SFinPerf$	2.535	-0.543	-2.464	4.188	0.821	-0.155
	(0.75)	*(-0.21)*	*(-0.77)*	*(1.54)*	*(0.38)*	*(-0.06)*
Rec		0.168			0.165	
		(13.06)***			*(13.75)****	
$DCrisis$	0.078	0.075	0.103	0.075	0.0732	0.0985
	(3.42)***	*(4.75)****	*(3.77)****	*(3.25)****	*(4.81)****	*(3.57)****
$DPostCrisis$	0.068	0.044	0.045	0.068	0.044	0.0569
	(3.11)***	*(2.73)****	*(1.61)*	*(3.12)****	*(2.88)****	*(1.86)**
$DCrisis * SIndEnv$			-0.427			-9.083
			(-0.04)			*(-0.99)*
$DCrisis * SManStr$			-6.257			11.538
			(-0.47)			*(0.75)*
$DCrisis * SMacro$			27.672			26.509
			(2.46)**			*(2.28)***
$DCrisis * SGrowth$			-18.107			-12.459
			(-1.93)*			*(-1.61)*
$DCrisis * SFinPos$			35.153			38.447
			(1.52)			*(1.60)*
$DCrisis * SFinPerf$			0.637			1.033
			(0.10)			*(0.18)*
$DPostCrisis * SIndEnv$			-4.826			-4.703
			(-0.59)			*(-0.53)*
$DPostCrisis * SManStr$			-5.773			-18.806
			(-0.44)			*(-0.93)*
$DPostCrisis * SMacro$			2.0801			0.373
			(0.19)			*(0.04)*
$DPostCrisis * SGrowth$			-31.306			-25.685
			(-1.76)*			*(-1.72)**
$DPostCrisis * SFinPos$			26.608			39.752
			(1.33)			*(1.98)**
$DPostCrisis * SFinPerf$			13.687			10.052
			(2.35)**			*(1.93)**
$DebtEquity$	-0.002	-0.001	-0.002	-0.002	-0.001	-0.002
	(-3.19)***	*(-1.31)*	*(-1.78)**	*(-3.70)****	*(-1.76)**	*(-1.96)**
$Adj.R-Sq.$	0.111	0.523	0.182	0.126	0.522	0.204

This Table measures the impact of themed sentiment on target price premia (*TPrem*). *TPrem* is a continuous variable and is calculated as the difference between the target price and the current market price scaled by the current market price. We estimate the target premium model by means of an OLS model. The independent variables are analysts' sentiment scores for the industry environment (*SIndEnv*), management and strategy (*SManStr*), the macroeconomic environment (*SMacro*), growth (*SGrowth*), financial position (*SFinPos*), and financial performance (*SFinPerf*). *Rec* is an ordinal variable that takes a value of 2 for a Buy, 1 for a Hold and 0 for a Sell recommendation. *DCrisis* and *DPostCrisis* are dummy variables which take a value of 1 when the report is written during the crisis (post crisis) period and 0 otherwise. The reference category here is the pre-crisis period. The control variables are natural logarithm of market capitalisation (*LogMCap*), price to book ratio (*PB*), return on common equity (*ROE*), and debt to equity (*DebtEquity*). For brevity, we only report the control variables that are significant. The *t*-statistics are given in parentheses, and ***, **, and * represent significance at the 1%, 5% and 10% levels, respectively. The t-statistics are calculated using White's robust standard errors and are clustered by companies to control for dependency in error terms.

Table 12. Impact of themed sentiments on deviation from consensus recommendations

Variables	LM Dictionary		Harvard-IV-4 Dictionary	
	(1)	(2)	(3)	(4)
$Constant$	0.142	0.250	0.163	0.211
	(0.60)	(1.07)	(0.67)	(0.86)
$SIndEnv$	15.173	37.947	5.860	41.733
	(1.27)	(1.52)	(0.48)	(1.30)
$SManStr$	-9.031	-0.408	-4.701	-36.083
	(-0.31)	(-0.01)	(-0.15)	(-0.74)
$SMacro$	-0.120	-67.377	1.877	-81.266
	(-0.01)	(-2.02)**	(0.12)	(-2.59)**
$SGrowth$	-3.206	85.960	-9.118	69.178
	(-0.18)	(1.93)*	(-0.49)	(1.92)*
$SFinPos$	27.406	-21.541	55.131	16.951
	(0.78)	(-0.43)	(1.95)*	(0.33)
$SFinPerf$	13.607	-16.731	13.571	-10.885
	(1.50)	(-1.30)	(1.53)	(-0.71)
$DCrisis$	0.036	0.076	0.027	0.123
	(0.36)	(0.72)	(0.27)	(1.06)
$DPostCrisis$	0.173	0.133	0.158	0.167
	(1.63)*	(1.07)	(1.56)	(1.19)
$DCrisis * SIndEnv$		-24.797		-43.452
		(-0.70)		(-1.11)
$DCrisis * SManStr$		-121.963		27.380
		(-2.23)**		(0.34)
$DCrisis * SMacro$		109.761		124.671
		(2.71)***		(2.83)***
$DCrisis * SGrowth$		-105.113		-94.335
		(-2.36)**		(-2.15)**
$DCrisis * SFinPos$		102.278		94.148
		(1.48)		(1.50)
$DCrisis * SFinPerf$		31.298		17.548
		(1.46)		(0.73)
$DPostCrisis * SIndEnv$		-34.640		-47.377
		(-0.96)		(-1.13)
$DPostCrisis * SManStr$		25.412		16.398
		(0.41)		(0.22)
$DPostCrisis * SMacro$		50.133		66.850
		(1.23)		(1.74)*
$DPostCrisis * SGrowth$		-117.186		-106.009
		(-2.54)**		(-2.46)**
$DPostCrisis * SFinPos$		27.606		38.140
		(0.41)		(0.53)
$DPostCrisis * SFinPerf$		58.111		44.943
		(3.11)***		(2.17)**
$DebtEquity$	-0.006	-0.003	-0.007	-0.006
	(-3.11)***	(-1.08)	(-3.38)***	(-1.99)**
$Adj. R - Sq.$	0.070	0.152	0.075	0.131

This Table measures the impact of themed sentiment on the deviation from consensus stock recommendations (*DevRec*). *DevRec* is a continuous variable and is the difference between consensus stock recommendations and an individual analyst's stock recommendation on a three point scale. We estimate models by means of an OLS regression. The independent variables are analysts' sentiment scores for the industry and market environment (*SIndEnv),* management and strategy (*SManStr),* the macroeconomic and regulatory environment (*SMacro*), growth (*SGrowth*), financial position (*SFinPos*), and financial performance (*SFinPerf*). *DCrisis* and *DPostCrisis* are dummy variables which take a value of 1 when the report is written during the crisis (post crisis) period, and 0 otherwise. The reference category here is the pre-crisis period. The control variables are the natural logarithm of market capitalisation (*LogMCap*), the price to book ratio (*PB*), the return on common equity (*ROE*), and the debt to equity ratio (*DebtEquity*). For brevity, we only report significant control variables. The t-statistics are given in parentheses, and ***, **, and * represent significance at the 1%, 5% and 10% levels, respectively. The t-statistics are calculated using White robust standard errors and are clustered by company to control for dependency in error terms.

Table 13. Impact of themed sentiments on deviation from consensus target price premia

Variables	LM Dictionary			Harvard-IV-4 Dictionary		
	(1)	(2)	(3)	(4)	(5)	(6)
$Constant$	-0.137	-0.287	-0.099	-0.147	-0.293	-0.109
	(-1.16)	(-2.52)**	(-0.84)	(1.20)	(-2.54)**	(-0.89)
$SIndEnv$	2.776	0.362	7.492	0.572	-0.686	9.382
	(0.80)	(0.11)	(1.33)	(0.17)	(-0.23)	(1.38)
$SManStr$	-2.469	-2.833	-5.886	1.731	3.333	9.010
	(-0.26)	(-0.35)	(-0.41)	(0.13)	(0.29)	(0.71)
$SMacro$	2.309	4.194	18.015	1.027	2.622	3.405
	(0.36)	(0.72)	(0.83)	(0.17)	(0.49)	(0.22)
$SGrowth$	6.525	5.228	33.423	5.194	4.488	22.082
	(0.80)	(0.75)	(2.80)***	(0.69)	(0.69)	(1.73)*
$SFinPos$	19.447	12.231	2.271	23.744	12.948	11.222
	(1.89)*	(1.22)	(0.14)	(2.00)**	(1.14)	(0.73)
$SFinPerf$	2.117	-0.129	-6.172	2.977	0.514	-6.309
	(0.59)	(-0.04)	(-0.95)	(0.87)	(0.16)	(-1.06)
Rec		0.123			0.121	
		(6.51)***			(6.34)***	
$DCrisis$	0.025	0.023	0.027	0.022	0.020	0.362
	(0.87)	(0.77)	(0.83)	(0.73)	(0.66)	(0.94)
$DPostCrisis$	0.049	0.031	0.017	0.047	0.030	0.028
	(1.48)	(0.90)	(0.41)	(1.38)	(0.86)	(0.68)
$DCrisis * SIndEnv$			-3.820			-10.819
			(-0.30)			(-0.84)
$DCrisis * SManStr$			-8.229			-36.272
			(-0.37)			(-1.37)
$DCrisis * SMacro$			-3.295			9.977
			(-0.17)			(0.65)
$DCrisis * SGrowth$			-28.329			-17.556
			(-2.43)**			(-1.34)
$DCrisis * SFinPos$			19.583			9.539
			(0.70)			(0.36)
$DCrisis * SFinPerf$			8.897			13.411
			(1.21)			(1.82)*
$DPostCrisis * SIndEnv$			-7.781			-12.890
			(-1.00)			(-1.37)
$DPostCrisis * SManStr$			6.666			3.154
			(0.32)			(0.11)
$DPostCrisis * SMacro$			-27.449			-12.147
			(-1.27)			(-0.73)
$DPostCrisis * SGrowth$			-41.039			-29.785
			(-2.37)**			(-1.77)*
$DPostCrisis * SFinPos$			36.723			34.421
			(1.70)*			(1.67)
$DPostCrisis * SFinPerf$			14.024			13.684
			(1.95)*			(2.07)**
$DebtEquity$	-0.004	-0.002	-0.003	-0.004	-0.003	-0.003
	(-6.70)***	(-5.01)***	(-2.97)***	(-5.82)***	(-4.16)***	(-2.31)**
ROE	0.014	0.018	0.020	0.013	0.017	0.021
	(1.35)	(1.44)	(2.25)**	(1.37)	(1.45)	(2.58)**
$Adj. R - Sq.$	0.106	0.270	0.163	0.112	0.270	0.168

This Table measures the impact of themed sentiment on the deviation from consensus target price premia (*DevTPrem*). *DevTPrem* is a continuous variable and is calculated as the difference between consensus target price and an individual analyst's target price, scaled by the market price. We estimate models by means of an OLS regression. The independent variables are analysts' sentiment scores for the industry and market environment (*SIndEnv),* management and strategy (*SManStr),* the macroeconomic and regulatory environment (*SMacro*), growth (*SGrowth*), financial position (*SFinPos*), and financial performance (*SFinPerf*). *Rec* is an ordinal variable that takes a value of 2 for a Buy, 1 for a Hold and 0 for a Sell recommendation. *DCrisis* and *DPostCrisis* are dummy variables which take a value of 1 when the report is written during the crisis (post crisis) period, and 0 otherwise. The reference category here is the pre-crisis period. The control variables are the natural logarithm of market capitalisation (*LogMCap*), the price to book ratio (*PB*), the return on common equity (*ROE*), and the debt to equity ratio (*DebtEquity*). For brevity, we only report significant control variables. The *t*-statistics are given in parentheses, and ***, **, and * represent significance at the 1%, 5% and 10% levels, respectively. The t-statistics are calculated using White robust standard errors, and are clustered by company to control for dependency in error terms.

Table 14. Impact of themed negative sentiments on target price premia and recommendations

Variables	LM Dictionary		Harvard-IV-4 Dictionary	
	Rec	TPrem	Rec	TPrem
Constant		0.071		0.075
		(1.01)		(1.05)
NegSIndEnv	-16.057	-5.916	-106.331	-8.556
	(-0.16)	(-1.22)	(-1.00)	(-1.74)*
NegSManStr	51.193	-0.089	30.245	2.237
	(0.51)	(-0.02)	(0.18)	(0.25)
NegSMacro	273.780	21.225	237.893	20.186
	(1.35)	(2.15)**	(1.30)	(2.19)**
NegSGrowth	-128.436	-10.157	-123.781	-12.002
	(-1.50)	(-1.80)*	(-1.29)	(-2.05)**
NegSFinPos	-264.073	-6.748	-108.057	-2.577
	(-1.08)	(-0.56)	(-0.34)	(-0.19)
NegSFinPerf	-62.730	4.619	-33.303	4.846
	(-1.01)	(1.34)	(-0.44)	(1.26)
DCrisis	0.675	0.147	0.708	0.133
	(0.93)	(3.03)***	(1.02)	(2.73)***
DPostCrisis	0.344	0.069	0.010	0.056
	(0.50)	(1.73)*	(0.02)	(1.53)
DCrisis * NegSIndEnv	-15.664	4.261	75.126	11.743
	(-0.10)	(0.33)	(0.50)	(0.92)
DCrisis * NegSManStr	319.970	10.575	221.643	20.915
	(1.55)	(0.90)	(0.90)	(1.05)
DCrisis * NegSMacro	-416.407	-26.080	-373.438	-26.224
	(-1.97)**	(-2.27)**	(-1.86)*	(-2.40)**
DCrisis * NegSGrowth	130.811	9.699	115.641	9.941
	(1.50)	(1.61)	(1.13)	(1.49)
DCrisis * NegSFinPos	19.726	-22.520	-69.099	-11.088
	(0.07)	(-1.14)	(-0.73)	(-1.25)
DCrisis * NegSFinPerf	-37.852	-8.763	-148.701	-25.406
	(-0.47)	(-1.03)	(-0.40)	(-1.17)
DPostCrisis * NegSIndEnv	239.626	14.953	384.088	18.116
	(1.78)*	(1.60)	(2.54)**	(1.85)*
DPostCrisis * NegSManStr	-154.155	11.095	-19.590	19.673
	(-0.78)	(0.78)	(-0.06)	(0.79)
DPostCrisis * NegSMacro	14.242	-4.304	72.184	-2.111
	(0.06)	(-0.32)	(0.33)	(-0.17)
DPostCrisis * NegSGrowth	44.229	10.480	23.213	12.766
	(0.42)	(0.60)	(0.21)	(0.70)
DPostCrisis * NegSFinPos	368.145	19.012	185.457	13.977
	(0.97)	(0.80)	(0.49)	(0.59)
DPostCrisis * NegSFinPerf	-152.583	-18.348	-205.093	-19.007
	(-1.82)*	(-3.39)***	(-2.13)**	(-3.28)***
Adj. R − Sq.		0.172		0.179
Pseudo R − Sq.	0.125		0.120	

This Table measures the impact of themed sentiments on stock recommendations (*Rec*) and target price premia (*TPrem*). *Rec* is an ordinal variable that takes a value of 2 for a Buy, 1 for a Hold and 0 for a Sell recommendation. We use an ordinal logistic regression for the recommendation model. *TPrem* is a continuous variable and is calculated as the difference between the target price and the current market price scaled by the current market price. We estimate the target premium model by means of an OLS model. The independent variables are analysts' negative sentiment scores for industry and market environment (*NegSIndEnv),* management and strategy (*NegSManStr),* the macroeconomic and regulatory environment (*NegSMacro*), growth (*NegSGrowth*), financial position (*NegSFinPos*), and financial performance (*NegSFinPerf*). *DCrisis* and *DPostCrisis* are dummy variables which take a value of 1 when the report is written during the crisis (post crisis) period, and 0 otherwise. The reference category here is the pre-crisis period. The control variables are the natural logarithm of market capitalisation (*LogMCap*), the price to book ratio (*PB*), the return on common equity (*ROE*), and the debt to equity ratio (*DebtEquity*). For brevity, we only report significant control variables. The t-statistics (z-statistics for the ordinal regression) are given in parentheses, and ***, **, and * represent significance at the 1%, 5% and 10% levels, respectively. The t-statistics (z-statistics) are calculated using White robust standard errors and are clustered by company to control for dependency in error terms.