Analysts' Assimilation of Soft Information in the Financial Press

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Abstract

Prior research establishes that both sell-side analysts and the media act as information intermediaries in the capital markets. This study investigates whether sell-side analysts use information from firm-specific print news coverage and whether analysts' assimilation of this news leads to informative recommendations. We find that the quantity of news coverage of a firm is positively associated with subsequent recommendation revisions, and that the tone of the news predicts the direction of the revisions. Moreover, we document that the market reactions to analysts' recommendation revisions are stronger for firms with more frequent recent news coverage, suggesting a positive relation between the intensity of news coverage and the informativeness of analysts' recommendations. To understand the nature of news information useful to analysts, we classify news into soft and hard news based on qualitative and quantitative content, and find that the link between news coverage and market reactions to analysts' revisions is primarily driven by analysts' assimilation of soft news. Taken together, our paper sheds new light on the sources of analysts' mosaic of information and the role of analysts in the efficiency of the capital markets.

Key words: Media, analysts, stock recommendations, tone, soft and hard news

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Analysts' Assimilation of Soft Information in the Financial Press

1. Introduction

This study examines whether sell-side analysts provide more informative research by assimilating information in the financial press. A long literature establishes that sell-side analysts act as a primary information intermediary in the capital markets (Womack 1996, Jegadeesh et al. 2004, Ramnath, Rock and Shane 2008). Understanding how analysts assemble and process the numerous types of value relevant of information available to them is the focus of numerous studies in both finance and accounting. More recently, a growing body of research investigates the media as another information intermediary. Beginning with studies like Miller (2006) and Tetlock (2007), finance and accounting researchers have become keenly interested in the direct role media plays in the flow of information within capital markets.[1] Bushee et al. (2010) conclude that the media serves as an information intermediary, which they define as "an agent that provides information that is new and useful to other parties" (pp. 1-2). We expect that the relation between these two information intermediaries is symbiotic, but there is no research of which we are aware that examines whether analysts exploit information from the media in their own role of providing new and useful information to investors.

Research demonstrates analysts' extensive use of numerous information triggers, including market prices, financial information and management disclosures.[2] As a practical example, Regulation Fair Disclosure presumes that analysts rely on multiple sources and types of information, claiming

[1] There are many finance and accounting studies on the role of the press, which precede the dates of these studies, and our intent with this statement is not to disregard earlier studies. Indeed, our literature review discusses many such studies. Nevertheless, beginning around 2006-2007, the studies on the role of the business press have grown into a well-defined area of the capital markets literature.

[2] For example, analysts rely on information garnered from prior earnings changes (Conrad et al. 2006, Ivković and Jegadeesh 2004), stock price changes (Abarbanell 1991), dividend changes (Denis, Denis and Sarin 1994), annual report disclosures (Hope 2003), management forecasts (Williams 1996), management guidance (Cotter, Tuna and Wysocki 2006), firm conference calls (Bowen, Davis and Matsumoto 2002), bond rating changes (Ederington and Goh 1998), broker-hosted investor conferences (Bushee, Jung and Miller 2011, Green et al. 2014), other analysts' research (Trueman 1994), and so on. Together, these studies characterize analysts as processing multiple information signals.

"Analysts can provide a valuable service in sifting through and extracting information that would not be significant to the ordinary investor to reach material conclusions." Given this, analysts should rely on information distributed through the media.[3] However, it remains an empirical question whether analysts are able to provide new and useful information to investors through their ability to process information contained in the financial press.

Analysts provide information to their clients by synthesizing these information sources and making useful recommendations. Analysts should possess a comparative information advantage because of their ability to generate assessments about the quality of a firm's fundamentals based on public information announcements. Public information conveyed by the media likely helps analysts to make informed opinions about a firm's fundamentals that are superior to those of other market participants (Kim and Verrecchia 1994, 1997), which are impounded into market prices. This is consistent with the evidence in Kross, Ro and Schroeder (1990) and Lys and Sohn (1990), who document that analysts' earnings forecasts are more informative when they are preceded by corporate accounting disclosures.

On the other hand, if print news and analyst reports are competing information channels, analysts' research based on media information may not be informative to investors for a number of reasons. First, the mere existence of print news may reduce or 'crowd out' the informativeness of analyst reports (Ivkovic and Jegadeesh 2004). Second, studies like Lin and McNichols (1998) and Irvine, Lipson and Puckett (2007) argue that analysts' research has a marketing role, reducing the importance of any particular source of information, including that conveyed in the media. Third, while prior studies

[3] It might be plausible to argue that analysts may choose not to rely on the information from the media. First, there is evidence that analysts ignore or only partially impound public information (Abarbanell and Bernard 1992, Bradshaw, Richardson and Sloan 2001). Much of the 'news' in news coverage is stale (Tetlock 2011), thus analysts may respond to either new or stale information, both, or neither. Third, to the extent that the media sometimes serves merely as an information conduit (i.e., pass-through of information) rather than an information intermediary (i.e., producer of information), it is possible analysts obtain the underlying information from more direct sources such as the firm itself (Hassell, Jennings and Lasser 1988) or newswires (Li, Ramesh and Shen 2011). Finally, Jensen (1979) expresses a sardonic characterization of news coverage as a form of entertainment, which diminishes the role of the media as a source of 'new and useful' information.

conclude that analysts are information agents with the ability to process information and affect stock prices (Womack 1996 and Michaely and Womack 2005), Altinkilic and Hansen (2009) characterize analysts' research as "information free" and argue that analysts "piggyback" on firm news and consequently issue uninformative reports. To the extent that the media sometimes serves merely as an information conduit (i.e., pass-through of information) rather than an information intermediary (i.e., producer of information), it is possible analysts obtain the underlying information from more direct sources such as the firm itself (Hassell, Jennings and Lasser 1988) or newswires (Li, Ramesh and Shen 2011).[4]

Much of our understanding of analysts' role in the capital markets is based on their quantitative outputs (i.e., earnings forecasts, discrete stock recommendations, or target prices), but these items are less important than qualitative factors such as their industry knowledge, management access, and written reports (Bradshaw 2013). Likewise, information conveyed through news coverage is both quantitative and qualitative. Petersen (2004) provides a thoughtful discussion of difference between 'soft' and 'hard' information, and concludes that there is a continuum and that a crisp dichotomy is unclear. However, hard information is almost always quantitative. Our examination of whether analysts respond to information in news coverage is focused on separately measuring the amount of soft versus hard information in firm-specific news coverage and, more importantly, examine which type of news is most strongly associated with analyst and investor reactions.

The first link we document is whether cross-sectional variation in the quantity of news coverage of a firm is associated with subsequent analysts' recommendation revision activity. We also examine whether any such association is conditional on the tone of news coverage. While a finding that analysts' revisions are positively associated with news coverage of the firm might not be surprising, we are not

[4] Of course, this is also a construct validity issue that we discuss later and attempt to address in our empirical design.

aware of any prior studies that document such a link.[5] The confirmation of the existence of such a link is important because it provides preliminary evidence consistent with analysts processing information conveyed by news coverage. However, such a relation could also reflect analysts processing the same information with a lag, analysts merely piggybacking off of public information disclosure, or some endogenous link between exogenous news and both media and analyst reactions. We address these alternative explanations through our primary analysis of how soft information in the financial press is associated with analysts' research and subject these analyses to numerous robustness tests.

We focus on stock recommendation revisions conditional on the type of information conveyed in the financial press. If analysts process information in news coverage, achieving information discovery, and this information that is not yet impounded into prices, we would expect more pronounced market reactions to analyst recommendation revisions subsequent to news coverage of a firm. If, however, analysts process information with a lag or piggyback on information releases, we should not see any permanent market reaction to the duplication of previously released news. Thus, we examine event window market reactions to analysts' stock recommendation revisions and investigate whether market reactions are stronger for firms with greater news coverage preceding the recommendation revision.

Our descriptive statistics are consistent with firm-specific news coverage being associated with higher levels of analysts' stock recommendation revision activity in the following 30-day window. A single news article is associated with a 1.66% increase in monthly revision activity, representing a 44% increase relative to the unconditional average revision frequency of 3.76%. In our primary tests, we document that the tone of the news corroborates the direction of revision activity. More importantly, we demonstrate that the market reaction to recommendation changes is stronger for firms with recent news coverage. A one standard deviation change in our variable capturing news coverage is associated with an

[5] A recent study by Cao et al (2014) examines the effect of media competition on analyst forecast properties in an international setting, in which they stress the need to establish a connection between the press and analysts.

incremental 0.6 percent negative return for downgrades and 0.4 percent positive return for upgrades. These incremental impacts are larger than several other mediating variables for stock recommendation reactions documented in previous literature, such as price momentum and herding (Loh and Stulz 2010). In our final analysis of the relative contribution of soft versus hard news to analysts' recommendation revisions and the associated stock price reactions, we substantiate an intuitive prediction that the stronger association between firm-specific news coverage and market reactions to recommendation revisions is driven primarily by analysts' interpretation of soft news.

Our study faces several empirical challenges, and we attempt to mitigate such concerns through our research design in several ways. One concern is that the media faces constraints in terms of news coverage, so there is selection bias in firm-specific news allocated valuable print media space. In our market reaction analyses, we control for factors that capture investor interest or firm visibility such as size, book-to-market, and momentum. A second, more important concern is that we assume the media is the source of the firm-specific news coverage, but such coverage could reflect the media merely transmitting firm-specific news releases. We omit newswires, which would capture direct firm releases, from our sampling procedures and rely instead on news coverage in the ten largest print newspapers. However, even if the news coverage we pick up is related to firm-specific disclosures, our focus is on analysts and market reactions in windows centered on analyst revisions, and these windows appear in the month following the associated news coverage. If news coverage is preceded by firm-specific disclosures through the newswires, the time lag to the analysts' revisions would be even longer and the expectation that investors would react to already public information would be even lower.[6] A third important concern is our implicit hypothesis that the news coverage forming the basis of our sample is

[6] It is possible that analysts might use the same information from another source. 8-K disclosures are considered one of the important firm-specific disclosure channels. To test this possibility, we conducted a robustness check by including firm-specific 8-K disclosures during the same period as the news coverage period. Our results remain qualitatively similar as those presented in the paper (see section 4.5 for more details).

the driver of the analyst revisions and the market reaction to those revisions. However, some unobservable aspect of the news coverage could be the driver of both the news coverage and the revisions and market reactions. Engelberg and Parsons (2011) describe how this identification problem hinders inferences in numerous studies on causal impacts of the media. We believe that our deliberate delay between the firm-specific news coverage and our sample analysts' subsequent revision activity observed in our sample minimizes concerns that any incremental market reaction to analysts' subsequent revision activity is merely a proxy for some unobservable aspect of the news coverage. The questionable alternative is that news would have to be very slowly processed by both analysts and investors for us to find significant incremental market reactions with our research design. Even if this were to be descriptive, our results still speak to the use of information in the print media by analysts. While it is fundamentally challenging to address the identification problem of news attribution, to the extent that the results from various sensitivity analyses support a general conclusion, the validity of our base-line results are enhanced.

Our results are consistent with various findings in the literature showing that analysts incorporate qualitative information into their analyses. For example, prior research demonstrates associations between analysts' recommendations and narrative annual report disclosures (Rogers 1996), an assessment of the quality of management (Barker 1999), a qualitative 'strengths-of-argument' variable (Asquith, Mikhail and Au 2005), and positive or negative affect in managerial presentations (Mayew and Venkatachalem 2012). More importantly, our study contributes to our understanding of the role of the media as an information intermediary in the capital markets. Bushee et al. (2010) examine news coverage of firms during earnings announcement windows and document a significant reduction in information asymmetry. We extend their research by demonstrating that one of the channels through which the media contributes to the information flow in the capital markets is through another

intermediary – financial analysts. Our analysis links firm-specific news coverage to analyst revision activity and incremental impacts on stock price reactions to those revisions. Our study also extends the large literature on analysts' role as a primary user of financial information. Prior research analyzes how analysts differentially use various sources of information such as income statement versus balance sheet (Previts et al. 1994), audited versus unaudited information (Rogers 1996), and management sourced versus independently gathered information (Williams, Moyes and Park 1996). We document that firm-specific news coverage provides information that not only impacts analysts' firm-specific revision activity, but interacts with that revision activity to strengthen market reactions to analysts' revisions.

The paper proceeds as follows. The next section provides background and our empirical predictions. The third section discusses data and variable measurement. The fourth section presents results, and the final section concludes.

2. Background and predictions

2.1 Background

Our study is related to several strands of research. First, a growing body of research is interested in how market participants react to information disseminated through the media. A seminal study in this area is Cutler, Poterba and Summers (1988), who document on average small stock market reactions to major news events (and the reverse, limited news events to justify the largest stock price movements), which for many years cast doubt on the view that stock price movements are attributable to news coverage. However, recent empirical evidence suggests news coverage sometimes leads, and sometimes lags stock price movements. For example, using a popular *Wall Street Journal* column "Abreast of the market," Tetlock (2007) documents that news coverage predicts stock market movements. Tetlock

(2011) investigates investors' reaction to 'stale news stories,' and documents evidence of strong return reversals for stocks with above-average individual investor trading activity.

Existing empirical evidence suggests that news coverage contains value relevant information on firm fundamentals that is not directly impounded into stock prices (e.g., Tetlock, Saar-Tsechansky and Macskassy 2008, Engelberg 2008, and Tetlock 2011), which allows some market participants to obtain an advantage from processing this information (see Engelberg, Reed and Ringgenberg 2012 for short sellers, Bushman, Williams and Wittenberg-Moerman 2013 for banks, Chuprinin, Gaspar and Massa 2013 and Fang, Peress and Zheng 2013 for mutual funds, and Bonsall, Green and Muller 2013 for rating agencies).[7] We contribute to this line of research by investigating the extent to which financial analysts facilitate security price discovery in the capital markets through the incorporation of relevant information from news coverage into their research products.

Second, our research is related to the extensive literature on financial analysts (see Brown 1993 and Schipper 1991 for commentaries on early research, and Ramnath, Rock and Shane 2008 and Bradshaw 2013 for reviews on recent research). Financial analysts are considered sophisticated information intermediaries in the capital markets. Beyer et al. (2010) review recent literature on firms' financial reporting environment, and suggest that analysts provide 22% of accounting-based information about a firm. Prior research has almost exclusively focused on analysts' use of hard information, such as stock prices (Lys and Sohn 1990, Abarbanell 1991), financial information (Mendenhall 1991, Bradshaw, Richardson and Sloan 2001), and other performance measures (Han and Wild 1990).[8]

[7] Recent commentators (Goldberg 2003) argue that major media outlets report news with a political bias. However, Mullainathan and Shleifer (2005) examine the determinants of media accuracy using a demand-side model, and find that in the aggregate readers should have an unbiased perspective if they have access to all news sources.

[8] Prior studies also investigate the sources of the usefulness of analyst research, such as the discovery of private information and/or interpretation of public information (Ivkovic and Jegadeesh 2004, Asquith, Mikhail and Au 2005). While Francis, Schipper and Vincent (2002) document evidence supporting the complementarity of analyst research and earnings announcements, Chen, Cheng and Lo (2010) find that information discovery (interpretation) dominates in the week before (after) firms' earnings announcements, supporting the co-existence of both roles.

Analysts have access to other information such as private communication with managers and public information, including news coverage. Our objective in this paper is to shed light on whether and how analysts incorporate the information content of news coverage in their research outputs. The information in the financial press seems largely qualitative (i.e., "soft" information, as opposed to "hard" information that characterizes much of financial reports and earnings announcements). The cost of processing soft information is high (Petersen 2004 and Engelberg 2008), which presents an opportunity for analysts to transform such soft information into inputs for their research. Indeed, soft information is a key element of the "mosaic" of information discussed in Reg FD.

Our paper provides a unique setting to examine analyst efficiency, where the empirical literature provides mixed evidence. Many studies draw inferences about analyst efficiency by examining market reactions to analyst recommendation revisions. While the overall empirical evidence supports the view that analysts are information agents with the ability to process information and affect stock prices (Womack 1996 and Michaely and Womack 2005), recent research by Altinkilic and Hansen (2010) raises concern about the information role of analysts. Using intraday returns data and a narrow window around daytime revision announcements, they document insignificant price reactions to stock recommendation revisions. They also present evidence that financial analysts piggyback on recent news from other sources. Bradley et al. (2013) revisit the same issue by pointing out that the time stamps reported in IBES for analyst recommendations released during trading hours are systematically biased. By using the correct time stamps reported by newswires, they find strong price reactions of a narrow window around revision announcements. Li et al. (2014) employ intraday returns data to examine both regular-hour and after-hours revisions to investigate the piggyback conclusion in Altinkilic and Hansen (2009). [9] The results show that the after-hours revisions generate greater price reactions than regular-

[9] Our results complement those of Li et al. (2014), who focus on recommendation revisions within three days of corporate news. In contrast, we examine how firm-specific news coverage affects analysts' *subsequent* revision activity, requiring a

hour revisions, which they interpret as inconsistent with the piggyback story. We contribute to this recent debate by employing news coverage and focusing on how analysts interpret soft information.

Finally, our research is related to the broad literature concerning information flows in the capital markets. Given the complex nature of the capital markets, information flows in numerous directions between different parties. There is an extensive literature on the information flows among firms, investors, analysts, and other participants in the capital market.[10] Our focus is on the flow of information from the media to analysts, which is not explored in prior research.

Empirical evidence is generally consistent with the media providing news coverage of corporate events, creating new information, and disseminating the information (Dyck, Volchkova and Zingales 2008, Miller 2006, Bushee et al. 2010, and Ahern and Sosyura 2013). Further, the news coverage contains value relevant information on firm fundamentals and is processed and used by different players in the capital market. Bonner, Hugon and Walther (2006) document that media coverage of an analyst is positively related to investors' reactions to forecast revisions. Similarly, Rees, Sharp and Twedt (2013) study the determinants of news about individual analysts in the financial press and the effects of that news on the career outcomes of analysts, and their evidence suggests that media coverage provides valuable exposure for analysts. However, these two studies focus on the information flow from analysts to the financial press, which leaves open the question of the other direction of information flow. The

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delay of at least three trading days. This approach minimizes the concerns that any incremental market reaction to analysts' subsequent revision activity is merely a proxy for some unobservable aspect of the news coverage. Also, we focus on the type of news most strongly associated with the informativeness of analyst research (i.e., soft information).

[10] Research on information flows between firms and investors examines events such as earnings announcements (Ball and Brown 1968 and subsequent papers), stock repurchases (Ikenberry, Lakonishok and Vermaelen 1995), and dividends initiations and omissions (Michaely, Thaler and Womack 1995). On the other hand, research on the interaction between firms and analysts covers settings such as "earnings-guidance game" (Richardson, Teoh and Wysocki 2004) and conference calls (Bushee, Matsumoto and Miller 2004 and Mayew 2008). Our research question is closely related to the literature on the interaction between investors and analysts (see Womack 1996 and others for investors' reactions to analyst recommendation revisions; and Conrad et al. 2006 for analysts' recommendation responses following large stock price movements) because we examine properties of investors' reactions to analyst recommendation revisions conditional on recent news coverage.

media and analysts serve similar roles as information intermediaries, gathering, processing, and disseminating information. As a result, both are likely to use the outputs from each other.

Anecdotal evidence appears in analysts' formal reports and suggests that analysts consume and their opinions are shaped by news coverage. For example, Barclays analysts covering Apple (NASDAQ: AAPL) noted, "As we previously reported, according to the *Wall Street Journal* ('Apple Plots its TV Assault,' 12/19/11), Apple executives have been meeting with media executives to discuss the future of television" (Reitzes and Thorwart 2012). In a report on Wachovia Corp (NYSE: WB), a Punk, Ziegel & Company analyst states, "If published reports in the *Wall Street Journal* and *New York Times* are correct, it would appear that Wachovia's stock is about to plunge once again and stay down for an extended period. Both newspapers report that the company is close to a deal to acquire Golden West Financial" (Bove 2006). Finally, Janney Capital Markets analysts discuss a promising product for Crumbs Bake Shop (NASDAQ: CRMB) by referencing that, "A *Boston Globe* article describes the … croissant-doughnut hybrid as a food portmanteau. Ansel's Cronut has been featured on Late Night with Jimmy Fallon, The Today Show, Good Morning America, and Piers Morgan Live on CNN with host Anthony Bourdain" (Kalinowski and Babington 2013).

While anecdotal evidence shows analysts sometimes refer to the financial press in their reports, it is an open empirical question whether and how analysts assimilate information in financial press, and whether their research outputs incorporating such information facilitate security price discovery and improve efficiency in the capital market. Our objective is to provide evidence on this direct flow of information from the media to analysts.

2.2 Empirical predictions

Our empirical analysis proceeds in several stages. In the first stage, we provide descriptive baseline evidence about the link between the incidence of news coverage and analysts' recommendation revision activity. Our unit of analysis here is a firm and the population of analysts providing stock recommendations for that firm. It seems obvious that firm-specific news coverage is associated with subsequent analysts' recommendation revisions, as analysts assimilate information in the news coverage in their recommendations. We note that we are not aware of any empirical evidence on this association, but the confirmation of such a link is an important first step to investigate the role of media in providing information that is subsequently used by analysts in generating research.

After documenting the association between firm-specific news coverage and analysts' revision activity, our primary focus turns to evidence of information processing by analysts. As discussed previously, we are primarily interested in whether part of analysts' information set is information provided by the news coverage. If so, then the descriptive evidence would be consistent with news coverage possibly being used by analysts to trigger updates to existing stock recommendations. However, a stronger test is to examine whether the market reaction to analysts' revisions is incremental in the presence of recent news coverage on the firm being followed by the analyst. Altinkilic and Hansen (2010) argue that analysts tend to piggyback on public news about firms, so piggybacking may explain any association between news coverage and recommendation revision activity. Our primary prediction relies on investors' processing of analyst revisions. If analysts use superior information processing skills to convert information in the news coverage to inputs for stock recommendations, and if such information in the news coverage reflects aspects of firms' fundamentals that have not been impounded in stock prices, we would expect more pronounced market reactions to analyst recommendation revisions when there is more coverage of the firm. Our first hypothesis is as follows.

H_1: The association between analysts' stock recommendation revisions for a firm and stock returns is positively related to recent news coverage of the firm.

We are also interested in capturing the nature of the information reflected in news coverage. One approach to characterizing the content of news would be to perform a content analysis, and manually code the specific types of information conveyed in news coverage (see, Asquith, Mikhail and Au (2005), for example). This is costly and subject to coding bias. An alternative that permits the processing of a large sample of news articles and extensive number of firms is to use machine-based textual analysis to characterize the composition of hard versus soft news and the tone of the information contained in the news coverage. These partitions are coarse relative to a manual content analysis, but they are popular in the literature due to their ease of computation and demonstrated ability to provide insights at a relatively low cost.[11]

We predict that the primary value obtained by analysts from consuming news coverage is in the soft information provided. Our argument is similar in spirit to that offered by Schneider (1972). He laments the lack of soft information in Securities and Exchange Commission filings because soft information is "highly relevant to investment decisions" (p. 254).[12] Accordingly, we believe that analysts' processing of information lies largely in the piecing together of various soft and hard information into a cogent opinion on the suitability of investing in a security. Analysts are typically viewed as quantitatively focused, using inputs from the financial statements. However, as noted in any text on financial analysis, much of the process is qualitative in nature, involving the selective processing of different strategic and economic conditions that are not amenable to quantification. Sedor (2002) discusses theories regarding information processing, and states that communication of information often

[11] See Tetlock, Saar-Tsechansky and Macskassy (2008), Kothari, Li and Short (2009), and Engelberg, Reed and Ringgenberg (2012) for the use of dictionary method to extract tonal information from news media. We use Loughran and McDonald's (2011) dictionary, which is more suitable for interpreting financial information based on 10-K filings.

[12] He acknowledges that there is no sharp dividing line between hard and soft information. For example, "Audited historical financial statements are normally considered to be a classic type of hard information. Accounting is not an exact science, however, and many subjective evaluations and other types of soft information must be considered in order to prepare audited financials." (p. 256)

takes place as "narratives." For example, narratives are used by managers in conference calls to discuss soft information like future plans, new products, timelines, and trends. Sedor (2002)'s fieldwork interviews of financial analysts also suggest that they generate forecasts by integrating historical quantitative financial information with qualitative, forward looking narratives from managers and other information sources (Webby and O'Connor 1996). As such, we predict that this type of information is the most likely to be useful to analysts assembling a mosaic of information that would trigger market reactions. Our second hypothesis is as follows.

> *H_2: The association between analysts' stock recommendation revisions for a firm and stock returns is more strongly related to soft news as opposed to hard news.*

Our final prediction relates to the tone of the news coverage. Tone has been examined in several contexts of financial disclosures. For example, Henry (2008) finds that the tone of earnings announcements significantly affects investors' reactions. She cites (Maat 2007), who explains that tone affects information processing because tone is "a stronger argument for a particular conclusion than the non-reinforced version" (p. 365). Similarly, Rogers, Van Buskirk and Zechman (2011) examine the impact of earnings announcement disclosure tone on shareholder litigation. Following this interpretation of the effect of tone on the receiver, we also predict that tone will affect analysts' use of the information. The differential impact of positive versus negative tone is more salient in the context of management press releases and disclosures, where strategic disclosure objectives may be present (e.g., Lang and Lundholm 2000).

In our empirical context, we are not aware of any evidence suggesting a strategic objective of financial news coverage. Further, we do not have any priors on whether analysts might differentially process positive versus negative tone. On one hand, analysts' ability to assemble and process a mosaic of information is expected to be neutral to the tone of the news coverage, so tone will be associated with the direction of recommendation changes, and by extension, market returns. On the other hand, it is well

documented that sell-side analysts' forecasts are routinely optimistic. The typical explanation for this phenomenon is that analysts wish to maintain cordial relationships with the covered firms. If this is the case, the analysts might react more strongly to the positive tone of the news coverage relative to the negative tone of the news coverage.[13] Given that the investors are aware of analysts' optimism bias, the market is not expected to strongly react to analysts' recommendation revisions associated with good news. In contrast, the market is likely to respond strongly to react to analysts' recommendation revisions associated with bad news because such revisions are more credible. Given that we do not have a clear prediction related to the tone of the news coverage, we form our final hypothesis as a null hypothesis.

> *H_3: The association between analysts' stock recommendation revisions for a firm and stock returns is not correlated with the tone of the news.*

3. Data and Variable Measurement

3.1 Data

The financial news texts are downloaded from Factiva. Following Engelberg (2008) and Gurun and Butler (2012), we use Factiva's Intelligent Indexing to match firms and news, and require that the firm's name appear at least once in the article to ensure the accuracy of matching.[14] We employ Factiva's algorithm on handling duplicates to ensure that the sample articles do not include duplicates. We omit newswires, which would capture direct firm releases, from our sampling procedures and rely instead on news coverage in the ten largest print newspapers. The news sources include top national newspapers (*Wall Street Journal*, *New York Times*, *Washington Post*, and *USA Today*) and top local

[13] It is also possible that analysts might strategically reference the media because of the need to provide cover, which would apply primarily for bad news coverage, i.e., news coverage with negative tone. We address this concern in section 4.4.

[14] Given analysts' value as industry specialists (Kadan et al. 2012; Bradshaw 2013), news articles that contain macro or industry-specific information might be more useful to an analyst. However our sampling procedure on firm-specific news articles precludes us from including such articles in the sample. Along those lines, it would be interesting to examine how analysts incorporate information from industry trade journals because they contain a real cogent set of news that analysts would be in the position to capitalize upon. This is an appealing approach to investigate the interaction between analysts' industry expertise and industry level media coverage, but it is beyond the scope of the current paper.

newspapers (*Atlanta Journal Constitution, Boston Globe*, *Denver Post*, *Pittsburgh Post-Gazette*, *St Louis Post-Dispatch*, and *Minnesota Star Tribune*).[15] Following Tetlock (2011), we exclude news articles with fewer than 50 words to alleviate the concerns about articles being a short summary. We collect analyst data from I/B/E/S, stock return data from *CRSP*, and financial data from *Compustat*.

The sample period spans 1998 to 2012. We begin with 1998 because Intelligent Indexing is not reliable before 1998. We limit our firm universe to the S&P 1500 because smaller firms rarely receive any coverage in these larger publications. Our empirical tests are conducted at different samples, and we also impose restrictions on data as they become necessary in testing the hypotheses. As a result, our samples vary across different tests. We explain the sample details when we discuss the results of each empirical test.

3.2 Variable Measurement

3.2.1 Media Variables

The key media variables used in the paper are the overall frequency of news coverage, the distribution of soft versus hard information included in news coverage, and the tone of the news. We proxy the frequency of press coverage for each firm as the number of news articles about the firm between days {-30, -3} centered on the analyst recommendation revision date (*#NEWS*). *#NEWS* is highly right-skewed, so we use a log transformation in the empirical analyses (*log#NEWS)*, calculated as log (1+*#NEWS*).

We also measure the frequency of soft versus hard information within news coverage. We designate textual information as soft and numerical information as hard, and construct a variable *HSRATIO*, equal to the number of numerical words (phrases consist of digits, decimal points, commas,

[15] The initial list of newspapers is from Engelberg et al. (2011). When we collected data from the Factiva database, some local newspapers used in Engelberg et al. (2011) were not retrievable through the system. We thus only collected news articles available from the Factiva system at the time of data collection. We only consider the version of print news, but not online version or the blogs.

percentage and/or dollar such as $1.08, 50% or 20,000) in an article divided by the sum of the number of positive words, negative words, and numerical words in the article. We use the classification method by Loughran and Mcdonald (2011) to identify positive and negative words.[16] We estimate *HSRATIO* for each article, and classify an article as a hard news article if *HSRATIO* is above 0.4, the median *HSRATIO* of all news articles, and as a soft news article otherwise. We then count the number of soft news articles and the number of hard news articles, and use a log transformation for the empirical analyses (*log#SOFTNEWS* and *log#HARDNEWS*).

Finally, we adopt a dictionary method to evaluate the tone of news article. We parse the news articles and count the number of positive and negative words using the classification method proposed by Loughran and Mcdonald (2011), who show that their word classification scheme is more suitable in the finance and economics context than the Harvard IV classification used in Tetlock (2010). We follow Tetlock (2007) and Dougal et al. (2012) to define several measures of the tone of articles: (1) the percentages of positive words (*%POS*) is defined as the number of positive words divided by the total number of words in the article, and the percentage of negative words (*%NEG*) is defined similarly; (2) the net tone of the article is defined as $TONE = \%POS - \%NEG$. *TONE* is constructed to capture the net effects from both the positivity and negativity of an article. In some regressions, we also include a variable *%HARD*, which is measured as the percentage of numerical words in an article, to capture the proportion of quantitative information (hard information) in the news coverage.

[16] Loughran and McDonald (2011) propose a new financial dictionary based on the words used in the 10-K filings. The authors manually classify the word lists into negative, positive, uncertainty, litigious, strong modal and weak modal categories, and we follow their approach to identify positive and negative words in the news article. On the other hand, numbers are identified using the following rule: the string needs to start with a space or a dollar sign, and then a string that combines digits, commas, and dots follows immediately. For example, $1.35 is considered as a number and FY13 is not counted as a number. To exclude numbers that mark the years, whole numbers from 1950 to 2020 are not included in the total counts.

3.2.2 Analyst Variables

We focus on analyst recommendation revisions to make inferences on analysts' assimilation of useful information in the financial process. Specifically, we examine three recommendation revision variables during month t of any given year.

> *PROP_REVISING*$_t$**:** The proportion of analysts revising their recommendation, calculated as the percentage of analysts revising recommendations (of all analysts covering the firm) during month t.
>
> ΔREC_t**:** The change in mean recommendation for firm i from month t-1 to month t. I/B/E/S defines recommendation level 1 as strong buy and 5 as strong sell, but we invert these measures so that higher numbers reflect higher recommendation levels. Thus, a higher ΔREC indicates a favorable recommendation revision.
>
> *CAR***:** The market reactions to analyst recommendation revisions, proxied by the abnormal stock returns upon analyst recommendation revisions. Following Loh and Stuz (2010), we use a two-day window (0, 1), and calculate abnormal stock returns upon analyst recommendation revisions as $CAR_i = \sum_{t=0}^{1} R_{it} - \sum_{t=0}^{1} R_{it}^{DGTW}$, where R_{it} is the return of firm i, and R_{it}^{DGTW} is the return on a benchmark portfolio with the same size, book-to-market, and momentum characteristics as the stock (constructed in similar fashion as in Daniel et al. 1997 and Wermers 2003, DGTW hereafter).

3.2.3 Control Variables

In our regression analyses, we include a number of control variables as suggested in the prior research on analyst recommendation revisions (Jegadeesh et al. 2004 and Loh and Stulz 2010, among others). We explain the construction of the control variables as follows.

> *logMV***:** The size of the firm, calculated as natural logarithm of market value, which equals to the number of shares outstanding times the price of the stock at the end of the previous year.
>
> *#ANALYSTS***:** Analyst coverage, calculated as the number of analysts covering a firm in month t of any given year.
>
> *logB/M***:** Book to market, calculated as natural logarithm of book value of equity divided by market value of equity measured at the end of the previous year.
>
> *MOMENTUM***:** Momentum of the stock, calculated as the cumulative stock returns from six month before the recommendation revision date to one month before the revision date (Jegadeesh and Titman 1993). Loh and Stulz (2010) suggest that this variable is useful in explaining the impact of analyst recommendation revisions.

logVOLATILITY: Stock return volatility, calculated as the standard deviation of daily returns over the past 60 days before the recommendation revision date. We include this variable to control the possibility that news coverage might increase or decrease uncertainty. Following Loh and Stulz (2010), we take the logarithm transformation in the regression analyses.

TURNOVER: Average daily share turnover over the past 60 days before the recommendation revision date, calculated as average trading volume divided by the number of shares outstanding.

Δ*EPS*: An indicator variable that equals to one if the analyst who issued a recommendation also issued a new EPS forecast in the past three days before the recommendation revision date, and zero otherwise. Prior research suggests that a recommendation is more useful when it is accompanied by an EPS revision (Kecskes, Michaely and Womack 2013).

RECDEV: The deviation of the analyst's recommendation from the consensus recommendation, calculated as the analyst's recommendation on the inverted 1-5 scale minus the consensus recommendation (Jegadeesh and Kim 2010).

ACCRANK: The analyst's lagged earnings forecast accuracy, measured in month t-1. We sort analyst earnings forecast accuracy into quintiles with quintile five being the most accurate. Loh and Mian (2006) find that the opinions of accurate analysts are more informative.

lagRET: Lagged stock returns, calculated as as the returns in the past 30 days before the recommendation revision date.

PREEARN: Earnings announcement after recommendation revisions, an indicator variable that equals to one if the firm makes an earnings announcement in the 15 days after the recommendation revision date, and zero otherwise.

POSTEARN: Earnings announcement before recommendation revisions, an indicator variable that equals to one if the firm made an earnings announcement in the 15 days before the recommendation revision date, and zero otherwise.

4. Empirical Results

4.1 Descriptive Statistics

Table 1 reports descriptive statistics for each newspaper. *The Wall Street Journal* has the highest number of news articles followed by the *New York Times* and the *Washington Post*. Local newspapers in general have fewer number of articles compared to national newspapers. The average number of words per article ranges from 496 to 706 words. There are slightly more negative than positive words for each article, which might reflect the need to attract the attention of readers (Hamilton and Zeckhauser 2004). On the other hand, the levels of news tone do not appear to differ across publications.

Table 2 presents summary statistics on analyst recommendation revision and firm level variables used in the paper. The mean (median) ΔREC is -0.019 (0.000), and the mean (median) *CAR* is -0.385 (-0.039), indicating that our sample includes more downward revisions (50,983) than upward revisions (45,666). The table also shows that sample firms are quite heterogeneous on dimensions such as size, growth opportunity, and performance.

4.2 News Coverage and Analyst Research Updates

Our first set of analyses examines the link between firm-specific news coverage and analyst revisions. We perform the following regression analysis:

$$PROP\_REVISING_{i,t} = \alpha + \beta_1 \, log\#NEWS_{i,t-1} + \beta_2 \, |lagRET_{i,t-1}| + \beta_3 \, logMV_{i,t-1} + \beta_4 \, \#ANALYSTS_{i,t-1} + \varepsilon_{i,t} \quad (1)$$

The dependent variable, *PROP_REVISING*, captures the likelihood of analysts revising their recommendations for firm i in month t. In this analysis, we start with S&P 1500 firms for a period of 15 years, and we arrive at sample of 268,197 firm-month observations after losing observations in the process of merging with CRSP, IBES, and the media data. *log#NEWS* is the variable of interest that captures the frequency of news coverage in the (-30, -3) window relative to the analyst revision month. In a different regression specification, we replace *log#NEWS* with two indicator variables, *I (#NEWS=1)* and *I (#NEWS>1)*, to capture the incidences when firms have one news article and when firms have more than one news article in month t. Control variables include the absolute value of lagged stock returns (|*lagRET*|), firm size (*logMV*), and the number of analysts covering the firm (*#ANALYSTS*). We standardize all continuous explanatory variables at mean 0 and standard deviation 1 to facilitate comparison of the economic magnitudes of coefficients.

Table 3 panel A presents the panel regression results, with standard errors clustered by year-month. Column (1) shows the results using indicator variables of news coverage, and column (2) reports

the results using the continuous variable of news coverage *log#NEWS*. In column (1), we find that both indicator variables, *I (#NEWS=1)* and *I (#NEWS>1)*, are positive and statistically significant. Regarding economic significance, the coefficient on *I (#NEWS=1)* indicates that a single news article is associated with a 1.66% increase in monthly recommendation revision activity, representing a 44% increase relative to the regression intercept of 3.76%. Given that all independent variables are demeaned, the intercept therefore reflects the proportion of analysts revising for the mean firm in the sample. However, the coefficient on *I (#NEWS>1)* has similar magnitude and significance as that on *I (#NEWS=1)*. In column (2), we find a positive and significant coefficient on *log#NEWS*, supporting the intuition that firm-specific news coverage is associated with greater subsequent revision of analysts' recommendations.

We next investigate whether analysts' revisions are associated with the tone of recent news coverage. We restrict the sample to the firm-month observations with available news coverage in the prior month, thus the sample is reduced to 41,101 firm-month observations. We expect the direction of recommendation changes to be associated with the tone of the financial news. We perform Fama-Macbeth regressions of ΔREC on the lagged news tone measures along with control variables. The regression model is as follows:

$$\Delta REC_{i,t} = \alpha + \beta_1 TONE_{i,t-1} + \beta_2 \%HARD_{i,t-1} + \beta_3 logMV_{i,t-1} + \beta_4 logBM_{i,t-1} + \beta_5 MOMENTUM_{i,t-1} + \beta_6 lag\Delta REC_{i,t-1} + \varepsilon_{i,t} \quad (2)$$

Table 3 panel B presents the Fama-Macbeth regression results. Tone is measured as *%NEG*, *%POS*, and *TONE* in columns (1), (2), and (3), respectively. We again standardize all continuous explanatory variables at mean 0 and standard deviation 1 to facilitate comparison of the economic magnitudes of coefficients. Column (1) shows that the percentage of negative words in news coverage is associated with downward recommendation revisions with statistical significance at better than the 5% level. On the other hand, we find that the percentage of positive words in news coverage is associated

with upward recommendation revisions, but the coefficient on *%POS* is not statistically significant. We control for *%HARD* when we examine the composite measure *TONE* in column (3). The results show a positive and statistically significant coefficient on *TONE*, supporting analysts' recommendations being associated the information content in news coverage. We control for *%HARD* and other control variables (listed in equation 2) in column (4). The inclusion of these control variables does not affect the sign and significance level on the tone measure, and we continue to observe a positive and significant coefficient on *TONE* in column (4).[17]

4.3 News Coverage and Market Reactions to Analysts Recommendation Revisions

The descriptive results in section 4.2 are consistent with the notion that analysts respond to news coverage by updating their recommendations, and that their recommendation revisions incorporate the qualitative signal from the news articles. Our primary set of analysis are discussed next, and focus on the market reactions to analyst recommendation revisions, which capture investors' processing of analyst research updates. We perform separate regressions of *CAR* for recommendation downgrades and upgrades, and regressions of |*CAR*| for both upgrade and downgrade revisions.[18] The regression models are as follows:

$$CAR_{i,t} \text{ or } |CAR_{i,t}| = \alpha + \beta_1 \, log\#NEWS_{i,t-1} + \beta_2 \, logMV_{i,t-1} + \beta_3 \, logBM_{i,t-1} + \beta_4 \, MOMENTUM_{i,t-1}$$
$$+ \beta_5 \, logVOLATILITY_{i,t-1} + \beta_6 \, TURNOVER_{i,t-1} + \beta_7 \, \Delta EPS_{i,t} + \beta_8 \, RECDEV_{i,t}$$
$$+ \beta_9 \, ACCRANK_{i,t-1} + \beta_{10} \, lagRET_{i,t-1} + \beta_{11} \, PREEARN_{i,t} + \beta_{12} \, POSTEARN_{i,t-1} + \varepsilon_{i,t} \qquad (3)$$

where *CAR* is the DGTW adjusted abnormal announcement return to analyst recommendation revision, and |*CAR*| is the absolute value of the return. The variable of interest is *log#NEWS*. Similar to Loh and Stulz (2010), we include a number of control variables as listed in equation (3).

[17] Note that the results in table 3 are also consistent with the strategic timing story, in which analysts await the arrival of news for cover. We provide additional analyses to address this possibility in Section 4.5.
[18] Reiterations are excluded from our analyses.

We note that the unit of analysis in this test is each individual analyst recommendation revision. This sample starts with the 268,197 firm-month observations in table 3. Given that each firm has an average of nine-analyst following and the mean proportion of analyst recommendation revision is 0.042, we arrive at a sample of 103,631 analyst recommendation revisions. Further requirements such as having necessary return data to calculate CAR reduces the sample to 96,649 recommendation revisions, with 50,983 upward and 45,666 downward revisions. A legitimate concern on this sample is that the fact that analysts do not revise recommendations does not suggest that they did not use the information from the media. However, restricting sample to recommendation changes makes empirical inferences feasible. That is why numerous prior research focuses identifiable rather than possible events (e.g., Beaver (1968), Loh and Stulz (2010)).

Table 4 panel A reports the results from the regressions on the market reactions to analyst recommendation revisions for the event window [0, +1], with standard errors two-way clustered by firm and analyst. We standardize all continuous explanatory variables at mean 0 and standard deviation 1 to facilitate comparison of the economic magnitudes of coefficients. Columns (1) and (2) show the results for downgrade revisions, columns (3) and (4) show the results for upgrade revisions, and the last two columns include both upgrade and downgrade revisions. We find a negative and significant coefficient on *log#NEWS* for downgrade revisions (columns (1) and (2)), suggesting more negative market reactions to downgrade revisions when there is more news coverage on the firm. Likewise, we observe a positive and significant coefficient on *log#NEWS* for upgrade revisions (columns (3) and (4)), suggesting more positive market reactions to upgrade revisions when there is more news coverage on the firm. Finally, the coefficient on *log#NEWS* is positive and significant in columns (5) and (6) when we examine |*CAR*| for both upgrade and downgrade revisions. In terms of economic significance, the results indicate that a one standard deviation of *log#NEWS* is associated with a 0.59 percent change in

abnormal returns for downward revisions (column 2), corresponding to roughly 19% of the mean abnormal returns in the two-day window. Similarly, the change in abnormal returns associated with one standard deviation of *log#NEWS* is 0.36 percent for upward revisions, equivalent to 14.5% of the mean abnormal returns in the two-day window (column 4). Collectively these results provide support for H_1.

The signs of coefficients on control variables are in general opposite to each other in downgrade and upgrade regressions. Large, high *BM*, high *MOMENTUM*, and low *VOLATILITY* firms experience less negative returns upon downward revisions, and less positive returns upon upward revisions. When there is a concurrent EPS revision and when the revision deviates from consensus, the abnormal returns are more negative upon downward revisions, and more positive upon upward revisions. These results are in general consistent with those documented in prior studies.

The lag between our measurement of financial news and the analysts' subsequent recommendations lessens the likelihood that the revisions are merely piggybacking on financial press news. Moreover, these regression results documenting stronger reactions in the presences of recent press coverage are inconsistent with the piggybacking explanation of Altinkilic and Hansen (2009). However, the market price reactions at high volume news days could be a result of investor attention to content, rather than the revelation of firm fundamentals. For example, investors may impound recommendation information more timely when there is more news coverage, which leads to stronger price reactions around the event date. To explore this possibility, we investigate the price reaction from day 2 to day 5 after the analyst recommendation revision date. If higher price reactions are a result of investor attention, then we would expect the price reaction to reverse in day 2 to day 5. The results from these regressions are presented in panel B of table 5. We find that the coefficient on *log#NEWS* becomes smaller in magnitude and lacks statistical significance, but no evidence of price reaction reversals.

To illustrate the results, we estimate both upgrade and downgrade regressions of $CAR_{i,t} = \alpha + \beta\ log\#NEWS_{i,t-1} + \varepsilon_{i,t}$ for each trading day after the recommendation revision date. The first graph of Figure 1 shows the plot of the β coefficients (on the vertical axis) that correspond to the number of days after the recommendation revision day (on the horizontal axis). As is evident from the graph, the β coefficient has the largest magnitude at day 0, and declines rapidly over time. Taken together, these results are consistent with the view that analyst recommendation revisions, in particular those associated with more intense news coverage, are informative to the capital market.

4.4 Analyst Interpretation of Hard versus Soft Information

Although the collective empirical evidence thus far suggests that analysts incorporate firm-specific information from the news coverage in their research updates and such research updates are valuable to investors, it is not clear what type of information in the news coverage analysts primarily rely on to revise their research. While information conveyed by the financial press is both quantitative and qualitative, recent studies on media suggest that the media contains important soft information. The cost of processing soft information is considerably high (Petersen 2004), which creates a demand for analysts to process this type of information. On the other hand, soft information seems to be an important element of the "mosaic" of information discussed in Reg. FD. Our investigation of whether analysts respond to business press information allows us to separately measure the amount of soft versus hard information in the news coverage, and shed light on whether analysts respond to the information content of firm-specific soft information. Specifically we revisit the market reactions to analyst recommendation revisions, and examine whether the market reactions differ in response to quantitative versus soft information in press coverage. We implement the following panel regressions:

$$CAR_{i,t} \text{ or } |CAR_{i,t}| = \alpha + \beta_1\ log\#SOFTNEWS_{i,t-1} + \beta_2\ log\#HARDNEWS_{i,t-1} + \beta_3\ \mathbf{X}_{i,t-1} + \varepsilon_{i,t} \quad (4)$$

where *CAR* is the DGTW adjusted abnormal announcement returns to analyst recommendation revisions. The variables of interest are *log#SOFTNEWS* and *log#HARDNEWS*. The vector $\boldsymbol{X}$ represents the same set of control variables as in equation (3).

Table 5 presents the results from the regressions on the market reactions to analyst recommendation revisions for the event window [0, +1], with standard errors two-way clustered by firm and by analyst. We again standardize all continuous explanatory variables at mean 0 and standard deviation 1 to facilitate the comparison of the economic magnitudes of the coefficients. Columns (1) and (2) show the results for downgrade revisions, columns (3) and (4) show the results for upgrade revisions, and the last two columns include both upgrade and downgrade revisions. For downward revisions (columns (1) and (2)), we find a negative and significant coefficient on *log#SOFTNEWS*, but an insignificant coefficient on *log#HARDNEWS*. The difference in the two coefficients is statistically significant at better than the 5% level. We interpret the results as more negative market reactions to downgrade revisions when there is more qualitative press coverage on the firm, but not quantitative coverage. For upgrade revisions (columns (3) and (4)), we observe positive and significant coefficients on both log *log#SOFTNEWS* and *log#HARDNEWS*. Although the coefficient on *log#SOFTNEWS* is larger in magnitude, the difference in the two coefficients is not statistically significant. When we examine |*CAR*| for both upgrade and downgrade revisions in columns (5) and (6), we find that the coefficient on *log#SOFTNEWS* is positive and significant, but the coefficient on *log#HARDNEWS* is not statistically significant. The difference in the two coefficients is statistically significant at better than the 1% level.

To illustrate the results, we estimate both upgrade and downgrade regressions of $CAR_{i,t} = \alpha + \beta\ log\#SOFTNEWS_{i,t-1} + \varepsilon_{i,t}$ and $CAR_{i,t} = \alpha + \beta\ log\#HARDNEWS_{i,t-1} + \varepsilon_{i,t}$ on each trading day after the recommendation revision date. The second graph of Figure 1 shows the plot of the β coefficients (on the

vertical axis) of *log#SOFTNEWS* that correspond to the number of days after the recommendation revision day (on the horizontal axis), and the third graphs shows the plot of the β coefficients (on the vertical axis) of *log#HARDNEWS*. The β coefficient of *log#SOFTNEWS* has the largest magnitude at day 0, and declines rapidly over time. In contrast, we do not observe patterns on the β coefficients of *log#HARDNEWS*. Collectively, these results are consistent with H_2, supporting that analysts contribute to the security price discovery by sifting through and extracting soft information in news coverage.

Descriptive results in table 3 suggest that analyst impound the qualitative signal from news coverage (i.e. the tonal information) in their recommendation revisions. We now formally document that the stock market responds to the tonal information contained in analyst recommendation revisions. First, we note that our results from both table 4 and table 5 suggest that the market responds significantly to the amount of news coverage for both upward revisions and downward revisions. The upward (downward) revisions are generally triggered by the positive (negative) tone of the media coverage. The significant coefficients on *log#NEWS* in both upward and downward revision samples provide support that these revisions are informative to the investors. Second, we employ another research design to test such a link, and also consider the interactions between the tone measures and news coverage intensity. Given that we need news articles to calculate tonal measures, we remove all observations without news coverage, which results in a sample of 29,993 recommendation revisions. Specifically, we estimate the following panel regressions:

$$CAR_{i,t} = \alpha + \beta_1 TONE_{i,t-1} + \beta_2 log\#NEWS_{i,t-1} + \beta_3 TONE_{i,t-1} * log\#NEWS_{i,t-1} + \beta_4 \boldsymbol{X}_{i,t-1} + \varepsilon_{i,t} \quad (5)$$

$$CAR_{i,t} = \alpha + \beta_1 TONE_{i,t-1} + \beta_2 log\#SOFTNEWS_{i,t-1} + \beta_3 TONE_{i,t-1} * log\#SOFTNEWS + \beta_4 log\#HARDNEWS_{i,t-1} + \beta_5 TONE_{i,t-1} * log\#HARDNEWS + \beta_6 \boldsymbol{X}_{i,t-1} + \varepsilon_{i,t} \quad (6)$$

where *CAR* is the DGTW adjusted abnormal announcement returns to analyst recommendation revisions. The variables of interest are the tone measures and the interactions between the tone and news coverage measures. Again, the vector ***X*** represents the same set of control variables from equation (3).[19]

Table 6 presents the results from these panel regressions, with standard errors two-way clustered by firm and by analyst. We again standardize all continuous explanatory variables at mean 0 and standard deviation 1 to facilitate the comparison of the economic magnitudes of the coefficients. The results on the control variables are not tabulated for brevity, but they are in general consistent with those presented earlier in table 3. Columns (1) to (3) report the regression results with three different tone measures, *%POS*, *%NEG*, and *TONE*, but without news coverage measures. Consistent with the expectation (H_{A4}), we observe a positive coefficient on *%POS*, a negative coefficient on *%NEG*, and a positive coefficient on *TONE*, with all three coefficients highly statistically significant. We infer from the results that the stock market responds to the tonal information analysts extract from news coverage and impound in their research updates. Although we cannot completely rule out analyst optimistic bias as an alternative explanation of the results (note that the magnitude of coefficient on positive news coverage is less than that on negative news coverage), the positive and significant coefficient on positive news coverage variable suggests that analyst optimistic bias is not the primary driver of the results, which corroborates the results in tables 4 and 5,

Column (4) presents the results estimating equation (5). Our focus is on the interaction of the tone and the news coverage measures. The results reveal that *TONE* is no longer statistically significant, but there is a positive and significant coefficient on the interaction term. Thus, the qualitative signal in the news coverage has a significant market impact when the press coverage is more intense.

[19] Given that we are interested in the effect of tone measure, we pool all the recommendation revisions together to run the regression, which is different from the research design in tables 4 and 5.

Column (5) presents the results estimating equation (6). Our focus is again on the interaction of the tone and the news coverage measures, but we also separate quantitative news coverage from qualitative news coverage. Similar to column (4), we do not find a significant coefficient on *TONE*. However, the coefficients on the two interaction terms are positive and statistically significant, although the coefficient on the *log#SOFTNEWS* interaction is higher in magnitude relative to that on the *log#HARDNEWS* interaction. This result implies that the tone signal in the news coverage has a significant market impact when the press coverage, in particular the qualitative press coverage, is more intense. Taken together, we interpret the empirical evidence in the paper as analysts extracting qualitative information from the news coverage, and providing such information to investors through recommendation revisions.

4.5 Extensions and Diagnostics

Finally, we address the concern that analysts might *strategically* reference the media because of the need to provide cover, which would apply primarily for bad news. Although the examination of the content of analyst reports is beyond the scope of the current study, we conduct the following analyses to investigate this possibility. First, we examine the timing (i.e. the number of days) of analyst revisions relative to the news articles, and how the timing differs with the direction of recommendation revisions. The mean (median) distance is 15.76 (15.55) days for upgrade revisions, and 15.58 (15.55) days for downgrade revisions. The lack of significant differences in the distance between up and downgrade revisions does not support the strategic cover-up story which predicts shorter distance for downward revisions (due to the need to cover up in particular for bad news). Second, although less likely, it might be possible that analysts need cover for good news. Thus we directly study whether the information content of recommendation revisions varies with the timing of the revisions relative to the news articles

by including both good news and bad news articles. Revisions closer to the news articles are more likely to be those for which analysts are strategically citing them, whereas revisions with more distance are those that fit the "mosaic" theory, where analysts are expected to use and process the information from the media. As such, if the results are driven by analysts' processing of information from media, we would expect to find similar significant market reactions for recommendation revisions regardless of the timing differences. Alternatively, if our results are contaminated by the strategic cover-up story, we would expect to find stronger market reactions for the revisions closer to the news articles.

For each revision, we compute the mean distance between the news articles and the revision, and partition the sample into two subsamples using the sample median of the mean distance, the subsample of revisions closer to the news articles and those distant. We then estimate the regressions of model (3) on the market reactions to analyst recommendation revisions for the event window [0, +1] using the two subsamples separately, with standard errors two-way clustered by firm and by analyst. Table 7 reports the results. Columns (1) and (2) show the results for downgrade revisions, columns (3) and (4) show the results for upgrade revisions, and the last two columns include both upgrade and downgrade revisions. The results for the subsample of revisions closer to the news articles are presented in columns (1), (3), and (5), and those for the distant subsample are in columns (2), (4), and (6). We find a negative and significant coefficient on *log#NEWS* for downgrade revisions (columns (1) and (2)), a positive and significant coefficient on *log#NEWS* for upgrade revisions (columns (3) and (4)), and a positive and significant coefficient on *log#NEWS* in columns (5) and (6) when we examine $|CAR|$ for both upgrade and downgrade revisions. Moreover, there are no significant differences in the *log#NEWS* coefficient between the two subsamples of interest, suggesting similar significant market reactions to revisions regardless of the timing between revisions and news articles. Collectively, our empirical evidence is more consistent with the "mosaic" story than the strategic reference cover alternative.

Next, an implicit assumption in our paper is that the media is the source of the firm-specific news coverage. However, such coverage could be a proxy of firm-specific news releases from other information sources and analysts could learn about this new information independently of the media coverage. To address this possibility, we consider the effects of firm-specific disclosure. Specifically, we collect data on firms' 8-K filings, which capture one of the important firm-specific disclosure sources. We additionally include the number of firm-specific 8-K filings during the same period as the news coverage period in the regression model and repeat the analyses. Although we do not find consistent results on the coefficient of the variable that captures the number of 8-K filings, our primary results on media coverage remain qualitatively similar as those presented in the paper.

Next, we further explore the market reactions to analyst revisions in response to national versus local news coverage. Given that national news coverage has greater impacts, the results are expected to be stronger for national news coverage. We conduct regressions of model (3) by including *log#NATIONAL_NEWS* and *log#LOCAL_NEWS*, along with other control variables. The results are not tabulated for brevity.We find a negative and significant coefficient on *log#NATIONAL_NEWS* for downgrade revisions, a positive and significant coefficient on *log# NATIONAL_NEWS* for upgrade revisions, and a positive and significant coefficient on *log# NATIONAL_NEWS* for both revisions. While the signs on *log# LOCAL_NEWS* are the same as those on *log# NATIONAL_NEWS*, the magnitudes are lower, and significant only for the upgrade revisions and the pooled revisions. This evidence suggests that the scope of news coverage is associated with analysts' assimilation of financial press information.

Finally, we perform several replications of our primary analysis to assess the robustness of our results to including various sample definitions and combinations of control variables.[20] We first consider the effects of other firm-specific correlated omitted variables by including firm fixed effects in the regression models; the inclusion of firm fixed effects does not change our main results on media

[20] These results are not tabulated for brevity, but are available upon requests.

coverage. Second, we consider the possibility that overlapping news coverage surrounding analyst revisions might contaminate our main results. We thus conduct a sensitivity analysis by removing from our sample revisions with overlapping news coverage, which leaves us with 41,135 downward revisions and 37,316 upward revisions. The regression results from this sensitivity analysis are similar to those reported in the paper. Third, we consider the effect of earnings surprises by including them in the market reaction regressions, and continue to find similar results as those reported in the paper. Fourth, we control for the direction of change in recommendation revisions in the market reaction regressions, and the inferences from this alternative specification are the same as those from the main specification reported in the paper.

5. Conclusion

To our knowledge, this is the first study to examine the role of the media in providing information that is subsequently used by analysts in generating informative research. There is a long literature on the efficiency of analysts with respect to numerous types of information. Whereas researchers most commonly presume that analysts primarily obtain information from financial reports and disclosures by firms, recent research has highlighted that analysts obtain non-financial information from alternative sources, such as manager forecasts (Hutton, Lee and Shu 2012), industry-level information (Kadan et al. 2012), broker-hosted investor conferences (Green et al. 2014), and nonverbal cues during manager presentations (Mayew and Venkatachalam 2012). We extend these studies by examining analysts' use of information, especially soft information, from firm-specific print news coverage.

We investigate whether sell-side analysts use information conveyed by the financial press. Our specific examination is of the link between information disseminated by the media, its assimilation by

analysts, and the communication of original analysis to investors. We document that analysts are more likely to revise their stock recommendations following greater news coverage of a firm. Moreover, investors' reactions to analysts' revisions are stronger when such revisions are linked to previous news coverage. Finally, we partition news by tone and type, and find not only that analysts and investors respond to both optimistic and pessimistic tone, but that the usefulness of news coverage by analysts and investors is primarily driven by soft information rather than hard information in the news. Our study primarily contributes to the general literature on the efficiency of capital markets, which is achieved through the free flow of information among participants in the capital markets.

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Table 1: Summary Statistics for News Coverage

This table presents descriptive statistics on the number of articles for each newspaper, as well as the number of words and news tone measures per article: %NEG is the number of negative words over total number of words for each article. %POS is the number of positive words over total number of words for each article. SD and Mean are standard deviations and sample means of the news articles in the corresponding news outlets.

	# Articles	Mean(Words)	Mean(%NEG)	SD(%NEG)	Mean(%POS)	SD(%POS)
Wall Street Journal	306,824	641	0.018	0.014	0.007	0.006
New York Times	92,806	522	0.018	0.014	0.006	0.004
Washington Post	41,368	708	0.018	0.015	0.006	0.005
USA Today	17,496	685	0.017	0.014	0.008	0.006
Atlanta Journal-Constitution	20,110	706	0.015	0.013	0.007	0.005
Boston Globe	28,430	496	0.016	0.015	0.007	0.008
Denver Post	13,906	596	0.016	0.014	0.006	0.005
Star Tribune	18,383	649	0.016	0.014	0.007	0.006
Pittsburgh Post Gazette	27,440	645	0.017	0.013	0.007	0.006
St Louis Post Dispatch	30,760	527	0.016	0.014	0.006	0.006

Table 2: Summary Statistics for Firm Level Variables

This table reports summary statistics of firm level variables. CAR is the DGTW-adjusted two-day [0,+1] return around each recommendation change and $|CAR|$ is its absolute value . TURNOVER is average daily turnover calculated as average trading volume divided by number of shares outstanding over the past 60 days. VOLATILITY is the lag daily volatility over the past 60 days. lagRET is lag return over the past 1 month. ΔREC is the change in recommendation levels. BM is log of book-to-market ratio. MV is market equity in million dollars. TONE is the difference between $\%POS$ and $\%NEG$. MOMENTUM is the stock return over the past 6 months (skipping the most recent month). #ANALYSTS is the number of analysts that cover firm in month t. PREEARN is an indicator variable indicating the recommendation is issued within 15 days before an earnings announcement. PREEARN is an indicator variable indicating the recommendation is issued within 15 days after an earnings announcement. ΔEPS is an indicator variable of whether the analyst issued a change in EPS forecast within the past 3 days. RECDEV is the absolute difference between the recommendation and median analyst recommendation and it proxies for deviation from consensus. ACCRANK is the rank of analyst forecast accuracy. It is a discrete variable ranging from 1 to 5. $PROP\_REVISING$ is the proportion of analyst revise the recommendation in the next month. #NEWS is the number of news count. #HARDNEWS is the number of hard news count. #SOFTNEWS is the number of soft news count.

Variable	**Mean**	**Median**	**Std Dev**	**Q1**	**Q3**
$\|CAR\|$	4.987	2.667	7.719	1.133	5.767
CAR	-0.385	-0.039	9.182	-2.718	2.613
$TURNOVER$	2.064	2.099	0.917	1.472	2.694
$VOLALTILITY$	3.236	2.693	2.044	1.878	3.968
$lagRET$	0.985	0.776	13.653	-5.312	6.765
ΔREC	-0.019	0.000	1.289	-1.000	1.000
BM	0.594	0.427	0.898	0.247	0.697
MV	27,479.785	8,071.182	53,318.282	2,132.420	25,856.626
$MOMENTUM$	5.366	5.831	36.296	-9.868	21.062
$TONE$	-0.012	-0.010	0.014	-0.019	-0.003
$\#ANALYSTS$	9.236	8.000	6.718	4.000	13.000
$PREEARN$	0.135	0.000	0.117	0.000	1.000
$POSTEARN$	0.321	0.000	0.467	0.000	1.000
ΔEPS	0.496	0.000	0.499	0.000	1.000
$RECDEV$	0.906	1.000	0.757	0.000	1.000
$ACCRANK$	2.953	3.000	1.339	1.000	4.000
$PROP\_REVISING$	0.042	0.000	0.100	0.000	0.048
#NEWS	2.338	0.000	8.854	0.000	1.000
#HARDNEWS	1.169	0.000	3.309	0.000	1.000
#SOFTNEWS	1.169	0.000	6.080	0.000	0.000

Table 3: News Coverage and Analyst Recommendation Change

Panel A tests whether news coverage increases the analyst recommendation changes. The dependent variable is the proportion of analyst issuing a recommendation change in the following month. The independent variables include log#NEWS (log number of news), I(#NEWS = 1) and I(#NEWS > 1) (two indicator variables for number of news equals to 1 and number of news greater than 1), logMV and number of active analyst coverage (#ANALYSTS) and $|lagRET|$ (the absolute return in the previous month). Panel B presents Fama-Macbeth regressions on mean recommendation changes. %NEG is the number of negative words over total number of words for each article published in the month prior to the recommendation revisions. %POS is the number of positive words over total number of words for each article published in the month prior to the recommendation revisions. TONE is the difference between %POS and %NEG. %HARD is the percentage of hard news in the past one month. See Table 2 for the definition of other variables included in the regression. Estimates and standard error are based on the time series of cross-sectional regressions. Significance level: *** $p < 0.01$, $**$ $p < 0.05$, * $p < 0.1$.

Panel A: News Coverage Intensity and Analyst Recommendation Revisions

	(1)	(2)
VARIABLES	$PROP\_REVISING$	$PROP\_REVISING$
I(#NEWS = 1)	0.0166***	
	(0.000708)	
I(#NEWS > 1)	0.0167***	
	(0.00091)	
log#NEWS		0.00473***
		(0.000221)
$\|lagRET\|$	0.00421***	0.00428***
	(0.000180)	(0.000180)
logMV	-0.00255***	-0.00218***
	(0.000254)	(0.000255)
#ANALYSTS	0.00176***	0.00118***
	(0.000235)	(0.000232)
Constant	0.0376***	0.0399***
	(0.000197)	(0.000177)
Observations	268,197	268,197
Adjusted R^2	0.031	0.025

Panel B: Predicting Recommendation Change				
VARIABLES	(1) ΔREC	(2) ΔREC	(3) ΔREC	(4) ΔREC
%NEG	-0.263**			
	(0.115)			
%POS		0.154		
		(0.109)		
TONE			0.271**	0.278**
			(0.114)	(0.116)
%HARD			0.0301	0.0945
			(0.124)	(0.123)
logMV				0.126
				(0.157)
logBM				-0.243**
				(0.119)
MOMENTUM				-0.658
				(0.693)
LAG(ΔREC)				-0.780***
				(0.172)
Constant	0.122	0.124	0.139	-0.0438
	(0.168)	(0.166)	(0.169)	(0.175)
Observations	41,101	41,101	41,078	41,078
Average R^2	0.001	0.001	0.001	0.001
Number of groups	179	179	179	179

Table 4: News Coverage Intensity and Announcement Return

This table presents the regression results on recommendation revision abnormal returns with panel A event window [0,+1] and panel B event window [+2, +5]. $CAR^{(-)}$ is DGTW-adjusted return for downward recommendation revisions. $CAR^{(+)}$ is DGTW-adjusted return for upward recommendation revisions. #NEWS is calculated as $\log(1 + \#NEWS)$, with $\#NEWS$ defined as the number of articles published in the prior month before recommendation revisions. log#HARDNEWS is log(1+#HARDNEWS), where #HARDNEWS is the number of hard news count. log#SOFTNEWS is log(1+#SOFTNEWS), where #SOFTNEWS is the number of soft news count. ΔEPS is an indicator variable on whether there is a concurrent EPS revision. RECDEV is the deviation of the recommendation from the consensus recommendation measure. ACCRANK is the earnings forecast accuracy rank for the analyst(range from 1 to 5). PREEARN is a dummy variable that indicates the firm is going to make an earnings announcement in the next 15 days. POSTEARN is a dummy variable that indicates that the firm made an earnings announcement in the past 15 days. See Table 2 for the definition of other variables included in the regression. Two-way clustered standard errors (by firm and by analyst) are reported in parentheses. Significance level: $p < 0.01$, $**p < 0.05$, $*p < 0.1$.

Panel A: Return Window (0,1)

VARIABLES	(1) $CAR^{(-)}$	(2) $CAR^{(-)}$	(3) $CAR^{(+)}$	(4) $CAR^{(+)}$	(5) $\|CAR\|$	(6) $\|CAR\|$
log#NEWS	-0.665***	-0.593***	0.404***	0.364***	0.825***	0.742***
	(0.132)	(0.123)	(0.0710)	(0.0741)	(0.0809)	(0.0702)
logMV	1.123***	1.130***	-1.150***	-1.070***	-1.520***	-1.421***
	(0.0886)	(0.0950)	(0.0590)	(0.0710)	(0.0608)	(0.0611)
logBM		0.675***		-0.174***		-0.605***
		(0.0788)		(0.0598)		(0.0520)
MOMENTUM		0.283***		-0.317***		-0.484***
		(0.0767)		(0.0515)		(0.0404)
logVOLATILITY		-0.791***		0.446***		1.180***
		(0.0838)		(0.0634)		(0.0525)
TURNOVER		-0.0953		0.0735		0.0836*
		(0.0718)		(0.0530)		(0.0475)
ΔEPS		-1.420***		0.333***		0.566***
		(0.103)		(0.0703)		(0.0592)
RECDEV		-0.297***		0.197***		0.00714
		(0.0459)		(0.0336)		(0.0435)
ACCRANK		-0.000311		-0.0162		-0.00145
		(0.0415)		(0.0308)		(0.0230)
lagRET		0.764***		-0.0978		-0.716***
		(0.0872)		(0.0697)		(0.0526)
PREEARN		0.134		0.206*		0.169*
		(0.173)		(0.117)		(0.0967)
POSTEARN		-0.707***		0.799***		1.031***
		(0.133)		(0.0958)		(0.0811)
Constant	-3.127***	-2.150***	2.500***	2.242***	4.544***	3.863***
	(0.0772)	(0.179)	(0.0501)	(0.124)	(0.0604)	(0.112)
Observations	50,983	46,753	45,666	41,720	96,649	88,473

Adjusted R^2	0.014	0.060	0.029	0.044	0.044	0.128
Panel B: Return Window (2,5)						
VARIABLES	(1) $CAR^{(-)}$	(2) $CAR^{(-)}$	(3) $CAR^{(+)}$	(4) $CAR^{(+)}$	(5) $\|CAR\|$	(6) $\|CAR\|$
log#NEWS	0.0730	0.0465	0.0140	0.00863	0.351***	0.225***
	(0.0795)	(0.0744)	(0.0290)	(0.0309)	(0.0548)	(0.0430)
logMV	0.0545	0.0671	-0.154***	-0.110***	-0.574***	-0.290***
	(0.0449)	(0.0450)	(0.0275)	(0.0324)	(0.0306)	(0.0234)
logBM		-0.0499		0.00338		-0.0318
		(0.0378)		(0.0293)		(0.0211)
MOMENTUM		-0.0157		-0.0175		-0.209***
		(0.0456)		(0.0352)		(0.0271)
logVOLATILITY		-0.00977		0.159***		1.044***
		(0.0384)		(0.0379)		(0.0244)
TURNOVER		0.128***		-0.125***		-0.0417**
		(0.0414)		(0.0284)		(0.0201)
ΔEPS		-0.0741		-0.00767		-0.00284
		(0.0519)		(0.0430)		(0.0249)
RECDEV		0.00498		0.0360*		-0.00105
		(0.0239)		(0.0214)		(0.0230)
ACCRANK		0.0177		0.00967		-0.0127
		(0.0223)		(0.0212)		(0.0115)
lagRET		-0.108		-0.0168		-0.455***
		(0.0682)		(0.0466)		(0.0407)
PREEARN		0.246**		0.183**		0.657***
		(0.108)		(0.0800)		(0.0573)
POSTEARN		0.0827		0.0353		0.0750**
		(0.0656)		(0.0461)		(0.0304)
Constant	-0.159***	-0.245***	0.222***	0.135*	2.707***	2.571***
	(0.0290)	(0.0906)	(0.0219)	(0.0821)	(0.0259)	(0.0469)
Observations	51,044	46,811	45,824	41,854	96,868	88,665
Adjusted R^2	0.001	0.002	0.001	0.003	0.020	0.140

Table 5: Types of News and Recommendation Announcement Return

This table presents regression results on recommendation revision announcement returns, with event window [0,+1]. $CAR^{(-)}$ is DGTW-adjusted return for downward recommendation revisions. $CAR^{(+)}$ is DGTW-adjusted return for upward recommendation revisions. log#NEWS is calculated as $\log(1+\#NEWS)$, with $\#NEWS$ defined as the number of articles published in the prior month before recommendation revisions. log#HARDNEWS is log(1+#HARDNEWS), where #HARDNEWS is the number of hard news count. log#SOFTNEWS is log(1+#SOFTNEWS), where #SOFTNEWS is the number of soft news count. The definition of soft news article and hard news article is discussed in the data section. ΔEPS is an indicator variable on whether there is a concurrent EPS revision. RECDEV is the deviation of the recommendation from the consensus recommendation measure. ACCRANK is the earnings forecast accuracy rank for the analyst(range from 1 to 5). PREEARN is a dummy variable that indicates the firm is going to make an earnings announcement in the next 15 days. POSTEARN is a dummy variable that indicates that the firm made an earnings announcement in the past 15 days. See Table 2 for the definition of other variables included in the regression. Two-way clustered standard errors (by firm and by analyst) are reported in parentheses. Significance level: $p < 0.01$, $**p < 0.05$, $*p < 0.1$.

VARIABLES	(1) $CAR^{(-)}$	(2) $CAR^{(-)}$	(3) $CAR^{(+)}$	(4) $CAR^{(+)}$	(5) $\lvert CAR\rvert$	(6) $\lvert CAR\rvert$
log#HARDNEWS	0.0980	0.104	0.108*	0.0946*	0.00775	-0.0270
	(0.0931)	(0.0886)	(0.0560)	(0.0572)	(0.0561)	(0.0514)
log#SOFTNEWS	-0.427***	-0.383***	0.207***	0.185***	0.531***	0.494***
	(0.137)	(0.125)	(0.0616)	(0.0634)	(0.0792)	(0.0705)
logMV	0.952***	0.943***	-1.102***	-1.017***	-1.372***	-1.255***
	(0.0808)	(0.0854)	(0.0563)	(0.0663)	(0.0583)	(0.0557)
logBM		0.636***		-0.163***		-0.571***
		(0.0783)		(0.0591)		(0.0514)
MOMENTUM		0.284***		-0.313***		-0.480***
		(0.0769)		(0.0517)		(0.0406)
logVOLATILITY		-0.806***		0.448***		1.191***
		(0.0852)		(0.0635)		(0.0528)
TURNOVER		-0.152**		0.0946*		0.144***
		(0.0704)		(0.0534)		(0.0467)
ΔEPS		-1.437***		0.345***		0.591***
		(0.103)		(0.0704)		(0.0603)
RECDEV		-0.302***		0.198***		0.00106
		(0.0463)		(0.0336)		(0.0233)
ACCRANK		0.00396		-0.311***		0.0615
		(0.157)		(0.117)		(0.0928)
lagRET		0.767***		-0.0948		-0.713***
		(0.0877)		(0.0699)		(0.0530)
PREEARN		0.0682		0.223*		0.234**
		(0.172)		(0.116)		(0.0963)
POSTEARN		-0.703***		0.806***		1.030***
		(0.134)		(0.0967)		(0.0825)
Constant	-3.138***	-2.146***	2.497***	2.239***	4.546***	3.840***
	(0.0790)	(0.180)	(0.0501)	(0.124)	(0.0613)	(0.113)
Observations	50,983	46,753	45,666	41,720	96,649	88,473
Adjusted R^2	0.011	0.062	0.028	0.043	0.037	0.124
$\beta_{SOFT} - \beta_{HARD}$	-0.525***	-0.445**	0.0988	0.0902	0.524***	0.523***

Table 6: News Coverage Intensity, Tone of News and Recommendation Announcement Return

Panel regression on recommendation revision abnormal returns. CAR corresponds to DGTW-adjusted return for recommendation revisions. log#NEWS is calculated as $\log(1 + \#NEWS)$. log#HARDNEWS is log(1+#HARDNEWS), where #HARDNEWS is the number of hard news count. log#SOFTNEWS is log(1+#SOFTNEWS), where #SOFTNEWS is the number of soft news count. Control variables are included in the regressions, but are not reported in the table. Control variables include: logMV, logBM, MOMENTUM, logVOLATILITY, RECDEV, ACCRANK, lagRET, REEARN, and POSTEARN. See Table 2 for the definition of other variables included in the regression. Two-way clustered standard errors (by firm and by analyst) are reported in parentheses. Significance level: $p < 0.01$, $** p < 0.05$, $* p < 0.1$.

VARIABLES	(1) CAR	(2) CAR	(3) CAR	(4) CAR	(5) CAR
%POS	0.231***				
	(0.0758)				
%NEG		-0.404***			
		(0.0734)			
TONE			0.419***	-0.0268	0.103
			(0.0771)	(0.121)	(0.100)
TONE * log#NEWS				0.662***	
				(0.157)	
TONE * log#HARDNEWS					0.240***
					(0.0895)
TONE * log#SOFTNEWS					0.469***
					(0.131)
log#HARDNEWS					-0.115
					(0.0734)
log#SOFTNEWS					0.00948
					(0.0844)
log#NUMNEWS	-0.161	-0.162	-0.157	-0.115	
	(0.110)	(0.109)	(0.109)	(0.0980)	
Control Variables	YES	YES	YES	YES	YES
Observations	29,993	29,993	29,993	29,993	29,993
Adjusted R^2	0.018	0.020	0.020	0.024	0.024

Table 7: Subsample Analyses: Recent News versus Distant News

This table presents regression results on recommendation revision announcement returns, with event window [0,+1]. We partition the sample by the median distance (lag) between the news article and the analyst revision dates. The recommendation revisions with average distance below the sample medium are classified as revisions associated with "recent news." Otherwise they are classified as revisions associated with "distant news." For both the "recent news" revision sub-sample and the "distant news" revision sub-sample, we run separate regressions. $CAR^{(-)}$ is DGTW-adjusted return for downward recommendation revisions. $CAR^{(+)}$ is DGTW-adjusted return for upward recommendation revisions. log#NEWS is calculated as $\log(1+\#NEWS)$, with $\#NEWS$ defined as the number of articles published in the prior month before recommendation revisions. ΔEPS is an indicator variable on whether there is a concurrent EPS revision. RECDEV is the deviation of the recommendation from the consensus recommendation measure. ACCRANK is the earnings forecast accuracy rank for the analyst(range from 1 to 5). PREEARN is a dummy variable that indicates the firm is going to make an earnings announcement in the next 15 days. POSTEARN is a dummy variable that indicates that the firm made an earnings announcement in the past 15 days. See Table 2 for the definition of other variables included in the regression. Two-way clustered standard errors (by firm and by analyst) are reported in parentheses. Significance level: $p < 0.01$, $**p < 0.05$, $*p < 0.1$.

	(1)	(2)	(3)	(4)	(5)	(6)
	Recent	Distant	Recent	Distant	Recent	Distant
VARIABLES	$CAR^{(-)}$	$CAR^{(-)}$	$CAR^{(+)}$	$CAR^{(+)}$	$\|CAR\|$	$\|CAR\|$
log#NEWS	-1.320***	-1.558***	0.393***	0.740***	1.010***	1.808***
	(0.299)	(0.282)	(0.126)	(0.188)	(0.161)	(0.174)
logMV	1.069***	1.009***	-0.780***	-0.896***	-1.109***	-1.400***
	(0.188)	(0.166)	(0.0929)	(0.122)	(0.102)	(0.0977)
logBM	0.610***	0.766***	-0.341**	-0.253*	-0.675***	-0.683***
	(0.176)	(0.221)	(0.152)	(0.153)	(0.114)	(0.130)
MOMENTUM	0.00729	0.0229***	-0.0129***	-0.00752*	-0.0165***	-0.0278***
	(0.00475)	(0.00661)	(0.00362)	(0.00403)	(0.00252)	(0.00351)
logVOLATILITY	-1.142***	-2.031***	1.011***	1.111***	1.973***	2.274***
	(0.280)	(0.354)	(0.234)	(0.270)	(0.174)	(0.219)
TURNOVER	0.224	0.501**	-0.229*	-0.338**	-0.173	-0.330**
	(0.210)	(0.231)	(0.134)	(0.148)	(0.119)	(0.145)
ΔEPS	-1.224***	-1.644***	0.422***	0.171	0.502***	0.188
	(0.207)	(0.244)	(0.141)	(0.163)	(0.112)	(0.134)
RECDEV	-0.425***	-0.158	0.0199	0.354***	0.260***	0.184**
	(0.118)	(0.143)	(0.0940)	(0.117)	(0.0717)	(0.0835)
ACCRANK	-0.0545	0.0122	-0.0294	-0.0881	-0.00787	0.0121
	(0.0799)	(0.110)	(0.0573)	(0.0703)	(0.0418)	(0.0556)
lagRET	0.0307***	0.0735***	0.0120	-0.0161	-0.0309***	-0.0697***
	(0.0103)	(0.0158)	(0.0109)	(0.0126)	(0.00656)	(0.0105)
PREEARN	0.738*	0.260	0.139	0.0946	0.0706	-0.550***
	(0.382)	(0.353)	(0.321)	(0.230)	(0.236)	(0.202)
POSTEARN	-0.200	-0.386	0.384**	0.718***	0.765***	0.447**
	(0.310)	(0.313)	(0.180)	(0.231)	(0.168)	(0.183)
Constant	-15.45***	-14.30***	13.34***	14.97***	17.88***	21.62***
	(3.005)	(2.739)	(1.432)	(1.985)	(1.615)	(1.597)
Observations	7,776	8,002	7,155	7,084	14,931	15,086
Adjusted R^2	0.072	0.110	0.057	0.051	0.144	0.197

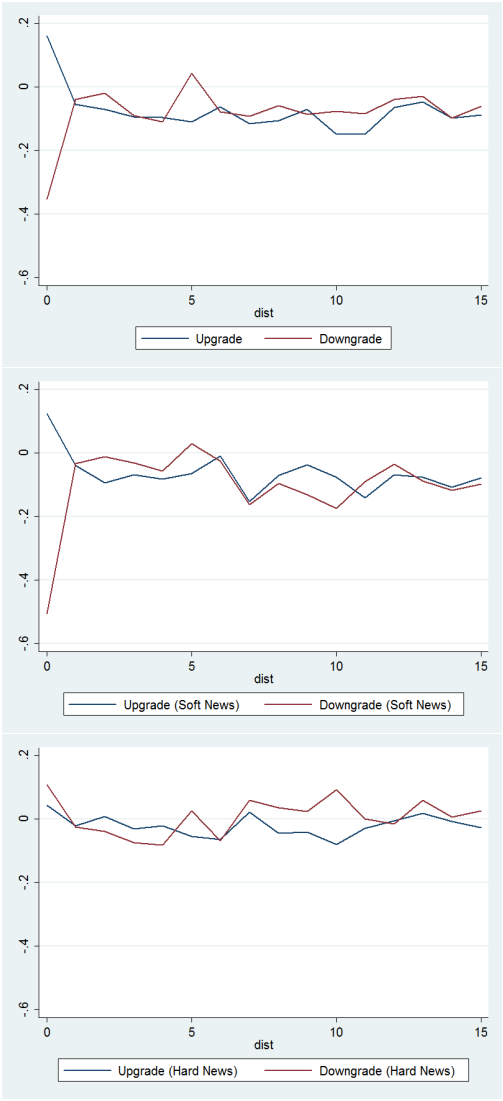

Figure 1: These plots are β coefficients from the regressions $CAR_t = \alpha + \beta log\#NEWS(TYPE) + \epsilon$, where t is the distance between the recommendation announcement date and TYPE is the type of news. The first graph, all news are counted. In the second figure, only the soft news are counted and in the third graph, only hard news are counted. All news variables are normalized with a mean 0 and standard deviation 1