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The Interpretation of Unanticipated News Arrival and Analysts' Skill

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Abstract

Analysts' functions are divided into discovery and interpretation roles, but distinguishing between the two is nontrivial. We conjecture that analysts' interpretation skill can be gauged by their forecast revisions following material unanticipated news, in particular, following nonearnings 8-K reports, which arrive at the market unexpectedly. We establish that unanticipated 8-Ks are informative for analysts and find that analysts who are more likely to revise their forecasts following unanticipated 8-Ks provide more timely and accurate forecasts. We document a positive association between analysts' tendency to react to unanticipated 8-Ks and market reaction to their recommendation changes, suggesting investors prefer these analysts' opinions.

I. Introduction

The purpose of corporate disclosure is to mitigate information asymmetry between management and shareholders and to ensure that all stakeholders have equal access to material information (as defined by the U.S. Securities and Exchange Commission (SEC)). Analysts' role is to use their expertise and knowledge to transform corporate disclosure into reports of forecasts and recommendations that investors then use in making investment decisions (e.g., Ivković and Jegadeesh (2004), Asquith, Mikhail, and Au (2005), and Chen, Cheng, and Lo (2010)). Recent studies suggest that one useful way of analyzing how analysts perform their task is by partitioning analysts' discovery and interpretation roles (Chen et al. (2010), Livnat and Zhang (2012)). These studies define analysts' reports that *preempt* the arrival of news as those that are associated with the discovery role, whereas analysts' reports that *follow* the arrival of corporate

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announcements are defined as those that are associated with the interpretation role. In this study, we argue that analysts' reports following corporate announcements are indicative of interpretation skill only if the corporate announcement is unanticipated. This is because reaction (i.e., forecast revision) to an anticipated corporate event, such as the earnings announcement, is potentially affected by the analyst's ability to predict the news. Consequently, the reaction to anticipated news is likely affected by both the discovery and interpretation skills of the analyst, making it difficult to isolate each of these skills by examining forecasts around anticipated news. In contrast, unanticipated announcements generally cannot be predicted; therefore, the reaction to such announcements depends only on the analyst's ability to interpret the information.

The purpose of this paper is twofold. First, we analyze the informativeness of analysts' forecasts following unanticipated corporate events to assess whether analysts are able to interpret the information. Second, we develop a measure of interpretation skill based on the tendency of analysts to issue forecasts following unanticipated news, and we examine whether this measure is associated with cross-sectional differences in forecast properties and market reaction to analysts' recommendations.

Our research setting focuses on material information filed via 8-K reports, divided between anticipated and unanticipated news. We define anticipated news as all 8-K reports where the company reports results of operations (i.e., all 8-K reports containing item 2.02), which are typically the preliminary earnings. Earnings are reported on a quarterly basis, and most companies announce in advance the earnings announcement's exact date and time, and thus market participants anticipate the earnings reports. One of the analysts' main tasks is to predict earnings news ahead of its arrival; therefore, forecast revision (or lack thereof) following earnings news is indicative of both the extent of the earnings news and the analysts' ability to predict the news in advance, combining the analysts' discovery and interpretation roles.

All other 8-K reports are defined as unanticipated news because these 8-K reports depend on the occurrence of events that analysts could not have predicted in advance. In contrast to anticipated news, the forecast revision or lack thereof following unanticipated reports is indicative only of analysts' ability to interpret the information, not of their discovery ability. Our main conjecture is that analysts who promptly react to such news have superior interpretation ability, which likely translates to superior forecast attributes and superior recommendations in general.[1]

We start the empirical analyses with an examination of analysts' tendency to revise their forecasts following anticipated and unanticipated news. Consistent with the evidence noted by Livnat and Zhang (2012), we find that the number of analysts who react to the anticipated 8-Ks is far larger than those who react to the unanticipated 8-Ks. Specifically, following anticipated earnings releases, 70% of

[1]The literature suggests that analysts differ in their interpretation and discovery skill for reasons related to education (De Franco and Zhou (2009)) and experience (Mikhail, Walther, and Willis (1997), Hong, Kubik, and Solomon (2000)) or, alternatively, their accumulated private information. We discuss this issue further in Section IV.C.

analysts on average revise their forecast, and the likelihood of at least one forecast revision is close to 94% on average. In contrast, only 14% of analysts on average react to unanticipated 8-Ks, and the likelihood of at least one forecast revision is close to 38%. The lower reaction to unanticipated news relative to anticipated news may be explained by the difference in the economic impact of news because earnings news on average generates greater market reaction than unanticipated news (in absolute terms). Hence, we partition the 8-K sample into five quintiles based on the market reaction to the 8-K report and examine the analyst reaction to the two types of news. We find that the analyst reaction to unanticipated 8-K information is uniformly lower than that of anticipated 8-Ks across the quintiles, indicating that the lower analyst reaction rate to unanticipated 8-Ks cannot be explained by differences in the economic impact of the news.

An alternative explanation for the low reaction to unanticipated news is that not all analysts are able to process and interpret the information because of analysts' varying skill levels (De Franco and Zhou (2009)). To test our conjecture, we first establish that unanticipated news reported via 8-K is relevant for future earnings. For this purpose, we construct two proxies of informativeness: i) the change in forecast error and ii) the likelihood of improvement in forecast error. We compare these two proxies across three groups of forecast revisions: those that follow anticipated 8-Ks, those that follow unanticipated 8-Ks, and all other revisions.[2] We use forecasts related to next fiscal quarter, next fiscal year, and 2 years ahead. In comparison to revisions not preceded by an 8-K report, we find that reaction to unanticipated news is associated with greater forecast error reduction and is also more likely to result in forecast error reduction. These results are robust and are not driven by any particular item reported via unanticipated 8-K.

The evidence therefore indicates that unanticipated 8-K reports convey relevant information for future earnings and, even more importantly, that analysts who revise their forecasts following these unanticipated 8-Ks have superior interpretation skill. Put differently, given that unanticipated 8-K filings are released publicly, nonreaction to such information implies that either the analyst does not know how to interpret the information or that the analyst believes that the information is not related to future earnings. Either way, the finding that forecasts issued following unanticipated 8-Ks are highly informative suggests that analysts who revise their forecasts following unanticipated 8-K reports have better interpretation skill than those who do not react.

We next develop a measure of interpretation skill based on the analyst's propensity to react to unanticipated news. Specifically, we measure interpretation skill as the cumulative reaction ratio (CRR) of the analyst to unanticipated information reported via 8-K filings. For each analyst-firm-year, we compute the total number of unanticipated 8-K reports to which the analyst reacted (by providing a revised forecast) from the beginning of the sample or coverage starting year

[2]The purpose of this analysis is not to examine the relative importance of revisions following the various sources of news. Thus, it is possible that further partitions of forecasts that do not follow an 8-K release into those that follow other types of news arrival (e.g., 10Q/K or some news headlines) may well be informative. Our point, however, is that partitioning forecasts that follow 8-Ks versus other forecasts allows us to analyze the relative information value provided by 8-Ks (anticipated and unanticipated) compared with all other sources of information.

(the latter of the two) through the beginning of the year, divided by the total number of unanticipated 8-K reports filed by the company in the same period.[3] Given that a higher CRR implies greater reaction to unanticipated 8-K information, we conjecture that CRR is positively associated with interpretation skill.

We find significant variation in analysts' CRRs at the firm-year level and significant variation in the CRRs of the same analysts across the firms they cover. The former result indicates that CRR is not determined by the firm's operation and disclosure environment, whereas the latter result suggests that CRR is not an overall analyst characteristic. Rather, it seems that there is variation in the analyst's ability to interpret information across the firms he or she covers, potentially for reasons related to experience covering the company and personal knowledge associated with the environment in which the specific firm operates.[4]

We next examine whether our interpretation skill measure can predict future analyst performance. We find that CRR at the beginning of the year is positively associated with future forecast accuracy. In addition, CRR is positively associated with timeliness, indicating that high CRR is associated with analysts who provide timelier processing of public information, and hence, analysts with low CRR are more likely to follow and use the information in high-CRR analysts' forecasts. Thus, our findings further suggest that cross-sectional differences in accuracy and timeliness across analysts are positively associated with the ability to interpret information.

We complement the analysis by examining whether investors recognize differences in skill arising from the analyst's ability to interpret nonearnings information. Specifically, we examine investors' reaction to recommendation changes conditional on CRR as well as other analyst characteristics that have been found to be associated with skill. The results indicate that investors' reaction to recommendation changes increases with CRR, and the relation is highly significant both statistically and economically. The reaction to recommendation change by an analyst with an average CRR is greater by 9% relative to a zero-CRR analyst. These results provide further support for our conjecture that the ability to interpret information as proxied by analysts' reaction to unanticipated 8-Ks is indicative of skill.

This study provides several contributions to the literature. First, we suggest a potentially useful avenue to identify financial analysts with better interpretation skill. In particular, the low response rate to unanticipated news that may not be predictable suggests that analysts who react to such news in a timely manner have superior interpretation skill. Nevertheless, we do not argue that analysts with better interpretation skill are different from analysts with better discovery skill, and it is likely that the two skills are positively correlated. Future research may find a way to identify and measure discovery skill and examine its association with interpretation skill. Second, we show that differences in analysts' interpretation skill explain cross-sectional differences in forecast accuracy, timeliness, and

[3] We use a cumulative measure rather than an annual measure because the filing of 8-K reports varies considerably over time, and thus a cumulative measure would better capture an analyst's interpretation skill (see Section IV.C).

[4] Hence, in this study, analysts' interpretation skill (CRR) is company specific; an analyst can be skillful when analyzing one company but less skillful when analyzing a different company.

investor reaction to recommendations. In particular, analysts with higher interpretation skill provide more accurate and timely forecasts, and recommendation changes by these analysts elicit a greater market reaction (in absolute value). The latter result implies that investors with access to high-CRR analysts may generate higher profits by trading on such recommendations prior to their public announcement. Clients of brokerages have early access to stock recommendations issued by the brokerage (Kim, Lin, and Slovin (1997)) and are able to trade on the information and generate abnormal returns (Green (2006), Irvine, Lipson, and Puckett (2007)). Third, we provide evidence that unanticipated 8-K filings represent major and material events that are informative for future earnings.

The rest of the paper proceeds as follows: Section II provides a literature review. Section III describes the data and variables. Section IV provides the empirical results. Section V concludes.

II. Literature Review

A. Research on Form 8-K

In addition to filing quarterly reports on Form 10-Q and annual reports on Form 10-K, public firms must report certain material corporate events on a more current basis. These reports are filed with the SEC on Form 8-K ("current report") and serve to announce major events of interest to security holders. Events that would trigger an obligation to file Form 8-K include those affecting the registrant's business and operations, financial information, securities and trading markets, financial statements, or corporate governance and management.[5]

Prior research shows that the information in 8-K filings has valuation implications. Specifically, Lerman and Livnat (2010) conduct a large-sample investigation of 8-K filings and find that disclosed items are associated with abnormal volume and equity returns, indicating that events reported on the 8-K have economic substance. Segal and Segal (2016) provide evidence consistent with managers engaging in the strategic disclosure of 8-K reports by delaying or obfuscating negative news in order to mitigate the potential market reaction. Other studies investigate individual categories in the filings, such as auditor changes (Schwartz and Soo (1996)), nonreliance on previously issued financial statements (Feldman, Livnat, and Segal (2008)), Regulation FD (Griffin, Lont, and Segal (2011)), changes in external auditors (Ettredge, Johnstone, Stone, and Wang (2011)), or director resignations and departures (Bar-Hava, Huang, Segal, and Segal (2017)). These studies tend to focus on the timeliness of compliance (whether the events are reported within the required reporting window) and/or market reaction.

B. Separating Analysts' Interpretation Role from Their Discovery Role

One of the most important roles of analysts is to interpret information that arrives in the market. It has become common in recent literature to associate the role of discovery with analyst reports that preempt the arrival of released corporate information and to associate the role of interpretation with analyst reports that are

[5]See the Appendix for a complete list of events reported on the current Form 8-K.

released immediately after the release of corporate information (e.g., Chen et al. (2010), Livnat and Zhang (2012)). However, as Livnat and Zhang (2012) describe, the separation between the discovery role and interpretation role is problematic because previous studies (e.g., Ivković and Jegadeesh (2004), Chen et al. (2010)) focus on earnings announcements as the only significant corporate public information. Companies regularly issue disclosures other than earnings, and hence revisions prior to earnings announcement could be attributed to the interpretation of other information issued by the firm rather than to the discovery of new information. Without a complete mapping of all material corporate announcements, it would be impossible to distinguish between the discovery and interpretation roles in the context of earnings announcements. Livnat and Zhang (2012) map all 8-K filings and find that investors place a higher value on revisions that are issued more promptly after announcements, which they claim is reflective of investors' valuing of analysts' interpretation role over the discovery role.

However, forecast revisions following the *anticipated* earnings 8-K are not necessarily indicative of interpretation skill. Analysts continuously form expectations about the earnings figure, and they especially do so prior to the earnings announcement date, a date that is typically known well in advance. Consequently, both the propensity of analysts to react by releasing a revised forecast and the magnitude of the change in the forecast (if revised) depend to a large extent not only on analysts' ability to interpret the earnings news but also on their discovery ability in predicting it. Hence, given that the interpretation of earnings news is intertwined with the discovery role, analysis of analysts' revision propensity and forecast error following the anticipated earnings 8-K is of limited value for understanding the quality of analysts' interpretation role.

To isolate the interpretation role, one should focus on forecast revisions following corporate announcements that arrive unexpectedly. The material news items that meet the unanticipated criteria are all 8-K reports that do not contain item 2.02 (Results of Operations). These 8-K filings arrive randomly because they depend on the occurrence of a largely unexpected event. Moreover, even in cases where the event may be somewhat anticipated, such as Material Impairments (item 2.06), the exact timing of the reporting and the magnitude of the event cannot be predicted in advance. Hence, our main conjecture is that the reaction to unanticipated 8-Ks primarily represents the interpretation of the news by the analyst.

Livnat and Zhang (2012) provide evidence that only 9% of forecast revisions are preceded by unanticipated 8-K releases. In contrast, 48% of the revisions are preceded by the anticipated earnings 8-Ks. These statistics indicate that unanticipated related information triggers lower reaction by analysts. Although the lower reaction to unanticipated 8-Ks may partially be explained by these releases being uninformative for future earnings, it is also plausible that analysts have a harder time in interpreting and processing this information and how it affects future earnings.[6] The latter explanation seems justified because the most frequent

[6]This is also consistent with the findings that analysts, in general, do not fully incorporate public information contained in nonearnings news, even if it has an effect on future earnings. For instance, Bartov and Bodnar (1994) find that analysts' forecast errors are correlated with changes in exchange rates. Elliott, Philbrick, and Weidman (1995) find that analysts systematically underweight new information. Abarbanell and Bushee (1997) find that forecast revisions do not incorporate all the

unanticipated 8-K items appear to have an impact on future earnings in our sample. For example, we find that Entry into a Material Definitive Agreement (item 1.01), which is likely to have a direct impact on future earnings, accounts for around 21% of the unanticipated related items. This suggests that the reaction, or lack thereof, to unanticipated 8-Ks is indicative of interpretation skill; analysts who react promptly to unanticipated 8-K releases have better interpretation skill.

III. Data and Descriptive Statistics

We download and analyze the entire population of Form 8-Ks filed with the SEC via Electronic Data Gathering, Analysis, and Retrieval (EDGAR) between 2005 and 2010.[7] For each 8-K filing, we identify firm and report identifiers and a list of reported items. The initial sample consists of 390,791 8-K reports with firm identifier, filing and event dates, and items reported. We exclude all firms that do not have a Compustat or Center for Research in Security Prices (CRSP) identifier, reducing the sample to 266,103 reports. We remove amendments to 8-Ks (5,852 reports) and cases in which a firm filed multiple 8-K reports within three subsequent days (33,242 reports). The latter restriction is imposed to allow for accurate identification of investors' and analysts' reaction to 8-K reports. We also omit 8-K reports that were filed within 3 days of a quarterly or annual report to mitigate the possibility that the analyst reacted to information not necessarily related to the information in the 8-K (6,019 reports).

Financial data are obtained from Compustat and CRSP. Requiring nonmissing values for share price, profitability, leverage, equity return volatility, and book value of equity at the beginning of the fiscal year further reduces the 8-K sample to 157,429 reports. Finally, we merge the 8-K sample and the detailed Institutional Brokers' Estimate System (IBES) file by firm and fiscal year-end. This essentially eliminates 8-K reports of firms with no analyst following. This restriction further reduces the 8-K sample to 102,083 reports filed by 3,326 firms, comprising 13,622 firm-years.

Table 1 provides firm-year descriptive statistics for the main variables used in the analysis. Mean (median) equity value is $4.44 billion ($691 million). Mean return on assets is close to 0, but the median is 4.1%. Mean equity return volatility is 3.2%, and mean book-to-market ratio is 0.53. Book leverage is on average 20%, and mean institutional ownership by large block holders is 21.8%. The mean number of analysts following a firm in a given year is 9.78.

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informationin fundamental signals related to future earnings, implying that analysts ignore available nonearnings information, and Chaney, Hogan, and Jeter (1999) find that analysts do not interpret the implications of restructuring charges appropriately. Bradshaw, Richardson, and Sloan (2001) find that analysts do not fully account for high accruals even though firms with high accruals are more likely to experience lower earnings in the future.

[7] We choose 2005 as the starting year because the SEC mandated a major change to Form 8-K that became effective on Aug. 23, 2004. The change significantly expanded the number of items (i.e., scope of material events) that must be reported via an 8-K filing and hence has resulted in a different form.

TABLE 1
Descriptive Statistics

In Table 1, the sample consists of 13,622 firm-year observations. MVE is the market value of equity at fiscal year-end. ROA is the return on assets; it is computed as income before extraordinary (IB) scaled by total assets (AT); SD_RET is equity return volatility; it is computed as the standard deviation of daily stock return during the year; BM is the book-to-market ratio; it is computed as book value of equity (CEQ) scaled by market value of equity; LEV is the leverage; it is computed as the sum of short-term and long-term debt (DLC + DLTT) scaled by total assets; IO is institutional ownership, computed as the proportion of shares held by large block holders (ownership > 5%); ANAL is the number of analysts following; it is computed based on the number of analysts who issue at least one forecast of next-fiscal-year earnings during the fiscal year.

Variables	Mean	Std. Dev.	Q1	Median	Q3
MVE	4,439	17,573	240	691	2,283
ROA	−0.003	0.185	−0.01	0.041	0.083
SD_RET	0.032	0.015	0.021	0.028	0.039
BM	0.527	0.48	0.243	0.417	0.669
LEV	0.2	0.204	0.006	0.159	0.318
IO	0.218	0.154	0.092	0.197	0.313
ANAL	9.773	7.777	4	8	13

IV. Results

In Section IV.A, we compare analysts' reaction to anticipated versus unanticipated 8-K filings and analyze the determinants of the reaction to 8-K filings. In Section IV.B, we show that the information in the unanticipated 8-K reports is informative for future earnings. In Section IV.C, we present evidence that analysts who react to unanticipated 8-Ks are more skillful. Finally, in Section IV.D, we show that investors recognize differences in analysts' ability to interpret information.

A. Analysts' Differing Reactions to Anticipated and Unanticipated 8-K Information

Panel A of Table 2 presents information on analysts' propensity to react to anticipated and unanticipated 8-K releases. We measure analysts' reaction using two variables: REACTION_RATIO and LIKELIHOOD_OF_REACTION. REACTION_RATIO is computed as the number of analysts who revised their forecast within a window between the event date and 3 days after the 8-K filing date (henceforth, *reaction window*) scaled by the number of analysts who follow the firm during the same period.[8] LIKELIHOOD_OF_REACTION is an indicator variable that takes the value of 1 if at least one analyst provided a revision during the reaction window, and 0 otherwise.[9] We label 8-K releases as anticipated

[8] We note that the filing date typically comes on the event date or the day after (84% of filings), but in general, the event day can be up to 3 days prior to the filing date because firms must report the reportable events (i.e., items) no more than 4 business days from the occurrence of the event. Furthermore, Segal and Segal (2016) find that in some cases firms announce the event through press release prior to filing the 8-K report, so analysts may react prior to the filing date in these instances. The extension to up to 3 days following the filing date is appropriate because analysts may need some time to process the information before they provide their new forecast.

[9] We start our analysis by measuring analysts' reaction to earnings forecast revisions (as opposed to recommendation revisions) because earnings forecasts can be compared with actual earnings, so we can use this metric to judge the quality of analysts' forecast revisions. Further, forecast revisions are important because the stock market reacts to analyst forecast revisions, there is evidence that accurate analysts tend to more often move prices (e.g., Jackson (2005)), and forecast accuracy is used to judge analyst performance (Stickel (1992), Mikhail et al. (1997), Hong and Kubik (2003), and Wu and Zang (2009)) and to rank analysts in all-star lists.

TABLE 2

Analysts' Reaction to 8-K forms

Table 2 provides statistics on the reaction to Form 8-K and the economic significance of the news. The total number of 8-K reports is 102,083. Panel A shows the mean reaction to anticipated and unanticipated 8-Ks. An 8-K is defined as anticipated if the form contains earnings news (item 2.02). REACTION_RATIO is computed as the ratio of the number of analysts who provided a revised forecast between the event date and 3 days after the 8-K filing scaled by the total number of analysts following the firm. LIKELIHOOD_OF_REACTION is an indicator that equals 1 if any of the analysts following the firm provided a revised forecast within a window between the event date and 3 days after the 8-K filing date, and 0 otherwise. Panel B shows the REACTION_RATIO, LIKELIHOOD_OF_REACTION, and ABS_CAR for the various 8-K reports. ABS_CAR is computed as the cumulative abnormal return over the 3 days centered on the filing date, using the 4-factor model (market, size, book-to-market ratio, and momentum).

Panel A. Reaction to Anticipated (Earnings) and Unanticipated 8-K Releases

Variables	*N*	Mean	Min.	Q1	Median	Q3	Max.
Anticipated							
REACTION_RATIO	36,693	0.703	0	0.5	0.75	1	1
LIKELIHOOD_OF_REACTION	36,693	0.936	0	1	1	1	1
Unanticipated							
REACTION_RATIO	65,390	0.137	0	0	0	0.143	1
LIKELIHOOD_OF_REACTION	65,390	0.376	0	0	0	1	1

Panel B. Mean REACTION_RATIO, LIKELIHOOD_OF_REACTION, and ABS_CAR by 8-K Item

	All 8-Ks				Single-Item 8-Ks			
Item	*N*	LIKELIHOOD_ OF_REACTION	REACTION_ RATIO	ABS_CAR	*N*	LIKELIHOOD_ OF_REACTION	REACTION_ RATIO	ABS_CAR
101	17,777	0.398	0.162	0.036	10,446	0.360	0.145	0.033
102	1,333	0.401	0.155	0.037	324	0.315	0.091	0.041
201	1,401	0.502	0.188	0.034	571	0.441	0.154	0.032
202	36,693	0.937	0.703	0.062	31,442	0.942	0.708	0.062
203	3,212	0.411	0.141	0.032	703	0.366	0.126	0.030
204	173	0.353	0.117	0.033	89	0.360	0.112	0.026
205	923	0.576	0.296	0.052	437	0.451	0.161	0.041
206	325	0.637	0.364	0.053	90	0.444	0.178	0.036
301	664	0.247	0.101	0.050	451	0.195	0.065	0.049
302	1,100	0.446	0.169	0.048	270	0.315	0.124	0.043
303	515	0.338	0.139	0.041	95	0.232	0.086	0.035
401	526	0.232	0.101	0.035	486	0.233	0.102	0.035
402	359	0.579	0.398	0.046	156	0.417	0.242	0.045
501	53	0.321	0.147	0.041	25	0.280	0.095	0.024
502	17,523	0.364	0.151	0.036	12,591	0.328	0.121	0.034
503	2,972	0.424	0.173	0.035	1,389	0.381	0.138	0.033
504	152	0.289	0.102	0.025	135	0.244	0.073	0.025
505	189	0.376	0.188	0.035	91	0.319	0.128	0.034
507	1,626	0.335	0.103	0.029	997	0.308	0.087	0.027
701	15,593	0.525	0.252	0.044	10,559	0.451	0.180	0.040
801	19,663	0.419	0.165	0.041	14,281	0.367	0.119	0.039
Total	122,772				85,628			

if the report includes item 2.02 (Results of Operations and Financial Condition). All other 8-K reports are labeled as unanticipated 8-Ks.

Panel A of Table 2 shows that unanticipated 8-Ks are approximately twice as common as anticipated 8-Ks during the sample period (65,390 vs. 36,693 reports). Panel A also shows that analysts are much more likely to react to the anticipated earnings 8-Ks than to unanticipated 8-Ks. On average, 70% of analysts revise their forecast after anticipated 8-K reports, and the likelihood of at least one revision is close to 94%. In contrast, the reaction to unanticipated information is far smaller: On average only 14% of analysts react to unanticipated information, and the likelihood of at least one revision is close to 38%.

Panel B of Table 2 shows the mean of the reaction variables as well as the absolute CAR (ABS_CAR) by item, where ABS_CAR is defined as the cumulative abnormal return (based on the 4-factor model) over the 3 days centered on

the filing date. Because many of the 8-K filings include more than 1 item, which makes it difficult to ascertain which specific item generated the reaction and abnormal return, we also report in the table the mean reaction variables when we restrict the sample to 8-K reports reporting a single item.[10] Although there is variability in the reaction across items, the REACTION_RATIO to most non-earnings-related items is in the low teens, and the LIKELIHOOD_OF_REACTION is largely between 30% and 40%. ABS_CAR of unanticipated 8-K information is 3.5% on average, which is about half that of anticipated earnings 8-K information (6.2%). Panel B also reveals that Regulation FD Disclosure (item 7.01), Non-Reliance on Previously Issued Financial Statements or a Related Audit Report or Completed Interim Review (item 4.02), and Material Impairments (item 2.06) generate the highest REACTION_RATIO, at 18%, 24.2%, and 17.8%, respectively. These items are also associated with a high ABS_CAR of 4%, 4.5%, and 3.6%, respectively, and are clearly associated with expected earnings, yet the REACTION_RATIO appears to be low in comparison to anticipated 8-K news. Note also that the items with the highest LIKELIHOOD_OF_REACTION are generally also those that generate the highest REACTION_RATIO.

To gain a better understanding of the determinants of analysts' reaction to anticipated and unanticipated news, we regress the REACTION_RATIO on firm characteristics and type of news. We control for variables that proxy for the information environment of the firm as well as operating and financial risk. Specifically, we control for the number of analysts following, size (log market value of equity), profitability (return on assets), leverage, book-to-market ratio, and equity return volatility. The type of news is captured by an indicator for unanticipated news. We also control for the economic impact of the news by including the absolute cumulative abnormal returns around the filing date.[11] We include year indicator variables in the regression and estimate the regressions using Tobit with firm-random effects. The standard errors correct for firm clustering.

The Full Sample column in Table 3 indicates that the REACTION_RATIO is positively associated with size, profitability, and book-to-market ratio, suggesting that analysts are more likely to react to both anticipated and unanticipated 8-K reports filed by large, profitable, and "value" companies. The positive coefficient on ABS_CAR suggests that the economic significance of the event is positively associated with analysts' revision activity. Because the REACTION_RATIO is computed by scaling the number of analysts who reacted to the news by the total number of analysts covering the firm, we find, as expected,

[10]Note that the number of items is about 20% larger than the number of 8-K filings (122,772 vs. 102,083). This is because many reports include multiple items. In addition, item 9.01 includes Financial Statements and Exhibits, and companies typically report this item together with item 2.02 (Results of Operations) or when the company enters into an agreement (e.g., item 1.01). Because the informational context of item 9.01 depends on the other items reported in the filing, we do not treat it as a separate item. Finally, some of the events that are required to be reported in an 8-K filing, such as item 1.04 (Mine Safety), item 1.03 (Bankruptcy and Receivership), and items 6.01–6.05 (related to asset-backed securities), do not appear in our sample.

[11]The relation between the reaction ratio and CAR is likely endogenous because high CAR could be driven by the reaction ratio. However, the point of the analysis is to examine the reaction to the news, and it is highly likely that the reaction is associated with the economic magnitude of the event. The results are similar if we do not control for absolute CAR in the regression.

TABLE 3
Reaction Ratio Regressions

Table 3 reports results concerning the determinants of the reaction to Form 8-K. The sample includes all 8-Ks. The dependent variable is REACTION_RATIO. UNANTICIPATED_8-K is an indicator variable that takes the value of 1 for unanticipated 8-Ks, and 0 otherwise. All other variables are defined in previous tables. The regressions are estimated using Tobit with firm random effects and year fixed effects; the standard errors correct for firm clustering. *, **, and *** indicate 2-tailed significance at the 10%, 5%, and 1% levels, respectively. Standard errors are provided in parentheses.

		Absolute CAR Portfolios				
Variables	Full Sample	Low	2	3	4	High
Constant	0.256***	0.256***	0.325***	0.310***	0.342***	0.305***
	(0.017)	(0.035)	(0.036)	(0.037)	(0.032)	(0.028)
ANAL	−0.009***	−0.002***	−0.001	−0.002***	−0.006***	−0.010***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
log(MVE)	0.062***	0.045***	0.038***	0.040***	0.051***	0.068***
	(0.002)	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)
ROA	0.031**	0.021	0.005	0.056**	0.013	0.079***
	(0.012)	(0.031)	(0.028)	(0.025)	(0.021)	(0.017)
LEV	−0.003	0.010	−0.025	0.011	0.001	−0.025
	(0.011)	(0.023)	(0.021)	(0.020)	(0.017)	(0.016)
BM	0.016***	0.017	0.022**	0.016*	0.017**	0.016**
	(0.005)	(0.011)	(0.010)	(0.009)	(0.008)	(0.007)
SD_RET	0.162	2.162***	1.221***	0.306	−0.972***	−1.136***
	(0.177)	(0.432)	(0.407)	(0.377)	(0.326)	(0.284)
ABS_CAR	1.245***	1.629	2.883***	3.194***	1.768***	0.836***
	(0.031)	(1.296)	(1.076)	(0.695)	(0.315)	(0.057)
UNANTICIPATED_8-K	−0.758***	−0.814***	−0.815***	−0.793***	−0.738***	−0.615***
	(0.003)	(0.008)	(0.008)	(0.007)	(0.006)	(0.006)
No. of obs.	95,738	19,449	19,261	19,080	18,907	19,041
No. of firms	3,204	1,003	1,551	1,713	1,716	1,671

that the REACTION_RATIO is negatively associated with the number of analysts following. More importantly, the coefficient on the unanticipated news indicator is negative (−0.76) and significant (p-value < 0.01), indicating that the average reaction ratio to unanticipated news is about 76% lower relative to anticipated news, consistent with the evidence in Table 2.

One potential explanation for the low reaction to unanticipated news is that the economic implications of unanticipated news are lower relative to anticipated news, and as a result, analysts tend to react less to unanticipated news. Although we control for the economic impact of the event with ABS_CAR in the regression specification, it is conceivable that the underreaction changes with the economic magnitude of the news. Hence, we further isolate the effect of differences in the economic impact of the anticipated and unanticipated news by conducting subsample regression analyses. We partition the sample into quintiles based on the ABS_CAR associated with the 8-K filing and estimate the regression separately for each quintile. The results in Table 3 indicate that the reaction to unanticipated 8-K filings is unambiguously lower in comparison to anticipated news across all quintiles, although the underreaction to unanticipated news decreases with the economic magnitude of the news. Nevertheless, the evidence suggests that the low reaction to unanticipated news cannot be explained by differences in the economic impact of the news.

Because the low reaction to unanticipated news cannot be fully explained by the economic impact of the news, we posit that the difference can be explained by analysts' differing ability to process and interpret the information.

This explanation is justified by the very fact that some analysts do react to unanticipated 8-K filings by updating their forecasts. This explanation is also consistent with analysts having different skill in processing and interpreting information (De Franco and Zhou (2009)). We explore this possibility in Section IV.B.

B. Analysts' Reaction to Unanticipated 8-K Information and Forecast Error Reduction

In this subsection, we examine whether news items contained in unanticipated 8-K reports are relevant for future earnings and whether forecast revisions following unanticipated 8-Ks are informative. Provided that the unanticipated 8-K report contains earnings-relevant information, if analysts who react to the news provide improved forecasts, then such a finding would suggest that analysts who react to these unanticipated 8-Ks are able to interpret information. This would establish our conjecture that reaction to unanticipated news is indicative of interpretation skill.

We employ the following research design. We merge the analysts' estimates of earnings per share (EPS) from the detailed IBES file with the 8-K sample. The matching is based on firm, and we generate the timeline of all analysts' revision dates and 8-K filing dates for each firm. We then classify the forecasts into 3 categories: i) revisions that occur during the reaction window of an unanticipated 8-K filing date (labeled *Unanticipated 8-K*), ii) revisions that occur during the reaction window of an anticipated earnings 8-K filing date (labeled *Anticipated 8-K*), and iii) revisions that occur at other times (labeled *Nonreaction*).

Intuitively, one approach to analyzing the informativeness of revisions following unanticipated 8-K reports would be to examine whether such revisions are associated with lower forecast error, which is defined as the absolute difference between the analyst's forecast and actual EPS, divided by stock price at the beginning of the fiscal year. However, such a finding might capture differences in analysts' skill and would not necessarily be indicative of the informativeness of the unanticipated 8-K report. For example, suppose (as we also conjecture in this paper) that skillful analysts are more likely to issue forecasts following unanticipated 8-K news and that less skillful analysts do not react to such news. In this case, we would find that forecasts following unanticipated 8-Ks are associated with lower forecast error not because the 8-K reports are informative but because the forecasts are issued by more skillful analysts. Hence, a better approach to gauge the informativeness of the 8-K reports (and the consequent analysts' revisions) is to examine whether revisions following 8-K reports are associated with a reduction in forecast error compared to nonreaction revisions.[12]

We therefore use two measures to compare the magnitude of change in forecast error across the three types of forecast revisions (Nonreaction, Unanticipated 8-K, Anticipated 8-K). The first measure is FORECAST_ERROR_CHANGE; we compute the change in the forecast error as the difference between the current and the preceding forecast error of the same analyst. Because the time that elapses from one forecast to another differs both over time (across an analyst's forecasts)

[12]We thank the referee for suggesting that a reduction in reacting analysts' forecast error is the direct way to study the informativeness of the 8-K releases.

and cross-sectionally, we adjust the change in forecast error so that it is measured on equal terms.[13] Specifically, we use an annualized measure by dividing the change in forecast error by the number of days that elapsed since that analyst's previous forecast and multiply the result by 365. The second measure is IMPROVEMENT. An alternative way of gauging the informativeness of the 8-K report is to examine whether forecasts that are associated with unanticipated 8-K reports are more likely to result in forecast error reduction (for the revising analyst) in comparison to nonreaction forecasts. We define the likelihood of improvement in the forecast error indicator IMPROVEMENT as 1 if the revision resulted in lower forecast error, and 0 otherwise. The advantage of using this measure relative to FORECAST_ERROR_CHANGE is that the likelihood of improvement in forecast error is not affected by the time elapsed since the analyst's previous forecast.

Panel A of Table 4 presents the univariate results. The panel shows the mean of each measure (FORECAST_ERROR, FORECAST_ERROR_CHANGE, and

TABLE 4

Forecast Error, Forecast Error Change, and Forecast Error Improvement

Table 4 shows results of analyses concerning the informativeness of 8-K reports. FORECAST_ERROR is defined as the absolute difference between the analyst's estimate and actual earnings per share (EPS), divided by stock price at the beginning of the fiscal year of the forecast date. FORECAST_ERROR_CHANGE is defined as the annualized percentage change in forecast error. It is computed as the change in FORECAST_ERROR between the current and the previous FORECAST_ERROR of the same analyst (for the same firm and reporting period) scaled by the number of calendar days since the previous forecast and multiplied by 365. IMPROVEMENT is an indicator with 1 if the revision resulted in lower FORECAST_ERROR (relative to preceding forecast), and 0 otherwise. Forecasts are partitioned into three groups based on the forecast period. 1 Quarter, 1 Year, and 2 Years correspond to the next quarterly (FPI = 6), annual (FPI = 1), and following-year annual EPS forecast (FPI = 2), respectively. Panel A provides the means of each FORECAST_ERROR, FORECAST_ERROR_CHANGE, and IMPROVEMENT. The panel also shows the significance of differences in the mean relative to the mean of the nonreaction revisions. Panel B provides ordinary least squares (OLS) (probit) regression results where the dependent variable is FORECAST_ERROR_CHANGE (specifications 1, 3, and 5) and the IMPROVEMENT indicator (specifications 2, 4, and 6), respectively. REACTION_INDICATOR equals 1 if the forecast is released within a window between the event date and 3 days after the filing date, and 0 otherwise. REACTION_TO_2.02_FILING is an indicator that equals 1 if the REACTION_INDICATOR equals 1 and the associated 8-K filing includes item 2.02, and 0 otherwise. DAYS_UNTIL_REPORT is the number of days between the revision date and the earnings report date. Other variables are defined in Table 1. OLS regressions include year and firm fixed effects; probit regressions include year and random effects. The standard errors correct for firm clustering in the OLS regressions. *, **, and *** indicate 2-tailed significance at the 10%, 5%, and 1% levels, respectively. Standard errors are provided in parentheses.

Panel A. Difference in Mean

	1 Quarter		1 Year		2 Years	
Variables	No. of Obs.	Mean	No. of Obs.	Mean	No. of Obs.	Mean
FORECAST_ERROR						
Nonreaction	191,032	0.63%	264,676	2.04%	229,430	4.29%
Unanticipate 8-K	12,041	0.57%***	17,499	1.86%***	14,964	4.07%***
Anticipated 8-K (2.0)	91,042	0.49%***	107,389	1.61%***	82,952	3.65%***
FORECAST_ERROR_CHANGE						
Nonreaction	48,363	−2.05%	198,968	−4.17%	168,425	−2.70%
Unanticipate 8-K	6,020	−3.25%***	14,660	−5.37%***	12,440	−3.38%***
Anticipated 8-K (2.0)	5,236	−4.18%***	78,464	−5.36%***	59,376	−3.24%***
IMPROVEMENT						
Nonreaction	48,363	60.76%	198,968	65.93%	168,425	59.85%
Unanticipate 8-K	6,020	69.07***	14,660	67.60%***	12,440	60.42%
Anticipated 8-K (2.0)	5,236	57.18%	78,464	70.98%***	59,376	62.11%***

(continued on next page)

[13]Because the analyst's information set includes more forecasts of other analysts as time progresses, in conjunction with more private and public information (e.g., Ruland (1978)), the decrease in the forecast error of a particular analyst is expected to be greater if a longer time has elapsed from the analyst's previous forecast.

TABLE 4 (continued)
Forecast Error, Forecast Error Change, and Forecast Error Improvement

Panel B. Regressions

	1 Quarter		1 Year		2 Years	
Variables	FORECAST_ERROR_CHANGE	IMPROVEMENT	FORECAST_ERROR_CHANGE	IMPROVEMENT	FORECAST_ERROR_CHANGE	IMPROVEMENT
	1	2	3	4	5	6
REACTION_INDICATOR	−0.0145***	0.2018***	−0.0139***	0.0540***	−0.0050**	0.0063
	(0.0031)	(0.0201)	(0.0032)	(0.0119)	(0.0022)	(0.0125)
REACTION_TO_2.02_FILING	−0.0083	−0.1319***	−0.0055*	0.0857***	−0.0040*	0.0420***
	(0.0056)	(0.0289)	(0.0034)	(0.0125)	(0.0023)	(0.0133)
DAYS_UNTIL_REPORT_DATE	−0.0003***	−0.0036***	−0.0001***	−0.0006***	0.0001***	−0.0008***
	(0.0000)	(0.0003)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
log(MVE)	0.0138***	−0.0010	0.0191***	−0.0022	0.0111***	0.0074
	(0.0039)	(0.0081)	(0.0037)	(0.0044)	(0.0018)	(0.0049)
BM	−0.0032	0.0531**	−0.0235***	−0.0109	−0.0110***	0.0195
	(0.0068)	(0.0228)	(0.0077)	(0.0108)	(0.0027)	(0.0122)
LEV	0.0053	−0.1365**	0.0073	−0.1316***	0.0161**	0.0541*
	(0.0136)	(0.0531)	(0.0128)	(0.0266)	(0.0075)	(0.0296)
SD_RET	0.1212	−0.0441	−0.0828	0.4019	−0.3178***	−0.3394
	(0.1887)	(0.7949)	(0.1818)	(0.3644)	(0.0778)	(0.4032)
RO	0.0315	0.1733***	0.0511***	0.1149***	0.0380***	0.1754***
	(0.0229)	(0.0635)	(0.0134)	(0.0292)	(0.0072)	(0.0332)
IO	−0.0005	0.0156	0.0284**	−0.1047***	0.0258***	0.0250
	(0.0123)	(0.0626)	(0.0130)	(0.0294)	(0.0065)	(0.0323)
No. of obs.	54,552	54,552	266,564	266,564	218,055	218,055
Adj. R^2	0.075		0.057		0.018	
No. of firms	1,492	1,492	1,669	1,669	1,517	1,517

IMPROVEMENT) for the three categories of revisions (Nonreaction, Unanticipated 8-K, and Anticipated 8-K). We present the means of the forecast attributes for forecasts relating to the following fiscal periods: next quarter, next year, and 2 years ahead.[14] Looking at the forecast error level, we observe that revisions following unanticipated 8-K reports are associated with lower forecast error and greater reduction in forecast error in comparison to revisions not preceded by an 8-K report across all forecast periods, and the differences are statistically significant. For example, for forecasts of next-fiscal-year earnings, the mean forecast error following an unanticipated 8-K is 1.86%, whereas the corresponding figure for nonreaction is 2.04% (p-value < 0.01). More importantly, the panel shows that revisions following unanticipated 8-K reports are associated with greater reduction in forecast error across all forecasting periods. Focusing on next-fiscal-year forecasts, we observe that the average reduction in forecast error following unanticipated news is 5.37%, whereas the average reduction in forecast error for nonreaction revisions is 4.17%, and the difference is statistically significant

[14]The number of observations drops for forecast error change and improvement compared with the level of forecast error because we need to have a previous forecast for the same reporting period by the analyst in order to compute these two measures. The reduction in number of observations is especially large for next-fiscal-quarter forecasts because most analysts provide only one such forecast.

(p-value < 0.01). Finally, we observe that reaction to unanticipated news is more likely to reduce the forecast error compared with nonreaction revisions, significantly so for short-term forecasts (next fiscal quarter and next fiscal year). For example, reaction to unanticipated 8-K news improves the forecast error of next-fiscal-year earnings in 67.6% of the cases, whereas the corresponding figure for nonreaction revisions is 65.9%, and the difference is statistically significant (p-value < 0.01).[15]

Panel A of Table 4 also shows the forecast properties of revisions following anticipated news. The direction of the differences relative to nonreaction revisions is similar to that for unanticipated news. Comparison of revisions following anticipated and unanticipated 8-Ks does not provide clear ordering of which type of 8-K is more informative. The figures for forecast error and forecast error change predictably show that revisions reacting to earnings 8-Ks (anticipated 2.02 filings) generate lower forecast errors. Interestingly, the reduction in forecast error (FORECAST_ERROR_CHANGE) for unanticipated 8-Ks is larger for next- and 2-year-ahead forecasts (−5.37% vs. −5.36% and −3.38% vs. −3.24%, respectively). These differences, however, are not statistically significant (untabulated), indicating that the information in unanticipated (i.e., nonearnings) 8-K filings is as important and useful for forecasting as earnings figures. We thus conclude that both types of 8-K reports (anticipated and unanticipated) are informative, and reaction to them generates superior forecast results compared with nonreaction forecast revisions.

Panel B of Table 4 presents the regression results. For each forecast period, we estimate the regressions with our two proxies for the informativeness of the 8-K reports. In the first specification, we use FORECAST_ERROR_CHANGE as the dependent variable and estimate the regression using ordinary least squares (OLS) with firm and year fixed effects. In the second specification, the dependent variable is IMPROVEMENT. The regression is estimated using probit with firm-random effects and year fixed effects. The standard errors correct for firm clustering.

The main variable of interest is REACTION_INDICATOR, which is defined as 1 if the forecast is released during the reaction window, and 0 otherwise. We also define the REACTION_TO_2.02_FILING indicator, which takes the value of 1 if the forecast is a reaction to an 8-K report with item 2.02 (i.e., Earnings Release), and 0 otherwise. Hence, the coefficient on REACTION_TO_2.02_FILING captures the marginal effect of the reaction to anticipated news over and above the reaction to unanticipated 8-K news. The baseline reference category is all revisions not associated with an 8-K filing. The regressions control for other variables that may influence the forecast error.

Consistent with the univariate analysis, we observe that the coefficient on REACTION_INDICATOR is negative and highly significant (at 5% or better)

[15] Interestingly, the panel indicates that reaction to anticipated news is associated with lower improvement relative to nonreaction revisions for 1-quarter-ahead forecasts (57.18% compared with 60.76%). However, the difference is not significant. Furthermore, it appears that the reason is that nonreaction revisions are issued later in the quarter. When we control for the number of days until the next report date, we observe that revisions following anticipated reports are associated with significantly greater improvement.

across all forecast periods in the regressions on forecast error change. The magnitude of the coefficient suggests that reaction to unanticipated news is associated with a greater reduction in the forecast error of 1.45%, 1.4%, and 0.5% on an annual basis for the next fiscal quarter, fiscal year, and 2 years ahead, respectively. The decrease in magnitude over the forecasting period suggests that the news items in the 8-K reports are more informative (i.e., their implications are more readily interpretable) for the short term. The coefficient on REACTION_TO_2.02_FILING is negative and significant (p-value < 0.1) in the regressions for next fiscal year and 2 years ahead, indicating that for longer-term forecasts, reaction to anticipated (i.e., earnings-related) news has a greater impact on forecast error change relative to reaction to unanticipated news (significant at the 10% level).[16]

The IMPROVEMENT specification shows that the coefficient on REACTION_INDICATOR is positive and significant (20.18%, 5.40%, p-value < 0.01) in the next-fiscal-quarter and next-fiscal-year regressions, indicating that the reaction to unanticipated news is more likely to be associated with improvement in the forecast error (relative to revisions not associated with an 8-K report), especially for shorter-term forecasts. The coefficient on REACTION_TO_2.02_FILING is negative and significant in the next-fiscal-quarter regression but positive and significant in the next-fiscal-year and 2-years-ahead forecasts regressions. Taken together, the multivariate results indicate that reaction to unanticipated news in 8-K reports is associated with a greater reduction in forecast error and is more likely to improve forecast error compared with nonreaction revisions. These results therefore suggest that unanticipated 8-K reports are informative and, importantly, that analysts who react to the news are able to interpret the news correctly and improve their forecast accuracy.

Because the dependent variable is forecast error change or improvement in forecast error, we do not have strong priors on the relation between the control variables and the dependent variable. We do not observe consistent patterns between the dependent variables and any of the controls.

We conduct several sensitivity analyses. First, we examine whether the results are driven by certain items (i.e., those unrelated to future earnings and those most frequently reported) in the 8-K form. We reestimate the regressions excluding reactions to the following items that do not have clear relation to future earnings: 3.03 (Material Modification to Rights of Security Holders), 5.04 (Temporary Suspension of Trading under Registrant's Employee Benefit Plans), 5.05 (Amendment to Registrant's Code of Ethics, or Waiver of a Provision of the Code of Ethics). There are only 451 revisions associated with these items, and we obtain

[16] As discussed earlier, it is imperative to control for the number of days elapsed since the previous forecast because otherwise one cannot compare the change in forecasts over time for the same analyst and cross-sectionally. Indeed, untabulated results show that when we do not scale by the number of days, the coefficient on the reaction indicator is negative and significant for the 1-quarter-ahead forecasts only. This is because the time elapsed since the previous forecast for 1-quarter-ahead earnings is shorter, with a lower standard deviation relative to 1-year-ahead forecasts, for example. Specifically, in our sample, we find that the mean time elapsed for 1-quarter-ahead forecasts is 38 days with a standard deviation of 31 days, whereas the comparable figures for 1-year-ahead forecasts are 55 and 39 days. Thus, the bias caused by not normalizing seems less of a concern for short-term forecasts.

virtually identical results when excluding these revisions. We also reestimate the regressions including only reactions to the most frequent items, as follows: 1.01 (Entry into a Material Definitive Agreement), 2.03 (Creation of a Direct Financial Obligation or an Obligation under an Off-Balance Sheet Arrangement), 5.02 (Departure of Directors or Certain Officers; Election of Directors; Appointment of Certain Officer), 7.01 (Regulation FD Disclosure), and 8.01 (Other Events). The results are similar to those reported. Except for item 2.03, we find that reaction to each of these items is associated with a significant reduction in forecast error across the three forecasting periods.[17]

Second, one could argue that the FORECAST_ERROR_CHANGE of unanticipated 8-K revisions is not only related to the informativeness but is also affected by the talent of the analyst. This is because skillful analysts are those who are expected to react to unanticipated 8-Ks. An alternative approach that possibly mitigates the effect of analysts' skill on FORECAST_ERROR_CHANGE is to measure the *percentage* change in forecast error. This measure is not affected by differences in skill ex ante because it provides relative improvement compared with the forecast error of the analyst prior to the forecast. The results are similar to those reported. We find that reaction to unanticipated news is associated with a greater percentage reduction in the forecast error relative to forecasts not preceded by an 8-K report across the 3 forecasting periods. These results further corroborate the conclusion that unanticipated reports provide relevant information for future earnings.

C. Analysts' Reaction to Nonearnings 8-K Information and Future Analyst Performance

The results thus far indicate that unanticipated information included in 8-K reports is useful in predicting future earnings, yet not all analysts react to this information, and reaction to unanticipated news appears to be low, especially in comparison to earnings news. As discussed previously, our conjecture is that one reason for the low reaction is the difference in analysts' ability to process and interpret unanticipated information, with few analysts able to transform the information into a meaningful forecast. Hence, we next examine whether the ability of the analyst to interpret unanticipated information can explain cross-sectional differences in forecast attributes.

To measure the analyst interpretation skill, we construct a proxy based on the analyst's tendency to react to unanticipated information. This directly follows from our observation that revision following unanticipated news leads to lower forecast error.

We measure analysts' interpretation skill using their CRR, which is measured at the firm-year-analyst level as the cumulative number of unanticipated 8-K reports filed by the company to which the analyst reacted scaled by the total number of unanticipated 8-K reports filed by the company. The ratio is computed as of the beginning of the fiscal year. Therefore, the unanticipated 8-K reports that affect the measure are only those that were released during the period starting at the

[17] Item 2.03 is associated with a reduced reaction only for the 1-year-ahead forecasts. There is no significant reduction in forecast error for the 1-quarter-ahead and 2-year-ahead forecasts.

beginning of the sample (2005) or the beginning of the first year in which the analyst began covering the firm (the latter of the two) and ending at year $t-1$. We use cumulative amounts in computing this measure because the filing of unanticipated 8-K reports is largely idiosyncratic (it depends on the occurrence of events that trigger the 8-K filing), and consequently, there is large variation over time in both the number and content of unanticipated 8-K reports filed by the company. For example, a firm may file several 8-K reports during a year in which the company undergoes restructuring and may file no reports in another year. Alternatively, a firm may acquire 1 or 2 companies in 1 year and not acquire other companies in the years before or after. Hence, ranking analysts based on the yearly reaction to 8-K would result in a measure that is also associated with the information environment of the firm during that year. Given how we construct CRR, it is evident that CRR is analyst-firm specific, and it can differ for the same analyst across the companies he or she covers. In other words, CRR does not measure the overall interpretation skill of the analyst; rather, it provides a measure of interpretation skill related to each company the analyst covers. We expect that the interpretation skill of the analyst may vary across companies, much in the same way as forecast error varies across companies, because of differences in experience covering each company and differences in the various companies' information environments.

Similar to De Franco and Zhou (2009), our two main measures of analysts' performance are accuracy and timeliness, which reflect analysts' ability to use and generate information. We expect a positive association between accuracy and CRR. Because we measure accuracy as forecast error, we expect a negative relation between CRR and the forecast error. We measure timeliness similar to Cooper, Day, and Lewis (2001) and De Franco and Zhou (2009). Specifically, for each forecast, we compute LEADING_DAYS as the number of days between the forecast and the two most recent forecasts by any other analyst preceding the forecast date. Similarly, we compute FOLLOWING_DAYS as the number of days between the forecast and the two most recent forecasts by any other analyst issued after the forecast date. We compute TIMELINESS as the ratio of LEADING_DAYS to FOLLOWING_DAYS. A timelier forecast indicates that either the analyst reacts to the new information more quickly or other analysts react to the news in the analyst's forecast. Hence, we expect to find a positive association between TIMELINESS and CRR.[18] We also use BOLDNESS and OPTIMISM as additional measures of performance. BOLDNESS is computed as the absolute value of the difference between the forecast and the consensus forecast scaled by the beginning-of-fiscal-year price per share, where the consensus forecast is the mean of all analysts' most recent forecasts issued during the 90-day period prior to the forecast date. This variable measures the analyst's confidence in providing a new forecast that deviates from the consensus. Similarly, OPTIMISM is computed as the difference between the forecast and actual earnings scaled by the beginning-of-fiscal-year price per share.

[18]Following Cooper et al. (2001) and De Franco and Zhou (2009), we exclude any additional forecasts by the analyst in computing TIMELINESS. In addition, if another analyst issued a forecast on the same day, both forecasts are excluded from the computation of TIMELINESS.

Prior research (Haw, Jung, and Ruland (1994), Mikhail et al. (1997), Maines, McDaniel, and Harris (1997), Jacob, Lys, and Neale (1999), Duru and Reeb (2002), Clement (1999), Clement and Tse (2003), (2005), Hirst, Hopkins, and Wahlen (2004), Malloy (2005), and De Franco and Zhou (2009)) documents that analyst performance can be explained in part by analyst characteristics. Thus, following these studies, we control for the following characteristics: analyst's experience following the firm (EXPER), which is the number of years the analyst has covered the company as of year t; analyst's specialization (COMPS), which is the number of companies covered by the analyst in year t; analyst's effort (FCST_FREQ), which is the total number of firm forecasts issued by the analyst during year t; resources of the brokerage house (BROKER), which is the number of analysts employed by the brokerage firm employing the analyst in year t; general experience (INDS), which is the number of unique 2-digit Standard Industrial Classification (SIC) codes of all companies followed by analyst i in the 12-month period prior to the forecast date.

We examine the relation between analyst performance and CRR using the Detailed History IBES (forecast period indicator (FPI) = 1) data file for the period 2005–2010. Because we use CRR at the beginning of the year as an independent variable, we are not able to use the year 2005 in the analysis. The total number of firm-year-analysts' forecasts with nonmissing CRR is 310,498.

Panel A of Table 5 provides descriptive statistics for the analyst characteristics used in the analysis. We average statistics by firm-year-analyst, resulting in a sample of 70,541 observations. Mean (median) CRR is 0.13 (0.1), indicating that analysts react on average to 13% of the unanticipated 8-Ks filed by the company, consistent with the univariate statistics in Table 2. The average firm experience is close to 4 years. Analysts cover 15.8 companies across 6.5 industries and issue 4.8 forecasts per firm-year. The average brokerage employs 55 analysts. We note that the mean statistics are somewhat higher than those reported by De Franco and Zhou (2009). This may reflect differences in sample size and period because their sample includes an earlier period, from 1999 through 2005.

Panel B of Table 5 reports the mean characteristics by CRR dummy, which takes the value of 1 if CRR is greater than 0 (i.e., if the analyst reacted to as little as 1 unanticipated 8-K prior to year t), and 0 otherwise. The number of analyst-years with 0 CRR (i.e., cases in which the analyst never reacted to an 8-K) is 25,039, which is substantial both in absolute terms and relative to the sample population (about 35% of the total analyst-year sample). The panel clearly points to a relation between CRR and analyst characteristics: Reacting analysts have greater firm experience, cover more companies, are employed by larger brokerages, cover fewer industries, and issue more forecasts. An untabulated Tobit regression of CRR on these characteristics provides similar results: CRR is positively associated with the analyst's firm experience, number of companies covered, forecast frequency, and broker size and is negatively associated with the number of industries covered by the analyst. The fact that CRR is positively associated with firm experience and broker size suggests that analysts are likely to develop interpretation skill related to that company as their experience covering the company increases, and analysts with superior interpretation skill are likely to be employed with the largest brokerage houses (Mikhail et al. (1997), Hong et al. (2000)). The finding that the

TABLE 5
CRR and Analyst Characteristics

Panel A of Table 5 provides descriptive statistics of the cumulative reaction ratio (CRR) and analyst characteristics. CRR is computed as the total number of unanticipated 8-K reports to which the analyst reacted from the beginning of the sample or coverage starting year (the latter of the two) through the beginning of the year, divided by the total number of unanticipated 8-K reports filed by the company in the same period. EXPER is the number of years the analyst has been covering the company; COMPS (INDS) is the number of companies (unique 2-digit SIC) covered by the analyst during the year; BROKER is the number of analysts employed by the brokerage; FCST_FREQ is the number of company-specific forecasts issued by the analyst during the year. Panel B shows analyst characteristics conditioned on whether the CRR is positive or 0. The difference of means is provided. *, **, and *** indicate 2-tailed significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Descriptive Statistics

Variables	Mean	Standard Deviation	Q1	Median	Q3
CRR	0.134	0.161	0	0.1	0.2
EXPER	3.821	2.98	2	3	5
COMPS	15.784	7.42	11	15	19
BROKER	54.645	42.961	19	40	81
INDS	6.519	4.081	4	6	9
FCST_FREQ	4.794	2.675	3	4	6

Panel B. CRR and Different Analyst Characteristics

CRR Dummy (= 1 if CRR > 0)	No. of Obs.	EXPER	COMPS	BROKER	INDS	FCST_FREQ
0	25,039	3.006	15.309	53.019	6.593	4.348
1	45,502	4.26	16.04	55.52	6.479	5.034
Difference		1.254***	0.731***	2.501***	−0.114***	0.686***

number of industries covered is negatively related to CRR may suggest that there may be a limitation for spreading the analysts' experience too broadly.

It is important to note that CRR is largely determined by the firm's operations. In other words, some firms are more likely to issue unanticipated 8-K reports that are easy to interpret and use in forecasting future earnings than others, and hence we further explore whether CRR may capture variation in firm characteristics rather than in analysts' skill by computing, at the firm-year level, the mean, standard deviation, and interquartile range of CRR for all analysts covering a firm. Untabulated results provide evidence of considerable variation in CRR across analysts covering a specific firm, which gives us confidence that CRR is an analyst attribute more than it is a firm characteristic.

Similarly, we examine whether an analyst's CRR score is similar across all companies covered by the analyst or whether it is firm specific. To this end, we compute the mean, standard deviation, and interquartile range of CRR at the analyst-year level (i.e., across all companies covered by an analyst). Untabulated results show that there is considerable variation in CRR across companies covered by an analyst, suggesting that CRR is not a fixed analyst characteristic but rather depends on the firm covered. Again, differences in analyst ability across companies should not be surprising because it is related to experience covering the company and the complexity of the company's operations.

Following De Franco and Zhou (2009), we examine the association between CRR and analyst performance by estimating the following model:

$$\begin{aligned}\text{PERFORMANCE}_{ijt} &= a_0 + a_1 \times \text{CRR}_{ijt-1} + a_{2-6} \\ &\quad \times \text{ANALYST\_CHARACTERISTICS}_{ijt} + \varepsilon_{ijt},\end{aligned}$$

where for each forecast of analyst i covering firm j in year t, the performance proxies are TIMELINESS, FORECAST_ERROR, BOLDNESS, and OPTIMISM. The analyst characteristics include the analyst's firm experience, number of companies covered, forecast frequency, broker size, and number of industries covered by the analyst. To facilitate comparison across observations, we follow De Franco and Zhou (2009) and Clement and Tse (2003), (2005) and standardize each of the performance measures and independent variables. Specifically, we transform each variable as follows: We subtract from each variable its minimum value for firm j in year t and scale that difference by the difference between the maximum and minimum value of the variable for firm j in year t. This standardization provides a relative measure for all analysts who follow the same firm in year t, and it thus controls for systematic firm-year differences in the variables.[19] Because CRR is the *cumulative* reaction ratio, the analyst-firm-year observations are not independent. To address this issue, we estimate the regression on a monthly basis controlling for firm fixed effects and present mean coefficients as in Fama and MacBeth (1973). Standard errors are corrected for serial dependence using the Newey and West (1987) adjustment, with 12 lags for serial dependence in the coefficients.

Table 6 presents the regression results. The coefficient on CRR is positive in the TIMELINESS column, indicating that analysts with a larger REACTION_RATIO provide more timely forecasts. This finding is consistent with the conjecture that high CRR is associated with analysts who provide timelier forecasts in response to public information. Further, this result suggests that analysts with low CRR are more likely to issue a revision after high-CRR analysts issued a revision. Importantly, we find that the coefficient on forecast frequency is also positive and significant; hence, reaction to unanticipated 8-K information is associated with increased TIMELINESS even after we control for the possible positive association between forecast frequency and CRR (Panel B of Table 5). Consistent with Clement and Tse (2005) and De Franco and Zhou (2009), we also find that TIMELINESS is associated with broker size and firm experience.

The FORECAST_ERROR column of Table 6 shows that analysts with high CRR have lower forecast error. This result is consistent with our premise that CRR is a proxy for interpretation skill; higher CRR indicates superior ability to interpret information, and hence more accurate forecasts. Interestingly, analysts with higher forecast frequency tend to have higher forecast error. Also, consistent with the extant literature, we find that forecast error increases with number of industries and decreases with firm experience and number of companies covered. We also find that forecast error is increasing in broker size and forecast frequency. We examine whether these results are potentially attributed to a correlation between CRR and analysts' characteristics. However, the univariate correlations do not appear to be high; the correlation between CRR and all other characteristics is mostly below 0.1, and the highest correlation is with firm experience at 0.13. When we log-transform analysts' characteristics instead of standardizing, we observe that the coefficient on CRR is still negative and significant, and the

[19] We obtain similar results when we do not standardize the variables.

TABLE 6
CRR and Analysts' Performance

Table 6 provides the Fama–MacBeth (1973) regression results of the performance measures on analyst characteristics. CRR is cumulative reaction ratio. TIMELINESS is based on the number of days between the analyst forecast and the forecasts by other analysts that precede and follow it. For each forecast, we compute leading days as the number of days between the forecast and the two most recent forecasts by any other analyst preceding the forecast date. Following days is the number of days between the forecast and the two most recent forecasts by any other analysts issued after the forecast date. We compute TIMELINESS as the ratio of leading days to following days. BOLDNESS is computed as the absolute value of the difference between the forecast and the consensus forecast scaled by the beginning-of-the-year price per share. We compute the consensus forecast as the mean of all analysts' most recent forecasts issued during the 90-day period prior to the forecast date. OPTIMISM is computed as the difference between the forecast and actual earnings scaled by the beginning-of-the-year price per share. FORECAST_ERROR is defined in Table 4, and all control variables are defined in Table 5. All variables in the regressions are standardized: We subtract from each variable its minimum value for firm j in year t and scale the difference by the difference between the maximum and minimum value of the variable for firm j in year t. We estimate the regression on a monthly basis, controlling for firm fixed effects, and present mean coefficients. Standard errors are corrected for serial dependence using the Newey and West (1987) adjustment, with 12 lags for serial dependence in the coefficients. The standard errors correct for firm clustering. *, **, and *** indicate 2-tailed significance at the 10%, 5%, and 1% levels, respectively. Standard errors are provided in parentheses.

Variables	TIMELINESS	FORECAST_ERROR	BOLDNESS	OPTIMISM
Constant	0.104***	0.339***	0.252***	0.519***
	(0.005)	(0.012)	(0.003)	(0.004)
CRR	0.004***	−0.004***	0.001	0.001
	(0.001)	(0.001)	(0.002)	(0.001)
EXPER	0.003**	−0.009***	0.000	−0.002
	(0.002)	(0.002)	(0.001)	(0.003)
COMPS	−0.003	−0.011***	−0.009***	0.003
	(0.004)	(0.001)	(0.002)	(0.004)
BROKER	0.063***	0.004***	0.026***	−0.02***
	(0.008)	(0.001)	(0.004)	(0.005)
INDS	−0.003	0.008***	0.000	−0.001
	(0.004)	(0.003)	(0.003)	(0.002)
FCST_FREQ	0.032***	0.013***	−0.002	0.005***
	(0.004)	(0.001)	(0.002)	(0.002)
Firm fixed effects	Yes	Yes	Yes	Yes

coefficient on broker size (forecast frequency) is not significant (negative and significant).

The results of the BOLDNESS and OPTIMISM regressions suggest that there is no significant association between these variables and CRR; analysts with high CRR do not provide bolder forecasts, and their forecasts are as optimistic as the average forecast optimism. The signs on the control variables indicate that BOLDNESS is increasing in broker size and decreasing in number of companies covered, whereas OPTIMISM decreases with broker size and increases with forecast frequency.

Taken together, the results indicate that analysts with greater CRR provide more timely and accurate forecasts. These results imply that cross-sectional differences in forecast accuracy and timeliness can be explained by our proxy for interpretation skill.

D. Analysts' Reaction to Unanticipated 8-K Information and Investors' Reaction to Analysts' Recommendation Changes

Because the CRR is correlated with analysts' performance, we can test an additional implication of analysts' reaction to unanticipated 8-Ks. If investors internalize that analysts who react to unanticipated news are associated with better ability to interpret company-related information, then they should also react more

strongly to recommendation changes made by these analysts. In this subsection, we test for this possibility.

We start with the entire sample of recommendation changes associated with firms in our sample period. To compute recommendation changes, we require the analyst's current and previous recommendations. Merging the sample of recommendation changes with the sample of analysts with a valid CRR at the beginning of the fiscal year results in a sample of 20,401 recommendation changes. We calculate investor reaction to recommendation changes using buy-and-hold CARs on the recommendation announcement day and the following trading day [0, 1]. We estimate abnormal returns using the Fama and French (1993) and momentum (Carhart (1997)) model (i.e., the 4-factor model).[20] The estimation window is 120 trading days (6 calendar months), ending 8 trading days before the day of the recommendation-change announcement. We require at least 115 daily stock returns (in which trade occurred) in the estimation period window. This restriction reduces the sample to 19,606 recommendation changes. To ensure that the investors' reaction is indeed attributed to the recommendation change and not to earnings news, we eliminate all recommendation changes that occurred during the 3-day trading period [0, 2] following earnings announcements. This further reduces our sample to 14,161 observations. Finally, we exclude from our sample all cases in which all analysts in a given firm-year have a CRR ratio of 0 (2,145 observations). The latter requirement eliminates cases of firms for which there is no variation in analysts' skill according to the CRR ratio. Our final sample includes 12,016 observations. The sample's average (median) reaction ratio is 0.168 (0.133); 22% of the observations have a CRR of 0, and a mere 1.3% of the observations have a CRR of 1. The standard deviation is 0.171. Hence, compared to the distribution of CRR in the full sample (Panel A of Table 5), the mean and median are slightly higher because we eliminated observations for which the CRR measure is 0 for all analysts covering the firm (in a given year).[21]

An analyst's recommendation is an integer between 1 (strong buy) and 5 (strong sell), where a recommendation of 3 is a hold. We compute the recommendation change as the current recommendation minus the previous recommendation times −1, so a positive recommendation change is an upgrade, and a negative recommendation change is a downgrade. Although a recommendation change could potentially take on a value between −4 and 4, in our sample, 98% of recommendation changes are between −2 and 2, and the number of positive recommendations is approximately the same as negative ones. Panel A of Table 7 provides the raw and abnormal returns associated with recommendation upgrades and downgrades separately. We also divide the sample into those below and those above the median CRR.[22] Panel A clearly shows that the reaction to recommendation change by analysts with above-median CRRs is larger in absolute value for both upgrades and downgrades. For positive recommendations, the reaction is approximately 25% larger, and the difference is significant at the 1% level.

[20] All results reported are similar if we use the market model instead.

[21] We exclude these observations because we cannot differentiate between the skill across the analysts of the particular firm-year.

[22] Similar results are obtained if we partition the sample into 0 CRR and nonzero CRR.

TABLE 7

CRR and Market Reaction to Analysts' Recommendation Change

Table 7 shows differences in investor reactions to analysts' recommendation changes conditioned on analysts' cumulative reaction ratio (CRR). ABNORMAL is the abnormal returns, which are computed based on the Carhart (1997) 4-factor model. RAW is the returns unadjusted for risk. The RAW (or ABNORMAL) returns are calculated during the 2-day period [0, 1] of the analyst's recommendation change date. ΔREC is the recommendation change; positive-integer (negative-integer) change implies an upgrade (downgrade). CRR is defined in Table 5 and is computed at the beginning of the year. Panel B shows the regression results, where the dependent variables are RAW and ABNORMAL, respectively. All controls also enter the regression as standalone variables (untabulated). All variables for firm characteristics are defined in Table 1, and analysts' characteristics are defined in Table 6. The firm and year fixed effects enter the regression as standalones and interacted with ΔREC. The standard errors correct for firm-level clustering. *, **, and *** indicate 2-tailed significance at the 10%, 5%, and 1% levels, respectively. Standard errors are provided in parentheses in Panel B.

Panel A. Reaction to Analysts' Recommendations and CRR

	ΔREC > 0			ΔREC < 0		
Variables	Above Median CRR	Below | Median CRR	Difference *p*-Value (1-sided)	Above Median CRR	Below Median CRR	Difference *p*-Value (1-sided)
RAW (%)	2.47	1.92	0.0017***	−2.59	−2.31	0.1055
ABNORMAL (%)	2.25	1.76	0.0016***	−2.58	−2.30	0.0884*

Panel B. Reaction to Analysts' Recommendation Change and CRR

	Raw	Abnormal	Raw	Abnormal
Variable	1	2	3	4
ΔREC	0.0146*** (0.0014)	0.0147*** (0.0014)	0.0120*** (0.0024)	0.0136*** (0.0022)
CRR	0.0041 (0.0042)	0.0014 (0.0039)	0.0017 (0.0045)	−0.0000 (0.0041)
ΔREC × CRR	0.0081*** (0.0030)	0.0082*** (0.0028)	0.0068** (0.0032)	0.0077*** (0.0029)
EXPER × ΔREC			−0.0002* (0.0001)	−0.0002 (0.0001)
COMPS × ΔREC			−0.0001 (0.0001)	−0.0001 (0.0001)
BROKER × ΔREC			0.0001*** (0.0000)	0.0000*** (0.0000)
INDS × ΔREC			0.0001 (0.0001)	−0.0001 (0.0001)
FCST_FREQ × ΔREC			−0.0002 (0.0002)	−0.0002 (0.0002)
log(MVE) × ΔREC			−0.0001*** (0.0000)	−0.0001*** (0.0000)
LEV × ΔREC			−0.0025 (0.0028)	−0.0044* (0.0026)
BM × ΔREC			0.0008 (0.0013)	0.0004 (0.0012)
SD_RET × ΔREC			0.2202*** (0.0524)	0.2054*** (0.0493)
ROA × ΔREC			−0.0154*** (0.0049)	−0.0157*** (0.0047)
Year fixed effects	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
No. of obs.	12,016	12,016	11,160	11,160
R^2	0.206	0.219	0.222	0.238

For downgrades, the reaction is approximately 11% larger (in absolute value) but is weakly significant (marginal 1-tailed significance). These univariate results support the notion that investors value the opinion of analysts with high CRRs more than they value the opinion of analysts with low CRRs.

Panel B of Table 7 provides the results of the multivariate regressions. The coefficient of interest is the interaction term of change in recommendation

(ΔREC) and CRR, labeled ΔREC × CRR. Because we are interested in the magnitude of the reaction to the recommendation change, a positive coefficient for this interaction term is interpreted as an increased reaction to the recommendation change of analysts with higher CRRs. If control variables could affect the magnitude of the reaction, they should enter the regression twice: once as a standalone variable and once interacted with the recommendation change, which captures the marginal effect of the control variable on the return magnitude to the recommendation change (Hirshleifer, Lim, and Teoh (2009), DellaVigna and Pollet (2009), and Michaely, Rubin, and Vedrashko (2014)). Failure to interact the control variable with the news variable (recommendation change) would provide an incorrect inference because the distribution of recommendation changes is on average 0; the effect of positive changes would cancel out the effect of negative changes. For example, consider the market value of equity as a possible control variable. It is economically meaningless to expect that the market reaction is more positive for larger firms (i.e., a positive coefficient on market value of equity), but it is economically meaningful to expect that the market reacts less to the analysts' recommendation changes for larger firms.[23]

In specifications 1 and 2 of Table 7, we estimate the regression with no control variables except firm and year indicators. We find that the coefficient of ΔREC × CRR is positive and highly significant at the 1% level for the raw and abnormal return regressions. More importantly, the results indicate that CRR has an economic impact as well. For example, in specification 1, we can calculate that a 1-unit recommendation change is associated with an increased reaction of 0.13% raw return for an analyst with average CRR. Because the mean CRR in the recommendation-change sample is 0.168 and the coefficient on ΔREC × CRR is 0.008, the analyst's skill component effect is 13 basis points (bps) per a 1-unit change in recommendation. Alternatively, the results show that the reaction to a change in recommendation by the mean CRR analyst is greater by more than 9% (i.e., $0.168 \times 0.008/0.0146$) relative to an analyst with a CRR of 0. Among the other control variables, we find that only the coefficient on broker size is significant. We compute the effect of broker size similarly to the effect of CRR and find that a 1-unit change in recommendation for an analyst employed at the mean broker size is 21 bps. Thus, an analyst with an average CRR employed by an average broker size elicits a total reaction of 34 bps, or around 65% higher than a zero-CRR analyst employed by a similar-size brokerage.

In specifications 3 and 4 of Table 7, we include firm and analyst control variables and their interaction with ΔREC (the standalone controls are not tabulated but are included in the regression). The results concerning CRR remain; a recommendation change by a high-CRR analyst elicits a greater market reaction. Further, the results also indicate that CRR has incremental contribution even after controlling for other analyst characteristics that seem to affect the market reaction to recommendations (e.g., broker size, which is highly significant).

[23] Similarly, it does not make much sense to include standalone year and firm fixed effects. Hence, we include two fixed effect variables: one standalone and one interacted with ΔREC.

V. Conclusion

In this article, we analyze the quality of analysts' interpretation skill in relation to the announcements of unanticipated news. We conjecture that an analyst's ability to interpret unanticipated information and assess its impact on future earnings is indicative of interpretation skill.

Our findings show that forecast revisions following unanticipated 8-K filings are less frequent compared with revisions following anticipated earnings 8-K filings. Although most analysts do not revise their forecasts following unanticipated 8-K releases, forecasts issued following unanticipated 8-K reports are more informative than forecasts that do not follow 8-K reports. This result indicates that unanticipated 8-K filings provide information associated with future profitability and that analysts who react to unanticipated 8-K filings are able to interpret this information and infer its impact on future profitability.

We explore whether the reaction to unanticipated information is related to interpretation skill by examining whether the tendency to react to unanticipated 8-K reports is associated with future analyst performance. We find that analysts who are more likely to revise their forecasts following unanticipated 8-K releases provide more accurate and timely forecasts in subsequent periods. Finally, we also find that investors react more strongly to recommendation changes from analysts who react to unanticipated news. Overall, our results suggest that reaction to unanticipated information is indicative of analysts' interpretation skill.

Appendix. Form 8-K Items Description

1.01: Entry into a Material Definitive Agreement

1.02: Termination of a Material Definitive Agreement

1.03: Bankruptcy or Receivership

1.04: Mine Safety: Reporting of Shutdowns and Patterns of Violations

2.01: Completion of Acquisition or Disposition of Assets

2.02: Results of Operations and Financial Condition

2.03: Creation of a Direct Financial Obligation or an Obligation under an Off-Balance Sheet Arrangement of a Registrant

2.04: Triggering Events That Accelerate or Increase a Direct Financial Obligation or an Obligation under an Off-Balance Sheet Arrangement

2.05: Costs Associated with Exit or Disposal Activities

2.06: Material Impairments

3.01: Notice of Delisting or Failure to Satisfy a Continued Listing Rule or Standard; Transfer of Listing

3.02: Unregistered Sales of Equity Securities

3.03: Material Modification to Rights of Security Holders

4.01: Changes in Registrant's Certifying Accountant

4.02: Non-Reliance on Previously Issued Financial Statements or a Related Audit Report or Completed Interim Review

5.01: Changes in Control of Registrant

5.02: Departure of Directors or Certain Officers; Election of Directors; Appointment of Certain Officers; Compensatory Arrangements of Certain Officers

5.03: Amendments to Articles of Incorporation or Bylaws; Change in Fiscal Year

5.04: Temporary Suspension of Trading under Registrant's Employee Benefit Plans

5.05: Amendment to Registrant's Code of Ethics, or Waiver of a Provision of the Code of Ethics

5.06: Change in Shell Company Status

5.07: Submission of Matters to a Vote of Security Holders

5.08: Shareholder Director Nominations

6.01–6.05: Asset-Backed Securities

7.01: Regulation FD Disclosure

8.01: Other Events

9.01: Financial Statements and Exhibits

References

Abarbanell, J., and B. Bushee. "Fundamental Analysis, Future Earnings, and Stock Prices." *Journal of Accounting Research*, 35 (1997), 1–24.

Asquith, P.; M. B. Mikhail; and A. S. Au. "Information Content of Equity Analyst Reports." *Journal of Financial Economics*, 75 (2005), 245–282.

Bar-Hava, K.; S. Huang; B. Segal; and D. Segal. "Do Outside Directors Tell the Truth, the Whole Truth, and Nothing But the Truth When They Resign?" Available at http://ssrn.com/abstract=1547852 (2017).

Bartov, E., and G. Bodnar. "Firm Valuation, Earnings Expectations, and the Exchange Rate Exposure Effect." *Journal of Finance*, 49 (1994), 1755–1785.

Bradshaw, M.; S. Richardson; and R. Sloan. "Do Analysts and Auditors Use Information in Accruals?" *Journal of Accounting Research*, 39 (2001), 45–74.

Carhart, M. M. "On Persistence in Mutual Fund Performance." *Journal of Finance*, 52 (1997), 57–82.

Chaney, P.; C. Hogan; and D. Jeter. "The Effect of Reporting Restructuring Charges on Analysts' Forecast Revisions and Errors." *Journal of Accounting and Economics*, 27 (1999), 261–284.

Chen, X.; Q. Cheng; and K. Lo. "On the Relationship between Analyst Reports and Corporate Disclosures: Exploring the Roles of Information Discovery and Interpretation." *Journal of Accounting and Economics*, 49 (2010), 206–226.

Clement, M. "Analyst Forecast Accuracy: Do Ability, Resources, and Portfolio Complexity Matter?" *Journal of Accounting and Economics*, 27 (1999), 285–303.

Clement, M., and S. Tse. "Do Investors Respond to Analysts' Forecast Revisions as If Forecast Accuracy Is All That Matters?" *Accounting Review*, 78 (2003), 227–249.

Clement, M., and S. Tse. "Financial Analyst Characteristics and Herding Behavior in Forecasting." *Journal of Finance*, 60 (2005), 307–341.

Cooper, R.; T. Day; and C. Lewis. "Following the Leader: A Study of Individual Analysts' Earnings Forecasts." *Journal of Financial Economics*, 61 (2001), 383–416.

De Franco, G., and Y. Zhou. "The Performance of Analysts with a CFA Designation: The Role of Human-Capital and Signaling Theories." *Accounting Review*, 84 (2009), 383–404.

DellaVigna, S., and J. Pollet. "Investor Inattention and Friday Earnings Announcements." *Journal of Finance*, 74 (2009), 709–749.

Duru, A., and D. Reeb. "International Diversification and Analysts' Forecast Accuracy and Bias." *Accounting Review*, 77 (2002), 415–433.

Elliott, J.; D. Philbrick; and C. Weidman. "Evidence from Archival Data on the Relation between Security Analysts' Forecast Errors and Prior Forecast Revisions." *Contemporary Accounting Research*, 11 (1995), 919–938.

Ettredge, M.; K. Johnstone; M. Stone; and Q. Wang. "The Effects of Firm Size, Corporate Governance Quality, and Bad News on Disclosure Compliance." *Review of Accounting Studies*, 16 (2011), 866–889.

Fama, E., and K. French. "Common Risk Factors in the Returns on Stocks and Bonds." *Journal of Financial Economics*, 33 (1993), 3–56.

Fama, E., and J. MacBeth. "Risk, Return, and Equilibrium: Empirical Tests." *Journal of Political Economy*, 81 (1973), 607–636.
Feldman, R.; J. Livnat; and B. Segal. "Shorting Companies with Unreliable Financial Statements." *Journal of Investing*, 17 (2008), 6–15.
Green, T. C. "The Value of Client Access to Analyst Recommendations." *Journal of Financial and Quantitative Analysis*, 41 (2006), 1–24.
Griffin, P. A.; D. H. Lont; and B. Segal. "Enforcement and Disclosure under Regulation Fair Disclosure: An Empirical Analysis." *Accounting and Finance*, 51 (2011), 947–983.
Haw, I.; K. Jung; and W. Ruland. "The Accuracy of Financial Analysts' Forecasts after Mergers." *Journal of Accounting, Auditing and Finance*, 9 (1994), 465–483.
Hirshleifer, D.; S. Lim; and S. H. Teoh. "Driven to Distraction: Extraneous Events and Underreaction to Earnings News." *Journal of Finance*, 64 (2009), 2289–2325.
Hirst, E.; P. Hopkins; and J. Wahlen. "Fair Values, Income Measurement, and Bank Analysts' Risk and Valuation Judgments." *Accounting Review*, 79 (2004), 454–473.
Hong, H., and J. Kubik. "Analyzing the Analysts: Career Concerns and Biased Earnings Forecasts." *Journal of Finance*, 58 (2003), 313–351.
Hong, H.; J. Kubik; and A. Solomon. "Security Analysts' Career Concerns and Herding of Earnings Forecasts." *Rand Journal of Economics*, 31 (2000), 121–144.
Irvine, P.; M. Lipson; and A. Puckett. "Tipping." *Review of Financial Studies*, 20 (2007), 741–768.
Ivković, Z., and N. Jegadeesh. "The Timing and Value of Forecast and Recommendation Revisions." *Journal of Financial Economics*, 73 (2004), 433–463.
Jackson, A. "Trade Generation, Reputation, and Sell-Side Analysts." *Journal of Finance*, 55 (2005), 673–717.
Jacob, J.; T. Lys; and M. Neale. "Expertise in Forecasting Performance of Security Analysts." *Journal of Accounting and Economics*, 28 (1999), 51–82.
Kim, S. T.; J. C. Lin; and M. B. Slovin. "Market Structure, Informed Trading, and Analysts' Recommendations." *Journal of Financial and Quantitative Analysis*, 32 (1997), 507–524.
Lerman, A., and J. Livnat. "The New Form 8-K Disclosures." *Review of Accounting Studies*, 15 (2010), 752–778.
Livnat, J., and Y. Zhang. "Information Interpretation or Information Discovery: Which Role of Analysts Do Investors Value More?" *Review of Accounting Studies*, 17 (2012), 612–641.
Maines, L.; L. McDaniel; and M. Harris. "Implications of Proposed Segment Reporting Standards for Financial Analysts' Investment Judgments." *Journal of Accounting Research*, 35 (1997), 1–24.
Malloy, C. J. "The Geography of Equity Analysis." *Journal of Finance*, 60 (2005), 719–755.
Michaely, R.; A. Rubin; and A. Vedrashko. "Corporate Governance and the Timing of Earnings Announcements." *Review of Finance*, 18 (2014), 2003–2044.
Mikhail, B.; B. Walther; and R. Willis. "The Development of Expertise: Do Security Analysts Improve Their Performance with Experience?" *Journal of Accounting Research*, 3 (1997), 131–157.
Newey, W. K., and K. D. West. "A Simple, Positive Semi-Definite, Heteroskedasticity and Autocorrelation Consistent Covariance Matrix." *Econometrica*, 55 (1987), 703–708.
Ruland, W. "The Accuracy of Forecasts by Management and by Financial Analysts." *Accounting Review*, 53 (1978), 439–447.
Schwartz, K. B., and B. S. Soo. "Evidence of Regulatory Noncompliance with SEC Disclosure Rules on Auditor Changes." *Accounting Review*, 71 (1996), 555–572.
Segal, B., and D. Segal. "Are Managers Strategic in Reporting Non-Earning News? Evidence on Timing and News Bundling." *Review of Accounting Studies*, 21 (2016), 1203–1244.
Stickel, S. "Reputation and Performance among Security Analysts." *Journal of Finance*, 47 (1992), 1811–1836.
Wu, J., and A. M. Zang. "What Determine Financial Analysts' Career Outcomes during Mergers?" *Journal of Accounting Economics*, 47 (2009), 59–86.