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FIRM'S DEGREE OF UNCERTAINTY and EARNINGS FORECASTS

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ABSTRACT

This study examines the relationship between earnings forecasts and task uncertainty. Company uncertainty is applied as a proxy for task difficulty and is investigated in terms of its effect on analysts' forecasts in three aspects: forecast accuracy, the optimism degree of the forecast, and the timely response to public information. The current study concludes that company uncertainty is positively related to forecast inaccuracy, positively related to the analysts' forecast optimism level, and is negatively related to revision timeliness. This finding suggests that if a company has a high uncertainty, then predicting the company's future earnings is difficult for financial analysts. Furthermore, when new public information is released (such as an earnings announcement), much time is needed to interpret this new information and to revise prior forecasts. We contribute to extant literature in the following ways: First, this study clarifies the effect of firm uncertainty on analyst performance. Second, we remind investors to be careful when taking an analyst's research reports as a reference for investment decisions.

1. INTRODUCTION

Factors that can induce bias in earnings forecasts have been the subject of research and regulatory interest since the 1980s; prior studies have reported on many elements that affect analysts' earnings forecasts. Clement (1999) indicates that an analyst's forecasting accuracy can be affected by his/her ability, portfolio complexity, and data resources. Libby et al. (2008) suggest that analysts are motivated to report optimistic forecasts to maintain a good relationship with company management. O'Brien et al. (2005) determine that an analyst responds more slowly to bad news than to good news. Holden and Stuerke (2008) reveal that forecast revision frequency is positively associated with earnings variability and trading volume; however, this frequency is negatively associated with the skewedness of trading volume.

Furthermore, a financial analyst's personal characteristics influence his/her earnings forecasts to a certain extent. In addition to such characteristics, task uncertainty also affects the forecasting accuracy of companies. When a company is highly uncertain,

reporting earnings forecasts is difficult for financial analysts; thus, the task uncertainty level is high. Duru and Reeb (2002) determine that firms' diversification degrees are associated with analyst forecasts that are not very accurate and are optimistic. Wallner (1999) and Anderson and Tushman (2001) define the complexity degree of a firm according to the level of diversification and information uncertainty. Prior studies have motivated our research by investigating the effect of a company's uncertainty degree on analysts' forecast behaviors in three aspects: forecast accuracy, the optimism degree of a forecast, and response timeliness to public news. In general, the future earnings of a highly uncertain firm are difficult to predict, and forecast accuracy may also drop. The second aspect of analyst behaviors examined in the present study is the degree of optimism/passivism in an analyst in relation to a firm's uncertainty degree. This issue is crucial to market participants because previous literature has documented that optimistic and passive analysts provide different opinions to the same firm. An analyst must spend much time and effort in processing and analysing the information of a highly uncertain firm; thus, his/her willingness to add coverage of such a company may indicate a belief that the firm has good prospects. As a result, this analyst presents an optimistic forecast. Nonetheless, an analyst may also have incentive to issue optimistic forecasts to gain access to private information according to Lim (2001) and Libby et al. (2008). This analyst may have increased motivation to favor management if he/she includes the coverage of a highly uncertain company; hence, he/she is likely to issue optimistic forecasts for this firm. The third topic investigated in the present work is the association between the adjustment speed of earnings forecasts to new information and the degree of firm uncertainty. Analysts normally adjust their forecasts upon receiving new public information; if an analyst adjust his/her forecasts frequently and in a timely manner, then the resultant forecasts are usually accurate. Therefore, we postulate that highly uncertain firms may be linked to slower earnings forecast adjustment because the message for such a company may take much time to interpret.

The current study concludes that company uncertainty is positively related to forecast inaccuracy, positively related to the analysts' forecast optimism level, and is negatively related to revision timeliness. This finding suggests that if a company is highly uncertain, then predicting the company's future earnings is difficult for financial analysts. Furthermore, when new public information is released (such as an earnings announcement), much time is needed to interpret this new information and to revise prior forecasts. We contribute to extant literature in the following ways: First, this study clarifies the effect of firm uncertainty on analyst performance. Second, we remind investors to be careful when taking an analyst's research reports as a reference for investment decisions. The remainder of this paper is organized as follows: Section 2 discusses related theoretical literature and the hypotheses of the current study. Section 3 describes the research design and all the variables in the regression. Section 4 presents the data resources and the sampling procedures, and discusses the empirical results. Finally, section 5 provides the conclusion.

2. LITERATURE REVIEW AND HYPOTHESES

Prior research regarding financial analyst forecasts focuses on forecasting performance, bias, and analysts' recommended revision. Clement (1999) and Clement et al. (2007) investigate forecast accuracy. McNichols and O'Brien (1997) as well as Libby et al. (2008) note that analysts tend to report optimistic forecasts. O'Brien et al. (2005) discuss the adjustment speed of analyst forecasts to public information. The current paper presents a new firm-level factor (company uncertainty) that affects the degree of analyst forecast optimism; moreover, this study offers insights on the type of company that may easily receive optimistic forecasts. On this basis, investors can interpret forecast information accurately.

Prior studies provide evidence on whether or not analysts differ in terms of individual forecasting performance. Mikhail et al. (1997) report that analysts' forecast accuracy is enhanced once they gain additional firm-specific experience. Jacob et al. (1999) reveal that an analyst's aptitude and brokerage house characteristics are related to forecast accuracy; however, learning-by-doing is not linked to this accuracy when the analyst's company-specific forecasting aptitude is controlled. Mikhail et al. (1997) and Jacob et al. (1999) also identify a positive relationship between forecast accuracy and experience.

Clement (1999) discusses the reason for the positive relationship between forecast accuracy and experience and suggests that the former increases with an analyst's personal ability and the size of the company employing him/her. By contrast, this accuracy decreases with the number of firms and industries followed. Furthermore, Bolliger (2004) applies European data and obtains results similar to those reported by Mikhail et al. (1997), Jacob et al. (1999), and Clement (1999) when U.S. data are used; however, Bollinger does not detect a significant relationship between forecast accuracy and analysts' job experience as well as the size of the brokerage house that employs them.

Many studies also discuss diversification and uncertainty. Gort (1962) indicates that no significant cross-sectional correlation was observed between profitability and diversification. Palepu (1985) and Rumelt (1982) utilize complete data to investigate the same issue and reach a conclusion similar to that presented by Gort. In terms of literature on product diversification of a firm and earnings forecast accuracy, Kini et al. (2009) indicate that the relation between sector diversification and forecast accuracy is context-specific. In an international context such as European Zone, forecast accuracy may increase with sector diversification, whereas in the U.S., analyst may generate higher accuracy when focus on a specific industry. With regard to regional diversification, Duru and Reeb (2002) suggest that increased international diversification in corporate is associated with analyst forecasts that are less accuracy accurate and are optimistic. This finding holds true even after controlling for a few determinants of forecast accuracy and bias, such as earnings variability, forecast horizon, firm size, and industrial diversification. Uncertainty is another proxy of complexity. Zhang (2006) investigates the inefficiency of analyst forecasts from an information perspective and determines that forecast accuracy and the frequency of forecast revisions are negatively linked to increased information uncertainty. In other

words, analysts' revisions are almost complete when this uncertainty is low; when such uncertainty increases, revisions are far from complete. Barron et al. (2002) report that analysts' forecast errors are positively associated with a firm's level of intangible assets. An additional analysis indicates that low levels of analyst consensus are associated with high-technology manufacturing companies, which suggests that certain factors in high-technology companies affect the predictions of financial analysts.

Based on these prior studies, the degree of a firm's uncertainty affects forecast accuracy; therefore, the first hypothesis of the current study is as follows:

H1: *The degree of uncertainty of a company negatively influences financial analysts' forecast accuracy.*

Financial analysts may report optimistic forecasts for certain reasons. McNichols and O'Brien (1997) suggest that analysts tend to avoid or delay the delivery of unfavorable news; moreover, their earnings forecasts are generally overoptimistic. Lim (2001) notes that issuing an optimistic forecast is a strategy to favor firm management. Libby et al. (2008) indicate that the optimistic or pessimistic forecasts may be linked to relationship incentives and access to information from management. Ke and Yu (2006) determine that analysts usually issue optimistic earnings forecasts initially, followed by pessimistic earnings forecasts before the day earnings are announced. On this basis, these analysts can acquire additional private information from firm management and enhance the accuracy of these forecasts; in the process, they are less likely to be fired by their employers.

Prior works on optimistic or pessimistic analyst forecasts usually focus on private information from firm management. In a highly uncertain company, an analyst may have increased incentive to favor management to acquire additional private information; hence, he/she must present optimistic forecasts to the firm. Moreover, an analyst must spend much time and effort in processing and analyzing a highly uncertain firm; thus, his/her willing to add coverage of a highly uncertain company may indicate a belief that the firm has good prospects. Therefore, the analyst issues an optimistic forecast. In line with these findings, the second hypothesis of the present study is as follows:

H2: *The degree of uncertainty of a company positively influences the optimism degree of financial analysts' forecasts.*

Ivković and Jegadeesh (2004) determine a sharp increase in recommendation revisions and forecast revisions after earnings announcements are made. O'Brien et al. (2005) also suggests that an analyst responds more slowly to bad information than to good information; this situation is particularly significant in large brokerage houses. This finding indicates that such houses increase analysts' reluctance to reveal negative news, particularly to clients in the investment bank business. Gleason and Lee (2003) reach the same conclusion as Ivković and Jegadeesh (2004) and O'Brien et al. (2005); Gleason and

Lee also report that an earnings revision signal can deter the efficiency of market price discovery, particularly in firms with low analyst coverage.

Prior studies on adjustment timeliness usually discuss positive and negative information. Certain firm-level factors affect the timeliness of forecast adjustments; in a highly uncertain company, analysts may require additional time and effort to analyze new information they obtain regarding a company; subsequently, they can revise prior forecasts. The corresponding hypothesis of the current study is as follows:

H3: *The degree of uncertainty of a company negatively influences the adjustment speed of financial analysts' forecasts.*

3. RESEARCH DESIGN

3.1 ACCURACY MODEL

This study investigates the effect of company uncertainty on analyst performance in three aspects: the accuracy of earnings forecasts, the optimism of earnings forecasts, and the timeliness of analysts' responses to new information. Our first model tests hypothesis 1 and is estimated as follows:

Model 1:

$$\begin{aligned} Accuracy_{i,j,t} = {} & \beta_0 + \beta_1 RD_{j,t} + \beta_2 ADE_{j,t} + \beta_3 AT_{j,t} + \beta_4 ForHorizon_{i,j,t} \\ & + \beta_5 DaysElap_{i,j,t} + \beta_6 IndSpec_{i,j,t} + \beta_7 NCom_{i,j,t} \\ & + \beta_8 Bro\,\mathrm{ker}\,Size_{i,j,t} + \beta_9 GExp_{i,j,t} + \beta_{10} FExp_{i,j,t} \\ & + \beta_{11} AnalystFollowing_{j,t} + \beta_{12} Dispersion_{i,j,t} \\ & + \beta_{13} H_{j,t} + \beta_{14} lagAccuracy_{i,j,t} + \varepsilon_{i,j,t}, \end{aligned} \quad (1)$$

where $forecast_{i,j,t}$ is the earnings forecast of analyst *i* for firm *j* in year *t*, $actual_{i,j,t}$ represents the actual earnings of firm *j* in year *t*. We apply absolute forecast error as the proxy for earnings forecast accuracy ($Accuracy_{i,j,t}$); a small forecast error indicates that the earnings forecast is accurate. Accuracy is scaled according to the prior year's stock price. We also follow Barron et al. (2002) in terms of taking R&D expenses (RD) and advertising expenses (ADE) as a proxy of company uncertainty; $RD_{j,t}$ and $ADE_{j,t}$ denote company *j*'s R&D and advertising expenses as deflated by total operating expenses in year *t*, respectively.

In this regression, $RD_{j,t}$, and $ADE_{j,t}$ are the main variables discussed in this paper; all other variables are controls. In accordance with Mikhail et al. (1997), Jacob et al. (1999), and Clement (1999), we include the characteristics of analysts and brokerage houses as control variables, including the following: $AT_{j,t}$ is the logarithm of the total assets of company *j* in year *t*; $ForHorizon_{i,j,t}$ is the number of calendar days between the forecast issue date and

the fiscal end date; $DaysElap_{i,j,t}$ denotes the days between the date on which the present earnings forecast was issued by analyst *i* and the date on which the most recent forecast was issued by other analysts for the same firm in the same year; $IndSpec_{i,j,t}$ measures industrial specialization, which is defined as the number of companies in the industry to which the firm *j* belongs covered by analyst *i* divided by the number of companies covered by analyst *i* in year *t*; $Ncom_{i,j,t}$ is defined as the number of companies covered by analyst *i* in year *t*; $BrokerSize_{i,j,t}$ is the total number of analysts employed by the brokerage house to which analyst *i* when the forecast was issued in the year *t*; $GExp_{i,j,t}$ is general experience and is defined as the number of years analyst *i* exists in I/B/E/S before year *t*; $FExp_{i,j,t}$ is firm-specific experience, which is represented by the number of years analyst *i* issues a forecast to firm *j* before year *t*; $AnalystFollowing_{j,t}$ is the number of analysts following company *j* in year *t*; $Dispersion_{i,j,t}$ is the variance of all forecasts issued by different analysts for company *j* in year *t* within 90 days before the fiscal year end date; $H_{j,t}$ is an assets-weighted measure of Herfindahl-based indices that is applied to determine firm diversification which is classified according to the business segment; $lagAccuracy_{i,j,t}$ is the accuracy of the forecast issued by analyst *i* for company *j* in the previous year *t*−1.

3.2 OPTIMISM MODEL

To clarify whether or not company uncertainty influences the optimism degree of financial analysts' forecasts, the following equation is applied:

Model 2:

$$\begin{aligned} Optimism_{\mathrm{i,j,t}} = {} & \beta_0 + \beta_1 RD_{j,t} + \beta_2 ADE_{j,t} + \beta_3 AT_{j,t} + \beta_4 ForHorizon_{i,j,t} \\ & + \beta_5 DaysElap_{i,j,t} + \beta_6 IndSpec_{i,j,t} + \beta_7 NCom_{i,j,t} \\ & + \beta_8 Bro\,\mathrm{ker}\,Size_{i,j,t} + \beta_9 GExp_{i,j,t} + \beta_{10} FExp_{i,j,t} \\ & + \beta_{11} AnalystFollowing_{j,t} + \beta_{12} Dispersion_{i,j,t} \\ & + \beta_{13} H_{j,t} + \beta_{14} lagOptimism_{i,j,t} + \varepsilon_{i,j,t}, \end{aligned} \quad (2)$$

where $Optimism_{i,j,t}$ is the difference between the earnings forecast and the actual earnings relative to the prior year's stock price. $lagOptimism_{i,j,t}$ is the $Optimism_{i,j,t}$ for analyst *i* in relation to firm *j* in year *t*−1. $RD_{j,t}$, and $ADE_{j,t}$ are the variables of interest in this study; all other variables are controls. The definitions of the remaining variables conform to those in Model 1.

3.3 TIMELY RESPONSE MODEL

To clarify whether or not company's degree of uncertainty negatively influences the timeliness of forecast adjustment by financial analysts, the following model is applied.

Model 3:

$$\begin{aligned} nextREVdays_{i,j,t} = {} & \beta_0 + \beta_1 RD_{j,t} + \beta_2 ADE_{j,t} + \beta_3 AT_{j,t} \\ & + \beta_4 DaysElap_{i,j,t} + \beta_5 IndSpec_{i,j,t} + \beta_6 NCom_{i,j,t} \\ & + \beta_7 Bro\ker Size_{i,j,t} + \beta_8 GExp_{i,j,t} + \beta_9 FExp_{i,j,t} \\ & + \beta_{10} AnalystFollowing_{j,t} + \beta_{11} Dispersion_{i,j,t} \\ & + \beta_{12} H_{j,t} + \beta_{13} Days\_last\_REV_{i,j,t} + \varepsilon_{i,j,t}, \end{aligned} \quad (3)$$

where $nextREVdays_{i,j,t}$ is equal to the number of days required for a financial analyst to revise his/her earnings forecast for year *t*+1 (the first revision) after a company announces its earnings for year *t*. We also control for $Days\_last\_REV_{i,j,t}$, which is defined as the number of days between the day the most recent forecast revision for firm j issued by analyst i before a company announces its earnings for year *t* and the earnings announcement day. We control this variable because once an analyst has revised his/her earnings forecast for firm *j*, he/she is unlikely to revise the forecast again for the firm within a short period. The definitions of all other variables conform to those of Model 1.

In this section, we follow O'Brien et al. (2005) to apply the hazard model of Cox regression developed by Cox (1972) to examine the timely response of financial analysts to the news of an earnings announcement in a 14-day window following the day of the announcement. To implement the hazard model, we define the subsequent revision date as the period that starts with the day of the earnings announcement and ends with either the early date of the next revision or the end of the window. In the Cox model, the hazard ratio of $nextREVdaysi,j,t$ is estimated, which represents instantaneous risk of forecast revision for analyst *i*. The negative relation between the $nextREVdaysi,j,t$ and uncertainty under the Hardzard model indicates higher degree of uncertainly is linked with slower adjustment of revision. An advantage of this method is that we can obtain unbiased and asymptotic estimates of the coefficients.

4. EMPIRICAL RESULTS

4. 1 DATA AND SAMPLE SELECTION

The data on the earnings and earnings forecasts for this study are obtained from the Institutional Broker Estimate System (I/B/E/S) detail history tape and cover the period of 1991 to 2010. We adjust the dilution effect on the actual earnings and earnings forecasts to primary basis. An analyst may report more than one earnings forecast for the same year on the same company, and only the most recent forecast before the end date of the fiscal year is reserved. Clement (1999) documents that some analysts may herd other analysts' forecasts close to the date of the earnings announcement; therefore, the current study ignores earnings forecasts made after the fiscal end date. Stock returns and prices are obtained from the Center for Research in Security Price (CRSP). Variables regarding financial statements and segments originate from Compustat. Upon merging the three aforementioned databases and excluding the missing data, the sample for this study consists of 82,496 observations.

4.2 SUMMARY STATISTICS

This research employs three regressions to verify the three hypotheses. Table 1 shows the descriptive statistics and distributions of all variables. The mean accuracy is 0.01, whereas mean optimism is close to 0.00. On average, an analyst requires approximately 10 days to revise earnings forecasts (*nextREVdays*) after an earnings announcement. The 10^{th} percentile of RD is 0, thus indicating that amount of R&D expenses in more than 10% of the companies in this sample show a very low figure. Such expenses are typically greater than advertising expenses are. The mean values of *nextREVdays* and *days_last_REV* are approximately 10 and 80 days, respectively, thus suggesting that financial analysts revise their forecasts quickly after the day of the earnings announcement. *DaysElap* indicates the days between two estimated dates of different forecasts for the same company. The mean of this variable is roughly 79, which is considerably higher than that of *nextREVdays*; therefore, when financial analysts receive new information (such as earnings announcements), they revise prior forecasts instantly.

The mean for firm-specific experience is approximately four years, but the 75^{th} percentile is only five years. This outcome indicates that most of the financial analysts (75%) do not follow the same company for more than five years. *BrokerSize* refers to the total number of analysts employed by a brokerage house; the mean value of this variable is approximately 80, the 50^{th} percentile is 55, and the 75^{th} percentile is 120. Therefore, this sample consists of many small and few large brokerage houses. Appendix 1 exhibits the correlation coefficients of the regression variables; the results suggest that certain independent variables are highly correlated (e.g. *GExp* and *FExp*, *RD* and *IndSpec*). Therefore, we estimate Model 1 to Model 3 by several auxiliary regressions that ignore highly correlated variables.

Table 1. Descriptive statistics and distributions of regression variables

Variable	Mean	Std.	P25	Median	P75
Accuracy	0.011	0.023	0.001	0.003	0.009
Optimism	0.004	0.025	-0.003	0.000	0.002
nextREVdays	10.888	5.700	3.000	15.000	16.000
RD	0.117	0.108	0.012	0.084	0.213
ADE	0.038	0.047	0.008	0.021	0.054
AT	18230	33042	858	3494	16773
ForHorizon	223.643	225.196	64.000	80.000	231.000
DaysElap	83.292	61.453	40.000	83.000	91.000
IndSpec	0.359	0.293	0.101	0.266	0.620
NCom	16.260	8.019	11.000	16.000	20.000
BrokerSize	83.620	70.820	27.000	56.000	122.000
GExp	8.072	4.238	4.000	8.000	11.000
FExp	4.092	2.440	3.000	4.000	6.000
AnalystFollowing	26.818	14.562	12.000	22.000	34.000
Dispersion	0.459	0.416	0.091	0.188	0.398
H	0.390	0.294	0.000	0.470	0.693
lagAccuracy	0.005	0.013	0.001	0.002	0.005
lagOptimism	0.000	0.013	-0.002	0.000	0.001
days_last_REV	81.065	60.569	41.000	82.000	92.000

Notes: This table presents descriptive statistics for all variables. The number of observations is 82,496. Accuracy is the forecast error = $|\text{forecast} - \text{actual}|/P_{j,t-1}$. Optimistic=(forecast-actual)/$P_{j,t-1}$. NextREVdays is equal to the number of days required for a financial analyst to revise his/her earnings forecast for year t+1 (the first revision) after a company announces its earnings for year t. AT_t is the logarithm of the total assets of company *j* in year *t*; $ForHorizon_t$ is the number of calendar days between the forecast issue date and the fiscal end date; *DaysElap* denotes the days between the date on which the present earnings forecast was issued by analyst *i* and the date on which the most recent forecast was issued by other analysts for the same firm in the same year; $IndSpec_{i,j,t}$ measures industrial specialization, which is defined as the number of companies in the industry to which the firm *j* belongs covered by analyst *i* divided by the number of companies covered by analyst *i* in year *t*; $Ncom_{i,j,t}$ is defined as the number of companies covered by analyst *i* in year *t*; *BrokerSize* is the total number of analysts employed by the brokerage house to which analyst *i* when the forecast was issued in the year *t*; *GExp* is general experience and is defined as the number of years analyst *i* exists in I/B/E/S before year *t*; *FExp* is firm-specific experience, which is represented by the number of years analyst *i* issues a forecast to firm *j* before year *t*; *AnalystFollowing* is the number of analysts following company *j* in year *t*; *Dispersion* is the variance of all forecasts issued by different analysts for company *j* in year *t* within 90 days before the fiscal year end date; *H* is an assets-weighted measure of Herfindahl-based indices that is applied to determine firm diversification which is classified according to the business segment; *lagAccuracy* is the accuracy of the forecast issued by analyst *i* for company *j* in the previous year *t−1*; *lagOptimism* is the $Optimism_{i,j,t}$ for analyst *i* in relation to firm *j* in year *t−1*;*Days_last_REV* which is defined as the number of days between the day the most recent forecast revision for firm j issued by analyst i before a company announces its earnings for year *t* and the earnings announcement day.

4.3 Regression Results

The results for Model 1 are reported in Table 2. In consideration of the multicollinearity problem, this regression is also divided into three parts: columns A, B, and C. As predicted, the coefficients for RD is positive and significant, whereas the coefficient for ADE is positive but not always significant. Thus, issuing accurate earnings forecasts is difficult for

financial analysts if a company has high levels of uncertainty represented by R&D expenses. The coefficient for AT is negative and significant, thereby indicating that the information is more transparent if a company has a high level of total assets, and the earnings forecasts are accordingly accurate. The result of Table 2 shows that analyst forecast inaccuracy increases when the degree of firm uncertainty increases; therefore, the first conclusion is that company uncertainty negatively influences financial analysts' forecast accuracy.

Table 2. Regression results on forecast accuracy

Variable	(A)	(B)	(C)
Intercept	0.004	0.0061	0.0014
	(3.45)***	(4.87) ***	(3.41) ***
RD	0.0314	0.0049	0.0061
	(4.68) ***	(13.65) ***	(6.25) ***
ADE	0.0069	0.00818	0.0068
	(0.21)	(9.54) ***	(1.93) *
AT	-0.0095		-0.0042
	(-6.87) ***		(-6.84) ***
ForHorizon	0.0036	0.0075	0.0056
	(7.32) ***	(11.62) ***	(7.29) ***
DaysElap	0.0066	0.0086	0.0046
	(8.45) ***	(0.35)	(2.35) **
IndSpec	-0.0083		-0.0064
	(-3.69) ***		(-4.68) ***
NCom		-0.0061	
		(-5.62) ***	
BrokerSize	-0.0046	-0.0016	-0.0067
	(-3.98) ***	(-6.57) ***	(-2.36) **
GExp		-0.0091	-0.0034
		(-3.21) ***	(-1.84) *
FExp	-0.0098		
	(-4.87) ***		
AnalystFollowing		-0.0023	
		(-6.94) ***	
Dispersion	0.0264	0.0341	0.0161
	(9.46) ***	(11.68) ***	(8.14) ***
H	0.006	0.0028	
	(7.65) ***	(7.62) ***	
lagAccuracy	0.5692	0.5136	0.4592
	(7.92) ***	(6.84) ***	(6.54) ***

Notes: Table 2 presents the regression coefficients for accuracy. The t-values are in parentheses. ***, ** and * indicate statistical significance at the 1 percent, 5 percent and 10 percent two-tailed confidence levels, respectively.

The results for Model 2 are listed in Table 3. The coefficient of RD and ADE are both positive and significant in columns A, B, and C; thus, when a company has a high degree of uncertainty, financial analysts more easily report optimistic forecasts. These results suggest that if a company's R&D or advertising expense accounts for a significant portion of its total operating expense, then financial analysts also easily report optimistic forecasts. The coefficient of AT is negative and significant; therefore, reporting optimistic forecasts to such large, stable companies is usually difficult for financial analysts. Table 3 concludes that company uncertainty positively influences the optimism degree of analyst forecasts, and the second hypothesis is confirmed. In addition, the earnings forecasts of such analysts are generally and persistently overoptimistic. Reporting accurate earnings forecasts is difficult for financial analysts given a highly degree of uncertainty company; thus, such analysts tend to report optimistic forecasts to favor management.

Table 3. Regression results on analyst optimism

Variable	(A)	(B)	(C)
Intercept	0.00485 (4.69) ***	-0.0041 (-4.65) ***	-0.0496*** (-7.56)
RD	0.0013 (1.86) *	0.0076 (6.25) ***	0.0047 (8.23) ***
ADE	0.0064 (6.23) ***	0.0243 (8.41) ***	0.0037 (4.68) ***
AT	-0.0094 (-4.58) ***		
ForHorizon	0.0071 (9.45) ***	0.0096 (9.65) ***	0.0096 (7.63) ***
DaysElap	0.0061 (0.35)	0.00001158 (0.61)	0.0031 (5.14) ***
IndSpec	-0.0034 (-5.61) ***		-0.0067 (-6.85) ***
NCom		-0.0412 (-0.07)	
BrokerSize	0.0035 (0.54)	-5.10E-07 (-0.63)	0.0047 (0.21)
GExp		-0.0016 (-5.61) ***	-0.0018 (-6.47) ***
FExp	-0.0013 (-3.68) ***		
AnalystFollowing		-0.0071 (-5.37) ***	
H	0.0069 (2.35) **	-0.0063 (-1.60)	0.0062 (6.59) ***
Dispersion	0.0413 (11.56) ***	0.0341 (8.45) ***	
lagOptimistic	0.5612 (5.69) ***	0.4623 (6.75) ***	0.0043 (7.236) ***

Notes: Table 3 presents the regression coefficients for optimistic. The t-values are in parentheses. ***, ** and * indicate statistical significance at the 1 percent, 5 percent and 10 percent two-tailed confidence levels, respectively.

The results for Model 3 are displayed in Table 4. This regression is conducted in three models: columns A, B, and C. The coefficient of RD and ADE are negative and significant; therefore, a company with low R&D or advertising expense will permit financial analysts to adjust their earnings forecasts quickly once some important public information is provided. The coefficient of AT is positive and significant, thereby suggesting that financial analysts adjust their earnings forecasts in a timely manner once important public information has been presented when the total assets of the target firm are high. The results of Table 4 indicate that the timely response of analysts to public news decreases with company's degree of uncertainty, because an analyst requires much time to interpret whether the new information obtained regarding a highly uncertain company is positive or negative. As a result, these analysts need additional time to revise their earnings forecasts; hence, the third hypothesis is confirmed.

Table 4. Regression results on analyst speed of revision

Variable	(A)	(B)	(C)
RD	-0.6852 (2.51) **	-0.1385 (4.65) ***	-0.0436 (8.62) ***
ADE	-0.4256 (2.53) **	-0.4268 (6.51) ***	-0.1425 (5.25) **
AT	0.0075 (5.68) ***		
DaysElap	-0.0046 (0.41)	-0.004265 (1.25)	-0.0046 (0.62)
IndSpec	0.0675 (6.84) ***		0.4263 (4.62) ***
NCom		-0.0043 (9.64) ***	
BrokerSize	0.0476 (4.56) ***	0.0049 (7.36) ***	0.0071 (4.59)***
GExp		0.0137 (3.54) ***	0.0635 (7.61) ***
FExp	0.0327 (7.51) ***		
AnalystFollowing		0.0048 (6.17) ***	
Dispersion	-0.0468 (8.69) ***	-0.0672 (9.41) ***	-0.0468 (4.55) ***
H	-0.04692 (8.27) ***	-0.0486 (4.75) ***	-0.0142 (5.51) **
Days_last_REV	0.0072 (0.69)	-0.0072 (0.95)	-0.0018 (0.94)

Notes: Table 4 presents the regression coefficients for adjustment timeliness. The Chi-Square-values are in parentheses. ***, ** and * indicate statistical significance at the 1 percent, 5 percent and 10 percent two-tailed confidence levels, respectively.

5. CONCLUSION

This study investigates the effect of the uncertainty degree of a target company on the forecast behavior of analysts in three aspects: forecast accuracy, degree of forecast optimism, and the speed of earnings forecast revision. To this end, we use the R&D and advertising expenses act as proxy variables for uncertainty. When a company has a high degree of uncertainty, an analyst must spend much time and effort to process and analyze the related information. Thus, our empirical results indicate that the future earnings of a firm are difficult to predict when the uncertainty level is high. Hence, earnings forecast accuracy is diminished. Due to uncertainty, an analyst does not respond in a timely manner to new information. Nonetheless, analysts are likely to issue optimistic forecasts to a highly uncertain company because his/her willingness to add the coverage of a high R&D and advertising expenses company implies a belief that the firm has good prospects. Thus, our findings conclude that the degree of uncertainty of a firm results in earnings forecasts that are not very accurate and are optimistic in addition to a response to earnings announcement news that is not very timely. Our results provide an important reference to market participants in making investment decisions as well as convey important messages to policy makers. In addition, we fill in the gap in the literature on the degree of a firm's uncertainty in association with the earnings forecasts of analysts.

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Appendix 1. Correlation coefficients of regression variables

Variable	Acc	Opt	NRD	RD	ADE	AT	FH	DE	IS	NCom	BS	GExp	FExp	AF	Dis	H	Lacc	Lopt	DLR
Acc	1.00																		
Opt	0.71	1.00																	
NRD	0.21	0.12	1.00																
RD	0.04	0.05	-0.06	1.00															
ADE	-0.06	0.01	0.00	0.04	1.00														
AT	-0.11	-0.06	-0.01	0.03	0.21	1.00													
FH	0.36	0.20	0.46	0.01	0.01	0.02	1.00												
DE	-0.03	0.01	0.05	0.00	0.03	0.02	-0.01	1.00											
IS	-0.07	-0.06	-0.04	0.45	0.04	0.15	0.01	-0.03	1.00										
NCom	-0.04	-0.02	-0.01	0.02	0.02	-0.08	-0.09	0.07	-0.19	1.00									
BS	0.02	0.02	-0.03	-0.03	0.00	0.05	0.04	-0.07	0.06	0.00	1.00								
GExp	-0.04	-0.03	-0.03	-0.06	-0.05	0.04	-0.02	-0.01	-0.05	0.20	0.08	1.00							
FExp	-0.05	-0.02	-0.02	0.01	0.01	0.12	0.02	0.03	-0.01	0.12	0.06	0.56	1.00						
AF	-0.19	-0.13	-0.08	0.47	0.29	0.36	-0.03	-0.02	0.33	0.00	-0.02	-0.01	0.09	1.00					
Dis	0.38	0.27	0.03	-0.04	-0.05	0.02	0.06	-0.07	-0.11	-0.02	0.07	0.02	0.02	-0.02	1.00				
H	0.05	0.02	-0.02	-0.02	0.12	0.36	-0.01	0.04	0.02	-0.01	0.04	0.03	0.09	0.17	0.03	1.00			
LAcc	0.40	0.22	0.10	-0.03	-0.06	-0.07	0.22	-0.03	-0.04	-0.02	0.01	-0.01	-0.01	-0.16	0.23	-0.05	1.00		
LOpt	0.26	0.31	0.05	-0.05	-0.02	-0.03	0.12	-0.01	-0.04	-0.01	0.01	-0.01	0.02	-0.07	0.14	0.00	0.59	1.00	
DLR	-0.03	0.01	0.05	0.00	0.03	0.02	-0.01	1.00	-0.03	0.07	-0.07	-0.01	0.02	-0.02	-0.07	0.04	-0.03	-0.01	1.00

Notes: Appendix 1 shows the Pearson Correlation Coefficients for all the regression variables. Acc is Accuracy. Opt is Optimistic. NRD is nextREVday. LAcc is lagAccuracy. FH is ForHorizon. DE is DaysElap. IS is IndSpec. BS is BrokerSize. AF is AnalystFollowing. Dis is Dispersion. LOpt is lagOptimistic. DLR is days_last_REV. Accuracy is the forecast error = $|\text{forecast} - \text{actual}|/P_{j,t-1}$. Optimistic=(forecast-actual)/$P_{j,t-1}$. NextREVdays is equal to the number of days required for a financial analyst to revise his/her earnings forecast for year t+1 (the first revision) after a company announces its earnings for year t. *AT* is the logarithm of the total assets of company *j* in year *t*; *ForHorizon* is the number of calendar days between the forecast issue date and the fiscal end date;

DaysElap denotes the days between the date on which the present earnings forecast was issued by analyst *i* and the date on which the most recent forecast was issued by other analysts for the same firm in the same year; *IndSpec* measures industrial specialization and is defined as the number of companies in the industry to which the firm *j* belongs covered by analyst *i* divided by the number of companies covered by analyst *i* in year *t*; *BrokerSize* is the total number of analysts employed by the brokerage house to which analyst *i* when the forecast was issued in the year *t*; *GExp* is general experience and is defined as the number of years analyst *i* exists in I/B/E/S before year *t*; *FExp* is firm-specific experience, which is represented by the number of years analyst *i* issues a forecast to firm *j* before year *t*; *AnalystFollowing* is the number of analysts following company *j* in year *t*; *Dispersion* is the variance of all forecasts issued by different analysts for company *j* in year *t* within 90 days before the fiscal year end date; *H* is an assets-weighted measure of Herfindahl-based indices that is applied to determine firm diversification which is classified according to the business segment; *lagAccuracy* is the accuracy of the forecast issued by analyst *i* for company *j* in the previous year *t−1*; *lagOptimism* is the $Optimism_{i,j,t}$ for analyst *i* in relation to firm *j* in year *t−1*;*Days_last_REV* which is defined as the number of days between the day the most recent forecast revision for firm j issued by analyst i before a company announces its earnings for year *t* and the earnings announcement day.