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Annual report tone and divergence of opinion: evidence from textual analysis

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ABSTRACT

By utilizing web-crawling and text analysis techniques on unstructured big data (text sets), this study examines to what extent investors disagree with the sentiment conveyed in annual reports. The main empirical findings suggest that the tone of annual reports significantly influences investor opinions. Specifically, a negative tone in annual reports is associated with high levels of divergence among investors' opinions, whereas a positive tone correlates with lower divergence. In the robustness tests, the results remain consistent after controlling for various factors. After we control for Management Discussion and Analysis (MD&A), both positive and negative tones in annual reports continue to be significant predictors of divergences in investor opinions. Additionally, after controlling for future earnings quality, future cash flows, and future earnings surprises, investors still present high/low divergence of opinion in response to a negative/positive tone in annual reports. Moreover, the robustness of our analysis is assessed by employing alternative sentiment analysis word lists.

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KEYWORDS

Divergence of opinion; corporate disclosure tone; textual analysis

1. Introduction

Extensive studies have demonstrated that investors may express disagreement when quantitative disclosures, such as financial statements, include information about uncertain valuations (Abdel-Meguid et al., 2019; Ahmed et al., 2009; Berkman et al., 2009; Shu & Tan, 2022). However, as the main form of corporate disclosures, the role of corporate qualitative information in eliciting investor disagreement has received comparatively little attention from researchers, particularly concerning the tone of corporate disclosures. Similar to quantitative information, the tone of corporate disclosures conveys critical valuation insights about the company. For example, a positive disclosure tone is often associated with low earnings variability and reduced operational risk (Del Gaudio et al., 2020; Liu & Nguyen, 2020; Yang et al., 2022), implying low corporate valuation uncertainties. Conversely, a negative disclosure tone is indicative of high risks and low

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earnings quality (Del Gaudio et al., 2020; Lopatta et al., 2017), implying high corporate valuation uncertainties.

Contrastingly, unlike quantitative financial data, which primarily reflect uncertain valuations based on past performance, the tone of corporate disclosures – characterized by positive or negative word usage – reflects managers' optimistic or pessimistic outlooks on the company's future performance (Ataullah et al., 2018; Davis & Tama-Sweet, 2012; Jiang et al., 2019). Thus, corporate disclosure tone is more directly related to future performance than numerical financial information (Davis & Tama-Sweet, 2012; Luo & Zhou, 2020), providing investors with a potentially more accurate framework for anticipating future outcomes. This study, therefore, seeks to explore whether the explanation of investors' divergence of opinion on the corporate disclosure tone would also exist as much as investors' divergence of opinion on numerical financial indicators.

Within the context of research on investors' disagreement on disclosure tone, two studies are particularly relevant to our research questions. Baginski et al. (2018) analyze data from management earnings forecasts and document a positive relationship between residual positive tone and investors' divergence of opinion. Druz et al. (2020) find that analysts tend to exhibit a higher dispersion in their forecasts when managers use more negative words (linguistic tone) during conference calls. However, these studies have not investigated how investors' divergence of opinion responds to the linguistic tone conveyed in annual report content. Annual reports are essential information sources for investors to understand companies' annual operations and financial conditions and to alleviate internal and external information asymmetry (Cao et al., 2022; Loughran & McDonald, 2011). Annual reports present the most extensive narrative sample, reflecting a company's narrative reporting style and providing comprehensive information (Loughran & McDonald, 2011; Wisniewski & Yekini, 2015). Therefore, managers have greater flexibility to express their sentiments using a broader range of semantic words. Moreover, the annual report holds higher credibility than other types of disclosures, as it is the only audited corporate disclosure. Consequently, the linguistic tone extracted from the annual report is highly informative and comprehensive, capturing managerial optimism or pessimism. This makes the tone of the annual report potentially more predictive of a company's future performance.

Our study focuses on analyzing Chinese textual data sourced from the Chinese stock market, driven by the following main motivations. First and foremost, individual investors, who significantly contribute to diverse opinions, play a major role in the Chinese stock market. Our study aims to provide valuable insights into the behaviors of Chinese investors, enriching the existing literature. Secondly, unlike previous studies that focus on English-speaking contexts, our research takes into account the nuances of the Chinese language. Being a tonal language, Chinese exhibits a more intricate use of lexicon in its written form. For example, a Chinese word can be composed of single or multiple characters (Wierzbicka, 1999; Woon Yee Ho, 2009). Liu and Zhao (2013) suggest that emotions expressed in Chinese may be more ambiguous, given the cultural traits of modesty and prudence reflected in positive words. Consequently, the tone extracted from annual reports may carry different corporate implications in the Chinese context compared to the English-speaking world.

The main findings of this research are as follows. By leveraging textual analysis techniques, we analyze the tone of annual reports from Chinese listed companies

spanning from 2007 to 2019. We find that investors present a high divergence of opinion towards negative annual report tone, whereas they are less likely to disagree with companies' positive annual report tone (measured as net proportions of positive words). Additional analyses suggest that investors' divergence of opinion towards the full content of the annual report tone is not derived from the MD&A tone. Moreover, after we take into account the future quantitative information: earnings uncertainty, cash flow, and earnings surprise, investors' divergence of opinion can still be explained by the annual report tone, implying that annual report tone could incorporate managers' psychological views or other quantitative indicator information. Finally, our above findings robustly exist in the classifications of Loughran & McDonald (2011) words list.

This study makes several significant contributions to the existing body of literature. First, we explore how investors' opinions diverge in response to the textual information in annual reports. Second, we examine the relationship between managerial statements and investor reactions. Third, the research extends knowledge of investor behavior in the Chinese stock market, addressing unique market characteristics. Fourth, we investigate how lexicon usage in corporate disclosures affects investor valuations in a tonal language context, such as Chinese, highlighting the linguistic nuances' impact on financial interpretation. Finally, the study suggests a future research pathway exploring the influence of managerial sentiment on investor evaluations and asset pricing, given certain performance metrics.

This paper is structured as follows. Section 2 reviews existing literature and formulates the hypotheses that guide our investigation. Section 3 describes our methodological framework, detailing the measurement of variables, the composition of our data sample, and the specification of our model. Section 4 presents the empirical results and discusses their implications. Section 5 is devoted to robustness tests, ensuring the validity and reliability of our results. Finally, Section 6 concludes the paper.

2. Literature review and hypothesis development

2.1. Negative annual report tone and divergence of opinion

Investors' divergence of opinion is referred to as investors holding disagreement on the firm's fundamental value (Doukas et al., 2006; Miller, 1977). In other words, high divergence of opinion indicates investors' broad differential firm valuations, which is derived from companies' uncertainties (Barron & Stuerke, 1998; Druz et al., 2020; Zhang, 2006). Silva and Cerqueira (2021) hypothesize and empirically confirm that investors depend more on their private valuations and individual information sources when there is more uncertainty regarding firms' value. In a similar vein, Ahmed et al. (2009) show that investors' differential interpretations are likely to be reduced by high earnings quality. The reason is that analysts are less likely to acquire private information to differentially interpret the earnings when earnings quality is high. High earnings quality implies that analysts have higher predictable accuracy for future earnings. We postulate that a negative annual report tone contains information regarding companies' uncertain valuations, to which investors present differential interpretations, thus higher divergence of opinion.

In the context of annual reports, extensive studies have shown that negative tone usage is associated with companies' risks and uncertainties. For instance, Lopatta et al. (2017) find that firms at risk of bankruptcy use significantly more negative words in their annual report filings compared to financially stable companies. This pattern persists up to three years prior to the actual bankruptcy filing. Similarly, Purda and Skillicorn (2015) find that negative linguistic cues in the annual report are associated with financial fraud. Furthermore, concerning earnings uncertainties, Liu and Nguyen (2020) find that a negative tone in the forward-looking sections and the CEO's letter of annual reports is associated with earnings quality, measured by earnings variability.

Regarding the investors' disagreement reactions, Loughran and McDonald (2011) analyze a U.S. sample spanning from 1994 to 2008 and find that the use of negative tone in 10-K filings is associated with increased stock return volatility and higher trading volume, indicating that companies with negative disclosures exhibit greater divergence of opinion in the stock market. Prior studies suggest that stock returns capture investors' reactions, and trading volume can be used to distinguish between different types of market participants' responses to such disclosure (Cready & Hurtt, 2002; Fischer et al., 2021). Shalen (1993) argues that a greater divergence of opinion directly leads to higher return volatility. In measuring divergence of opinion, numerous studies utilize stock return volatility (Boehmer et al., 2005; Gao et al., 2006; Garfinkel, 2009) and trading volume (Banerjee, 2011; Chang et al., 2021; Harris & Raviv, 1993) as proxies. Therefore, the presence of high return volatility and trading volume suggests investors' high divergence of opinion caused by the negative tone used in annual reports. Moreover, the negative tone is usually paired with lower readability in the annual report, as drawn from the obfuscation hypothesis that managers tend to obfuscate companies' negative outcomes. As such, by intentionally reducing the readability of annual reports, managers may lead investors to experience greater divergence of opinion (De Franco et al., 2015; Efretuei, 2021; Hassan et al., 2022; Lehavy et al., 2011).

Taken together, these studies demonstrate that a negative tone in annual reports contains information that signals corporate future uncertainties, such as potential risks and uncertain profitability. As discussed earlier, investors' divergence of opinion increases due to differential interpretations of uncertain valuations. Consequently, disagreements among investors are likely to increase. Based on this understanding, we hypothesize that:

H1: Negative annual report tone is associated with divergence of opinion.

2.2. Positive annual report tone and divergence of opinion

In contrast to a negative tone that reflects company uncertainties, a positive tone has been widely vindicated as a sign of fewer corporate uncertainties. Theoretically, according to the incremental information hypothesis, managers use positive words to signal positive corporate outcomes (Davis & Tama-Sweet, 2012; Liu & Nguyen, 2020; Wu et al., 2021). Some studies show that the positive tone suggests less uncertainty. Patelli and Pedrini (2014) provide empirical evidence of a significant link between an optimistic tone and future earnings performance. Moreover, concerning investors' anticipation of earnings, Del Gaudio et al. (2020) study shows that a positive annual report tone is associated with lower subsequent earnings variability (measured as the standard deviation of ROA), which implies that a positive annual report tone signals low corporate uncertainty. Similarly, P. Liu and Nguyen (2020) find that companies with a more positive tone in their annual report are associated with higher subsequent quarter profitability. Drawing on evidence from China, Yang et al. (2022) find a relationship between more positive annual report tones and a lower probability of the regulator issuing an inquiry letter. The underlying reason is that a positive tone is likely to generate an overall positive expectation of financial statements and a company's operations, thus potentially yielding a higher forecast of the listed company's sustainability and profitability while also reducing doubts about its internal and external uncertainties. Therefore, in this condition, investors could have a lower divergence of opinion, as difficulties for their value function may be mitigated.

Apart from a positive tone delivering a signal of a company's good performance, two strands of literature provide additional explanations for the relationship of a positive tone to lower divergence of opinion. Chen (2020) identifies that when faced with positive news, pessimistic traders, constrained by short sale prohibitions, tend to exit the market. This reduction in the number of pessimistic investors, while maintaining a constant population of optimists, leads to decreased divergence of opinion. In addition, a positive tone is also likely to decrease information asymmetry and further reduce investors' divergence of opinion. For instance, a positive disclosure tone may speed up information transmission to investors, implying a reduction of information asymmetry (Brown & Tucker, 2011; Feldman et al., 2010) since some studies have shown that information asymmetry is another steam for waving investors' divergence of opinion (Fischer et al., 2021; Kim & Verrecchia, 1994, 1997). Therefore, in this spirit, investors' divergence of opinion would be reduced by a positive annual report tone. Based on these discussions, we hypothesize that:

H2: Positive annual report tone is associated with lower divergence of opinion.

3. Data & methodology

3.1. Descriptive statistics

The annual reports are collected from Shanghai and Shenzhen stock exchanges. Additional firm characteristics data are collected from China Stock Market & Accounting Research Database (CSMAR). Our sample spans from 2007 to 2019 and excludes all special treated (ST) companies due to their potential risk of delisting and low accounting quality. Moreover, we excluded firms with a negative book value, as per regulations from the China Securities Regulatory Commission (CSRC) that prohibit such firms from being listed in the capital market.

3.2. Measurement of annual report tone

To assess annual report tone, following the methodology outlined byFeldman et al. (2010) and Bassyouny et al. (2020), we adopt net proportions of positive sentiment words to proxy for positive annual report tone, which is calculated by the difference of positive word count and negative word count divided by the total word count. This measurement effectively captures the net sentiment expressed by managers. A higher net tone indicates a more positive sentiment conveyed in the annual report.

Negative annual report tone is calculated by dividing the number of negative words by the total number of words. Previous research, such as the studies by Hildebrandt and Snyder (1981), has documented the Pollyanna effect, where managers tend to use more positive than negative words in business communications. From this perspective, the presence of more negative words often accompanies an increase in positive words, and a single negative tone may not necessarily imply negative implications (Boudt & Thewissen, 2019). Therefore, to address this issue, we also consider the proportions of positive words in annual reports as a control variable.

To classify sentiment words, we utilize the National Taiwan University Semantic Dictionary (NTUSD). This word list is extensively used for identifying sentiment in social media posts (Zeng et al., 2012) and is well-suited for analyzing Chinese textual information (Cao et al., 2022; Yuan et al., 2022).

3.3. Measurement of divergence of opinion

To measure divergence of opinion, we employ the dispersion of analyst forecasts as our first proxy, which is expected to capture experts' divergence of opinion. Inspired by D'Augusta et al. (2016) and Hu et al. (2021), we compute the dispersion of analysts' forecasts as follows:

$$DISP_{i,t} = \frac{Std(FEPS_{i,t})}{AEPS_{i,t}}$$
(1)

Forecast dispersion (DISP) is computed by the standard deviation of all analysts' EPS forecasts (StdFEPS), divided by the actual value of earnings per share stock (AEPS). We choose a window of analysis between the annual report issued in year t and 3–6 months before the next annual report issued in year t + 1. During this window, analyst forecast behavior is mainly influenced by the annual report tone and is not likely to be influenced by the textual information in other disclosures (year-end conference call and on-site visit, etc.).

In addition, to investigate the effects of annual report tone on the divergence of opinion surrounding the annual report announcement window, inspired by Chrodia et al. (2001) and Barinov (2015), we adopt the following two indicators. The first indicator is a trading turnover-based measure (VOLA), which is computed as the standard deviation of daily excess turnover during the 2-day period starting from the annual report announcement date and extending to 31 days after the announcement ([+2, +31]). To detrend the effects of individual trading volume driven by market level, the excess turnover ratio is calculated as the difference between the firm-level turnover ratio and the market

turnover ratio. The second indicator is a stock returns-based measure (RETVOL), computed as the standard deviation of daily excess returns from the second day after the annual report is released up to the 31st day following the release ([+2, +31]).

3.4. Models specification

To examine the first hypothesis regarding the effects of negative annual report tone on divergence of opinion, we formulate the following equation:

$$DIVO_{i,t+1} = \beta_1 NTone_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 BM_{i,t} + \beta_4 DE_{i,t} + \beta_5 REGROW_{i,t} + \beta_6 LIQU_{i,t} + \beta_7 LOGCT_{i,t} + \beta_8 NUDP_{i,t} + \beta_9 DIQUA_{i,t} + \beta_{10} ROA_{i,t} + \beta_{11} DIQUA_{i,t} + \sum Firm + \sum Year + \alpha_{i,t}$$

$$(2)$$

where $DIVO_{i,t+1}$ denotes proxies of divergence of opinion corresponding to the date of annual report release. To estimate how annual report tone effects differently influences three proxies for divergence of opinions, we standardize the coefficients of divergence of opinion proxies.

To control other elements related to divergence of opinion, control variable include SIZE, the natural logarithm of total asset value that controls for size effects; DE, denoting debt to equity, controls for leverage level; and BM, denoting book-to-market ratio. To further control for revenue momentum, we use REGROW to denote the growth rate of revenue. LIQU denotes the liquidity level around the date of the annual report release and is calculated as the average turnover ratio over the window of annual report release. LOGCT is a natural logarithm of total words account of an annual report, which controls for document length. Due to the Pollyanna effect, we introduce positive word proportions (NUDP) as a control variable, which is calculated as the positive word count divided by the total word count. DIQUA is a proxy of corporate disclosure quality, measured by Kim and Verrecchia's (2001) method. ROA is used to control for earnings information. STDEV is the standard deviation of annualized stock return, computed as the standard deviation of return over the last 12 months ending three months after the fiscal year-end. To address the potential concern that analysts' dispersion of analysts' forecasts may be related to analysts following, we also control analyst following (ANF), which is computed as the natural logarithm of one plus the analysts' reports. In the event of potential endogenous issues, for instance, omitted variables, we control for firm and year-fixed effects: $\sum Firm \sum Year$ with clustering standard errors. We present the definitions of the variables in Table 1.

To examine hypothesis two regarding the association between positive annual report tone and divergence of opinion, we formulate the following equation:

$$\begin{split} DIVO_{i,t+1} &= \beta_1 PTone_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 BM_{i,t} + \beta_4 DE_{i,t} + \beta_5 REGROW_{i,t} + \beta_6 LIQU_{i,t} \\ &+ \beta_7 LOGCT_{i,t} + \beta_8 DIQUA_{i,t} + \beta_9 ROA_{i,t} + \beta_{10} STDEV_{i,t} + \sum Firm \\ &+ \sum Year + \alpha_{i,t} \end{split}$$

(3)

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Table 1. Variable definitions.

Variable	Definitions
PTone (%)	Positive annual report tone: positive minus negative words divided by total words accounts in the full annual report, then it times 100.
NTone (%)	Negative annual report tone is calculated as the number of negative words divided by the total number of words, then it multiplying by 100. Positive/negative is classified according to National University of Taiwan Chinese Semantic Dictionary.
DISP	Dispersion of analyst forecast which is computed as the value obtained by dividing the standard deviation of company i's earnings per share forecasted by all analysts in year t by accurate earnings per share. The window is adopted during the annual report release at year t and before 3–6 months the next year annual report release t + 1.
VOLA (%)	Divergence of opinion around annual report release which is computed as excess turnover volatility, calculated as firm's excess return volatility over the 2-day period after the annual report release to post 31 days of annual report. Excess turnover volatility is computed as the difference between firm level turnover and market level turnover.
RETVOL (%)	Divergence of opinion around annual report release. It is computed as the standard deviation of excess return during 2 nd -day following annual report release and post 31-day of release.
SIZE	Firm size: the natural logarithm of total asset value to control for size effect.
DE	Leverage ratio: denoted as debt to equity.
BM	Book-to-market ratio.
REGROW (%)	Growth rate of firm value.
LIQU	Liquidity around the annual report release level that is calculated as the average value of turnover ratio during the window $[-1, +1]$.
LOGCT	Natural logarithm of annual report words account, to control for the documents lengths.
DIQUA	Disclosure quality, measured following Kim and Verrecchia (2001).
ROA (%)	Profitability indicator, measured as return on assets.
ANFOL	Analysts following, measured as the natural logarithm of one plus the analysts' reports.
STDREV (%)	Standard deviation of stock return computed as standard deviation of return over the last 12 months ending three months after the fiscal year-end.
NUDP (%)	Positive words proportions: calculated as the positive words accounts divided by the total words account, then it times 100.
RTA (%)	Earnings uncertainty, calculated as standard deviation of the four quarterly return on assets.
Cash	Cash-holding: the total cash divided by the total asset.
SUE	Standardized unexpected earnings surprise: accurate earnings minus the predicted earnings
	divided by the stock prices.

4. Empirical results

4.1. Data & descriptive statistics

Table 2 presents the summary statistics for our main variables, including mean, standard deviation, maximum, and minimum values, following the winsorization of all continuous variables at the 5th and 95th percentiles to mitigate the impact of outliers. Notably, the average positive tone (PTone) in annual reports is higher than the negative tone (NTone), with values of 2.078% and 1.631% respectively. This observation supports the Pollyanna hypothesis that people tend to use more positive words than negative words in business writing (Henry, 2008; Hildebrandt & Snyder, 1981). Moreover, the three investor disagreement measures (DISP, VOLA, and RETVOL) exhibit positive means (0.328, 1.415%, and 2.935% respectively), indicating that the period following the disclosure of annual reports is marked by a significant divergence in investor opinions.

4.2. Negative annual report tone and divergence of opinion

Table 3 illustrates the testing of Hypothesis 1, which explores the relationship between the negative tone in annual reports and divergence of opinion. Across Columns (1) to (6),

Variable	Obs	Mean	Std.Dev.	Min	Max
PTone (%)	18323	2.078	1.118	-0.801	3.943
NTone (%)	18323	1.631	0.276	0.991	2.178
DISP	11686	0.328	0.391	0.013	1.554
VOLA (%)	18323	1.415	1.095	0.139	4.184
RETVOL (%)	18323	2.935	0.917	1.134	4.727
SIZE	18323	22.038	1.179	19.731	24.551
BM	18323	0.606	0.240	0.119	1.018
DE	18323	0.448	0.197	0.060	0.785
LIQU (%)	18323	2.659	2.223	0.178	8.498
LOGCT	18323	10.986	0.266	10.229	11.471
REGROW (%)	18323	1.984	0.987	0.877	4.582
ANFOL	11125	2.578	1.028	0.693	4.927
STDRET (%)	18323	13.050	5.457	4.206	26.847
DIQUA	18323	0.459	0.187	0.091	1.012
ROA (%)	18323	4.212	4.167	-13.529	12.598
NUDP (%)	18323	2.560	0.677	1.279	3.988
F.Cash	15091	0.195	0.132	0.015	0.520
F.RTA (%)	15091	1.947	1.444	0.118	5.547
F.SUE	15091	-1.323	1.919	-14.641	0.851

Table 2. Summary statistics for annual report tone and divergence of opinion.

NTone consistently exhibits significant positive coefficients, underscoring a positive correlation with divergence in opinion. Particularly, when measured by the dispersion of analyst forecasts (DISP), the coefficient of NTone is 0.296, suggesting that 1% of negative tone used in the annual report corresponds to a 0.296% standard deviation from analysts' forecast in EPS.

In terms of investors' divergence of opinion proxied by trading behavior in Columns (4) and Column (6), we find that 1% of the negative tone used in annual reports corresponds to a 0.068% turnover ratio-based divergence of opinion, and 0.068% stock returns-based divergence of opinion. These findings are consistent with the findings of Druz et al. (2020), who demonstrated a similar relationship between the use of negative textual tone and analysts' divergence in opinion. Collectively, these findings suggest that negative annual report tone increases investors' divergence of opinion during the window of annual report release and analysts' forecasts. Several control variables are also significant in shaping expectations. Across all columns, firm size (SIZE) is negatively and significantly associated with investors' disagreement, showing -0.103 in Column (2), -0.238 in Column (4), and -0.267 in Column (6), respectively. Moreover, the leverage effect is positively related to the divergence of opinion around annual report releases, as the coefficients on DE report 0.340 in Column (2), 0.214 in Column (4), and 0.190 in Column (6).

Additionally, the analysis reveals that document length, as indicated by LOGWORD, is positively correlated with investor divergence of opinion. The coefficients on LOGWORD are 0.174 in Column (2), 0.131 in Column (4), and 0.087 in Column (6), respectively. A potential explanation for this relationship is that more extensive corporate disclosures may decrease readability and thus obfuscate investors' understanding, as suggested by D'Augusta et al. (2023). Moreover, the coefficients on return on assets (ROA) are consistently negative and significant across the columns examined, with values of -0.069 in Column (2), -0.013 in Column (4), and -0.015 in Column (6). This indicates that higher company profitability, as quantified by ROA, is associated with lower divergence of opinion among investors. In summary, these results suggest that

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j	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	DISP	DISP	VOLA	VOLA	RETVOL	RETVOL
NTone	0.270***	0.296***	0.160***	0.068**	0.151***	0.058*
	(5.89)	(5.69)	(6.04)	(2.27)	(5.80)	(1.92)
NUDP	(2122)	-0.084***	(000 0)	-0.033***	()	-0.053***
		(-3.85)		(-2.72)		(-4.22)
SIZE		-0.103***		-0.238***		-0.267***
		(-6.09)		(-26.89)		(-28.67)
BM		0.255**		0.326***		0.417***
		(1.97)		(4.34)		(5.52)
DE		0.340***		0.214***		0.190***
		(3.79)		(4.93)		(4.06)
REGROW		0.103***		-0.040**		-0.032**
		(3.89)		(-2.52)		(-2.04)
LIQU		-0.005		0.048***		0.037***
		(-0.98)		(13.62)		(10.66)
LOGCT		0.174***		0.131***		0.087**
		(2.65)		(3.38)		(2.17)
DIQUA		-0.066		0.023		-0.000
		(-1.28)		(0.63)		(-0.00)
ROA		-0.069***		-0.013***		-0.015***
		(-17.71)		(-7.62)		(-8.16)
ANFOL		-0.025				
		(-1.50)				
STDRET				0.006***		0.005***
				(3.49)		(3.38)
Constant	-0.165	0.257	0.465***	3.991***	0.649***	5.281***
	(-0.82)	(0.34)	(3.37)	(9.78)	(4.36)	(12.44)
Observations	11,346	11,125	18,323	18,323	18,323	18,323
R-squared	0.122	0.273	0.110	0.352	0.108	0.361
Number of Firms	2,260	2,225	2,732	2,732	2,732	2,732
Control for Year	Yes	Yes	Yes	Yes	Yes	Yes
Control for Industry	Yes	Yes	Yes	Yes	Yes	Yes

Table 3. Negative annual	report tone and	divergence of	opinion.
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This Table shows the effects of negative annual report tone (NTone), classified by NTUSD, on the divergence of opinion, measured as dispersion of analyst forecast, from Column (1) to Column (2), measured as turnover ratio based divergence of opinion, from Column (3) to Column (4). We control for year and firm fixed effects. T-statistics in parentheses ***p < 0.01, **p < 0.05, *p < 0.1.

a negative annual report tone establishes a higher divergence of opinion. Thus, the first hypothesis cannot be rejected.

4.3. Positive annual report tone and divergence of opinion

Hypothesis 2 asserts the relationship between positive annual report tone and low divergence of opinion. We find that a positive annual report tone significantly reduces investors' divergence of opinion. Shown as Column (1), Column (4), and Column (6) of Table 4, the coefficients on positive annual report tone report -0.065, -0.018, and -0.027 on DISP, VOLA, and RETVOL respectively.

This result suggests that a positive annual report tone could have a persistent influence on analyst's evaluations. Specifically, a 1% increase in the positive tone used for the annual report corresponds to a decrease of 0.0655% in the dispersion of analysts' forecast, which represents a decrease of 0.018% in the divergence of opinion, measured as trading turnover ratio-based indicator, and a decrease of 0.027% in the divergence of opinion, measured as stock returns-based indicator. Thus, consistent with our expectations,

ναριαρί ές	(1) DISP	(2) DISP	(3) VOLA	(4) VOLA	(5) BETVOI	(6) BETVOI
		0.015				
Plone	-0.106***	-0.065***	-0.026***	-0.018***	-0.036***	-0.02/***
0.75	(-8.15)	(-5.43)	(-3./3)	(-2.92)	(-4.96)	(-4.02)
SIZE		-0.108***		-0.239***		-0.26/***
		(-6.37)		(-26.99)		(-28.54)
BW		0.261**		0.328***		0.41/***
55		(2.02)		(4.37)		(5.52)
DE		0.332***		0.213***		0.188***
DECDOW		(3.70)		(4.90)		(4.02)
REGROW		0.104***		-0.040**		-0.032**
		(3.91)		(-2.50)		(-2.04)
LIQU		-0.005		0.048***		0.03/***
LOCCT		(-0.96)		(13.59)		(10.63)
LOGCI		0.101*		0.12/***		0.104***
510114		(1.67)		(3.56)		(2.82)
DIQUA		-0.065		0.023		0.001
		(-1.26)		(0.64)		(0.01)
ROA		-0.069***		-0.013***		-0.015***
11/201		(-1/./8)		(-7.63)		(-8.12)
ANFOL		-0.024				
		(-1.44)				
SIDREI				0.006***		0.005***
A		1 = 2 0 * *		(3.50)		(3.32)
Constant	0.508***	1.529**	0./82***	4.108***	0.9/2***	5.114***
- · ·	(2.69)	(2.37)	(5.93)	(11.95)	(6.84)	(14.16)
Observations	11,346	11,125	18,323	18,323	18,323	18,323
R-squared	0.124	0.273	0.104	0.352	0.106	0.359
Number of Firms	2,260	2,225	2,732	2,732	2,732	2,732
Control for Year	Yes	Yes	Yes	Yes	Yes	Yes
Control for Industry	Yes	Yes	Yes	Yes	Yes	Yes

Table 4. Positive annual report tone and divergence of opinion.

This Table shows the effects of positive annual report tone (PTone), classified by NTUSD, on the divergence of opinion, measured as dispersion of analyst forecast, from Column (1) to Column (2), measured as turnover ratio based divergence of opinion, from Column (3) to Column (4). We control for year and firm fixed effects. T-statistics in parentheses ***p < 0.01, **p < 0.05, *p < 0.1.

a higher level of positive annual report tone mitigates investors' disagreement. Therefore, the second hypothesis cannot be rejected.

5. Additional analyses and robustness tests

5.1. Considerations of MD&A tone

Now we investigate whether investors' divergence of opinion towards annual report tone is derived from Management Discussion and Analysis (MD&A) tone. The MD&A section is one of the key sections in an annual report. It mainly provides lookingforward information (Bochkay & Levine, 2019; Muslu et al., 2015) regarding companies' earnings and business strategies. Thus, it is posited that the underlying roots of investors' disagreement can be derived from the tone expressed in this section.

As shown from Column (1) to Column (3) in Table 5, we examine negative MD&A tone (MDANTone) effects on divergence of opinion with the negative annual report tone. We are particularly interested in the coefficients for the NTone and MDANTone. The empirical results reveal that a negative annual report tone reports a significant coefficient of 0.217 (Column (1)) for dispersion of analysts' forecasts, 0.062 (Column

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	DISP	VOLA	RETVOL	DISP	VOLA	RETVOL
MDAPTone				-0.025***	-0.006	-0.012**
				(-2.74)	(-0.94)	(-2.02)
PTone				-0.048***	-0.018**	-0.024***
				(-3.25)	(-2.19)	(-2.87)
MDANTone	0.130***	0.011	0.020			
	(3.11)	(0.87)	(1.33)			
NTone	0.217***	0.062*	0.060*			
	(3.45)	(1.71)	(1.65)			
Constant	-0.835	4.177***	5.578***	0.507	4.378***	5.593***
	(-0.92)	(7.98)	(10.44)	(0.65)	(9.79)	(12.26)
Observations	8,387	13,443	13,443	8,387	13,443	13,443
R-squared	0.262	0.294	0.323	0.255	0.295	0.323
Number of Firms	1,734	2,052	2,052	1,734	2,052	2,052
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Control for Year	Yes	Yes	Yes	Yes	Yes	Yes
Control for Firm	Yes	Yes	Yes	Yes	Yes	Yes

Table 5. Considerations of MD&A to	ne.
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This Table shows the effects of positive MD&A tone on investors divergence of opinion. From Column (1) to Column (3), we estimate negative MD&A tone effects. From Column (4) to Column (6), we estimate positive MD&A tone effects. t-statistics in parentheses. ***p < 0.01, **p < 0.05, *p < 0.1.

(2)) for VOLA, and 0.060 (Column (3)) for RETVOL. Furthermore, when we delve into the MD&A section, we find that it only plays a significant role in shaping analysts' forecasts, as evidenced by the coefficient of 0.130 for the dispersion of analyst forecasts with a negative MD&A tone. However, its impact on individual investors' divergence of opinion appears to be insignificant, with coefficients shown 0.011 in Column (2) and 0.020 in Column (3). This suggests that analysts, given their professional expertise and focus on long-term fundamentals, are more attuned to the nuances of the MD&A section, while individual investors may place less weight on this section when forming their opinions.

Columns (4) to (6) reports how investors' disagreements react to positive annual report tone and positive MD&A tone (MDAPTone). Consistent with the findings from Columns (1) to (3), the two of three columns here for positive annual report tone (PTone) remain significant coefficients and the magnitude of the full content of positive annual report tone is larger than for positive MD&A tone. Specifically, in Column (4), which shows the divergence of opinion among experts, 1% of positive annual report tone is likely to reduce 0.048 of dispersion of analyst forecast, whereas there is only 0.025 of dispersion of analyst forecast mitigated by positive MD&A tone. Around the annual report release window, MD&A tone exhibits less magnitude than the full content of the annual report tone, as Column (6) shows that coefficients for PTone and MDAPTone are -0.024 and -0.012, respectively.

Taken together, these findings indicate that the divergence of opinion among investors regarding the tone of the annual report is not significantly influenced by MD&A information. This observation aligns with Loughran and McDonald's (2011) study that MD&A does not provide a clearer lens for investors to assess a firm's performance. One potential explanation for this finding is that the MD&A section, typically shorter in length, may not be as informative as the full content of the annual report. In our analysis, the average word count for the MD&A section is approximately 1,300 words, compared to the average of 15,000 words for the full content of an annual report. Particularly in contexts like the Chinese speaking world, where expressing nuanced opinions may require more extensive textual elaboration, the brevity of the MD&A could limit its effectiveness in conveying comprehensive managerial perspectives. Moreover, while the MD&A section focuses on forward-looking information, it often lacks detailed descriptions that could reflect the companies' actual performance or managerial emotions. Such detailed contextual information is typically presented in other sections of the annual report, such as the corporate governance section, which details the external environmental factors, and the CEO's letter, which may reflect personal managerial insights. Consequently, investors may give greater consideration to the tone found in other parts of the annual report, which collectively provide a more detailed and comprehensive view of the companies' overall performance and future prospects.

5.2. Considerations of future earnings information

Existing literature suggests that managers' textual tone may be related to financial numerical indicators, such as earnings and cash flow (Huang et al., 2014; Jiang et al., 2019). For instance, Jiang et al. (2019) demonstrate that managers may extrapolate recent earnings trend and optimistically expect that future earnings to remain high, potentially leading to overvaluation. As previously discussed, managers often employ a positive tone to signal implied good news to investors, thereby influencing their expectations regarding financial indicators when they encounter a positive tone. In this context, we aim to examine whether the effects of tone on investors' divergence of opinion could be substituted by financial numerical indicators. To address this, we include subsequent year earnings quality (F. RTA), cash flow (F.CASH), and earnings surprise (F.SUE) as control variables in Equations (2) & (3). Inspired by Liu and Nguyen (2020), we use earnings variability to proxy for earnings uncertainty, which is computed as standard deviation of quarterly return on assets over one year. Additionally, cash-holding (CASH) is defined as the total cash divided by

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	DISP	VOLA	RETVOL	DISP	VOLA	RETVOL
PTone				-0.072***	-0.016**	-0.027***
				(-6.02)	(-2.40)	(-3.75)
NTone	0.296***	0.064**	0.045			
	(5.69)	(2.06)	(1.46)			
F.RTA	0.026**	-0.001	-0.025***	0.026**	-0.003	-0.025***
	(2.23)	(-0.26)	(-4.49)	(2.26)	(-0.59)	(-4.51)
F.Cash	0.046	-0.011	-0.090	0.026	0.000	-0.089
	(0.54)	(-0.20)	(-1.53)	(0.31)	(0.01)	(–1.51)
F.SUE	-0.055***	-0.007*	-0.014***	-0.037***	-0.008**	-0.014***
	(-5.03)	(-1.80)	(-3.77)	(-3.77)	(-2.22)	(-3.75)
Constant	-0.018	3.795***	5.336***	1.727***	4.122***	5.046***
	(-0.02)	(8.35)	(11.71)	(2.70)	(10.85)	(12.82)
Observations	11,344	15,091	15,091	11,344	15,091	15,091
R-squared	0.065	0.139	0.482	0.362	0.133	0.482
Number of Firms	2,259	2,538	2,538	2,259	2,538	2,538
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Control for Year	Yes	Yes	Yes	Yes	Yes	Yes
Control for Firm	Yes	Yes	Yes	Yes	Yes	Yes

Table 6. Considerations of future uncertainty, future cash-flow, and future earnings surprises.

This table shows the effects of positive annual report tone (from Column (1) to Column (2)) and negative annual report tone (from Column (3) to Column (4)) on the divergence of opinion after taking into considerations of future earnings surprises and realized cash-flow. t-statistics in parentheses ***p < 0.01, **p < 0.05, *p < 0.1.

total assets. Earnings surprise is calculated as the difference between actual earnings and predicted earnings, divided by stock prices.

Table 6 presents findings related to how future earnings uncertainty, cash flow, and earnings surprise relate to investors' divergence of opinion regarding annual report tone. Notably, in Columns (1) and (2), two out of three columns report significant coefficients on negative annual report tone: 0.296 and 0.064, respectively. These results suggest that negative annual report tone can still explain divergence of opinion after accounting for future earnings uncertainty, cash flow, and earnings surprise.

The analysis of the effects of positive annual report tone in Columns (4) to (6) of Table 6 aligns with the observations from the negative tone effects, reinforcing the significance of tone in influencing investor divergence of opinion. These columns report negative and significant coefficients for positive annual report tone: -0.072, -0.016, and -0.027, respectively. These results indicate that the divergence of opinion are not explained by future earnings uncertainties, future cash flow, or future earnings surprises. The reason behind this phenomenon could be that positive/negative tone incorporates managers' other psychological views such as overconfidence (Liu & Nguyen, 2020) or optimism (Ataullah et al., 2018). Investors faced with these sentiments present high/low divergence of opinion. It is noteworthy that there is no need to extend these two conjectures, as the goal of this research is not to discuss what kind of company information is contained in the tone that engenders divergence of opinion among investors.

Upon closer examination, the largest magnitude of negative and positive annual report tone is displayed in Column (1) and Column (4), implying that one percent of the negative (positive) tone used in annual reports corresponds to an increase (decrease) of 0.296% (0.072%) dispersion of analyst forecast. One potential reason for this could be that during the short time-window, investors may not be aware of negative narrative information as they anticipate future numerical indicators. In addition to numerical information, however, analysts are also concerned with supplementary information, such as managers' annual report statements; thus, experts' anticipations are more likely to be influenced by textual information. That is, after taking into account of future earnings information, analysts are more likely to be influenced by the annual report tone. The potential reason could be that analysts have more concerns about qualitative indicators. Because analysts may be more likely to read the full content of annual report and be more sensitive on the sentiment words usage than individual investors. For instance, after anticipating future earnings information, analysts have more chance to use big data techniques to textual analyze annual report textual information.

5.3. Alternative dictionary

To assess the robustness of our analysis, we employed an alternative sentiment classification method using the Loughran and McDonald (2011) word list, widely recognized in English-speaking research. Following Zhou et al. (2018), we translate all English words into Chinese using Youdao and Kingsoft Dictionary, retaining a comprehensive set of emotional words to ensure robust sentiment analysis in Chinese.

Table 7 presents the results from applying the Loughran and McDonald (2011) word list to our baseline models in Equations (2) & (3). For positive annual report tone, the coefficients in Columns (1) to (3) were -0.095, -0.057, and -0.046, respectively,

	(1) DISD	(2)	(3) DETV(0)	(4) DISD	(5)	(6) DETV(0)
VARIADLES	DISP	VOLA	REIVOL	DISP	VOLA	REIVOL
PTone_LM	-0.095**	-0.057**	-0.046*			
	(-2.37)	(-2.43)	(–1.93)			
NTone_LM				0.127***	0.067***	0.057**
				(3.07)	(2.71)	(2.26)
SIZE	-0.096***	-0.236***	-0.265***	-0.096***	-0.237***	-0.265***
	(-5.70)	(-26.52)	(-28.30)	(-5.65)	(-26.48)	(-28.24)
BM	0.252*	0.320***	0.411***	0.245*	0.317***	0.407***
	(1.93)	(4.27)	(5.44)	(1.88)	(4.21)	(5.38)
DE	0.348***	0.216***	0.195***	0.342***	0.211***	0.190***
	(3.86)	(4.96)	(4.17)	(3.80)	(4.87)	(4.06)
REGROW	0.104***	-0.040**	-0.032**	0.103***	-0.042***	-0.034**
	(3.92)	(-2.51)	(-2.00)	(3.86)	(-2.62)	(-2.11)
LIQU	-0.006	0.048***	0.037***	-0.005	0.048***	0.037***
	(-1.06)	(13.54)	(10.56)	(-1.06)	(13.61)	(10.59)
LOGCT	0.112*	0.138***	0.106***	0.098	0.127***	0.092**
	(1.72)	(3.71)	(2.74)	(1.51)	(3.43)	(2.42)
DIQUA	-0.070	0.021	-0.004	-0.070	0.022	-0.003
	(-1.35)	(0.57)	(-0.11)	(-1.36)	(0.59)	(-0.08)
ROA	-0.070***	-0.013***	-0.016***	-0.070***	-0.013***	-0.015***
	(-17.80)	(-7.95)	(-8.54)	(-17.81)	(-7.76)	(-8.36)
ANFOL	-0.033**			-0.031*		
	(-1.97)			(-1.83)		
STD_RET		0.005***	0.005***	-0.096***	-0.237***	-0.265***
_		(3.34)	(3.17)	(-5.65)	(-26.48)	(-28.24)
NUDP_LM				-0.251***	-0.193***	-0.187***
_				(-2.66)	(-3.57)	(-3.28)
Constant	0.853	3.794***	4.907***	1.054	4.014***	5.146***
	(1.16)	(9.75)	(12.07)	(1.41)	(10.25)	(12.68)
Observations	13,228	18,323	18,323	13,228	18.323	18,323
R-squared	0.274	0.350	0.356	0.274	0.352	0.357
Number of Firms	2,538	2,732	2,732	2,538	2,732	2,732
Control for Year	Yes	Yes	Yes	Yes	Yes	Yes
Control for Firm	Yes	Yes	Yes	Yes	Yes	Yes

Table 7. Annual report tone, classified by LM (2011) words list, and divergence of opinion.

This Table shows the effects of annual report tone, classified by LM (2011) words list, on divergence of opinion. From Column (1) to Column (3)/Column (4) to Column (6), we measure negative/positive annual report tone effects. t-statistics in parentheses. ***p < 0.01, **p < 0.05, *p < 0.1.

indicating a consistent reduction in investor divergence of opinion with an increase in positive tone. For negative annual report tone, Columns (4) to (6) showed coefficients of 0.127, 0.067, and 0.057, respectively. These positive and significant values demonstrate that an increase in negative tone correlates with an increase in investor divergence of opinion. Collectively, these results align with our previous findings using the NTUSD dictionary, demonstrating that a positive/negative annual report tone decreases/increases investors divergence of opinion.

6. Conclusion

In this study, we analyze the textual content of annual reports from Chinese listed companies to examine the extent of investor disagreement in response to the report's tone. Our hypothesis, validated through empirical evidence, asserts that a company's negative annual report tone leads to increased investor divergence, while a positive tone corresponds to lower divergence. In robustness tests, we find that the observed reactions to annual report tones persist after we control for MD&A tone. Moreover, our findings still hold after we control for future earnings information such as future earnings quality, future cash-flow, and future earnings surprise, suggesting that annual report tone could incorporate managers' psychological views or other quantitative indicator information. Additionally, the consistency of our results is maintained when employing an alternative word list for sentiment analysis.

This study distinguishes from previous research on qualitative aspects such as readability and risk exposure by highlighting the role of managerial emotional expression in annual report tone. We demonstrate that investors adeptly identify and respond to qualitative information about corporate uncertainty in a manner akin to their response to quantitative information. Contrary to Baginski et al. (2018), our study shows linguistic positive tone reduces investors' divergence of opinion, while they find that residual positive annual report tone is likely to engender investors' high divergence of opinion, because abnormal positive tone serves impression management, not genuine emotional expression. Furthermore, while our findings align with those of Druz et al. (2020), our research is distinctively positioned within the annual report context, where managerial flexibility in expressing opinions and emotions is paramount.

This study makes significant contributions on multiple fronts. Firstly, we augment the existing literature on investors' behavior concerning corporate qualitative disclosure tone, illustrating the impact of textual information on investors' valuations. Secondly, we provide insights into the origins of investor disagreement on corporate disclosure. Thirdly, our research is dedicated to unraveling the intricacies of investors' behaviors within the Chinese stock market, the second-largest market by capitalization. Fourthly, we demonstrate that in the tonal nuances of the Chinese language, the semantic lexicon used in corporate disclosures can influence investors' valuations. Lastly, our contribution extends to outlining the future research trajectory, examining how managerial sentiment, given certain realized performance, influences investors' evaluations and asset pricing.

There are many avenues that further research could explore. Further research needs to be conducted to taking into account of annual report readability, since low readability is another instrument used by managers to whitewash negative outcomes. Moreover, the bag-of-word method employed in this paper relies on computing frequencies from a user-specified thesaurus in the text to measure positive and negative tone. As such, it does not recognize sentence structures, subjunctive clauses or the context in which a given word occurs, even though all of these can modify or even negate the meaning of a particular word. Future research should endeavour to address these methodological deficiencies.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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