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Non-financial information farsightedness and capital market information efficiency

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Non-financial information disclosed by firms is an important channel for investors and analysts to understand the operating conditions of firms and a major source of information other than financial data. This study examines the impact of disclosure of forward-looking non-financial information content by listed companies on the information efficiency of the capital market. Using data from A-share listed companies in China's Shanghai and Shenzhen markets from 2007 to 2022, it is found that forward-looking non-financial information content has a positive impact on improving capital market information efficiency, while analysts' attention plays a moderating role. The mechanism study finds that non-financial information disclosure with forward-looking content affects the accuracy of analysts' earnings forecasts, the type of audit opinion, and the degree of financialisation of firms, which in turn have different impacts on the information efficiency of the capital market. The heterogeneity test finds that disclosure of non-financial information with forward-looking content will more significantly improve the information efficiency of the capital market if the listed company receives a high level of media attention, as well as listed companies with higher quality of internal control. This study explores the forward-looking characteristics of non-financial information in depth, enriches the study of information efficiency in the capital market, and provides theoretical suggestions for the content and direction of corporate non-financial information disclosure.

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Introduction

In recent years, with the continuous development of the market and the improvement of regulatory mechanisms, the transparency of information in China's capital market has increased, especially regarding the disclosure of non-financial information by listed companies (Zhang et al., 2022; Li et al., 2019; Li et al., 2020; Li and Li 2020; Huan et al., 2023). However, information asymmetries still exist, leading some investors to face the risks of inadequate or inaccurate information (Yang et al., 2021; Xin et al., 2022; Wenhao et al., 2023). Therefore, although there has been progress in overall information efficiency in China's capital market, specific areas—particularly in the responsiveness and accuracy of non-financial information—remain lagging (Nan and Zhang, 2018; Xinyu et al., 2023). This situation often results in the market's delayed reaction to a company's true value, increasing decision-making risks for investors (Wanqi and Zhaoguang, 2024). Moreover, the behavioral characteristics of market participants also influence information efficiency, especially in the context of a high proportion of retail investors, where market sentiment and short-term fluctuations often dominate price movements (Liu et al., 2024). With the application of big data and artificial intelligence technologies, the methods of acquiring and analyzing market information are undergoing changes (Weihui et al., 2024). This offers new possibilities for enhancing market information efficiency but also raises higher demands for information quality and reliability (Guo and Wu, 2024).

The COVID-19 pandemic has posed significant challenges to economic development and corporate sustainability. In the context of heightened environmental uncertainty, addressing information asymmetries is crucial for fostering robust business practices (Gao et al. 2024; Ni et al. 2024). Typically, the information disclosed by companies includes both financial and non-financial information (Chen and Wang, 2022; Wang et al. 2022). As societal focus on non-financial information grows, these qualitative and subjective data, compared to the objective and quantifiable nature of traditional financial information, exhibit greater autonomy and diversity (Zhang and Zhang, 2020), adding multifaceted roles to the information environment of capital markets and introducing uncertainty and various potential outcomes regarding information efficiency (Shen 2021; Lei 2017; Grewal et al. 2019). As investors enhance their investment capabilities and awareness of self-protection, relying solely on past operational performance for information disclosure has become increasingly inadequate to meet their evolving needs (Hassanein and Hussainey 2015; Fang et al. 2015). In response, the U.S. Securities and Exchange Commission (SEC) and the Financial Accounting Standards Board (FASB) have introduced new regulations encouraging listed companies to disclose more forward-looking information based on future business projections (Chauhan and Kumar 2018). According to the Administrative Measures for Disclosure of Information by Listed Companies, first issued in 2007 and amended in 2021, non-financial information disclosed by listed companies mainly includes company background information, descriptions of operating results, and management discussions and analyses (Loughran and McDonald, 2016; Xue et al. 2022; Lei 2017).

In 2007, the China Securities Regulatory Commission updated the "Guidelines on the Content and Format of Information Disclosure by Companies Issuing Public Securities No. 2," requiring listed companies to include a section in their board of directors' reports dedicated to discussions of predictions and future outlooks (Liu 2021). This requirement has sparked academic interest in analyzing the sentiments and foresight embedded in these disclosures. Recent empirical research has increasingly focused on the forward-looking content of non-

financial information, marking a new trend in accounting research (Andreas 2024; Shen et al. 2022). The analysis of information text content appears in various forms across multiple disciplines, known as computational linguistics, natural (or statistical) language processing, information retrieval, content analysis, and stylometrics (Muslu et al. 2015). The exponential growth in electronic computing power over the past fifty years, coupled with the demand for Internet search engines, has driven the development of text analysis technology, making it indispensable in numerous fields (Peng et al. 2024).

In accounting and finance, text analysis techniques are widely applied to online news articles, earnings conference calls, SEC filings, and social media texts (McKay et al. 2012; Lin and Xie 2017; Li and Jiang 2020; Mio et al. 2020). This study focuses on employing text analysis technology to explore the impact of the foresight reflected in the non-financial information disclosures of listed companies on the information environment of capital markets. First, we apply machine learning techniques to quantify the foresight of the non-financial information disclosed by listed companies. Second, we verify the impact of this foresight on capital market information efficiency. Third, we examine how analyst attention moderates the relationship between non-financial information foresight and market information efficiency. Fourth, we test the mediating mechanisms through which non-financial information foresight affects capital market information efficiency, focusing on analysts' earnings forecast biases, audit opinions, and corporate financialization. Finally, in the heterogeneity tests, we categorize listed companies based on different levels of media attention or internal control quality to examine the impact of non-financial information foresight on capital market information efficiency within each group.

This study finds that positive non-financial information disclosures can increase the informational content of share prices, thereby enhancing capital market information efficiency. Moreover, the positive impact of non-financial information foresight on capital market information efficiency is more significant when there is higher analyst attention. Mediating mechanism tests identify the roles of analysts' earnings forecast biases, audit opinions, and corporate financialization in the relationship between non-financial information foresight and capital market information efficiency. The heterogeneity tests show that first, when listed companies receive higher media attention, the impact on capital market information efficiency is more pronounced; second, if the quality of internal controls in listed companies is higher, the effect on capital market information efficiency is also more significant.

The potential contributions of this study can be summarized as follows: first, the existing literature on the economic consequences of non-financial information foresight is relatively sparse, and prior research has primarily focused on its effects on corporate decision-making and investment choices without exploring its impact on capital market information efficiency. Therefore, this study expands and complements the existing literature in this area. Second, by employing machine learning techniques, we delve deeper into the assessment and quantification of non-financial information foresight. Third, we identify and propose a new avenue and methodology for enhancing capital market information efficiency, thereby promoting more effective sustainable development of the capital market.

This study also encounters several limitations. First, the non-financial information data utilized primarily originates from disclosures made by publicly listed companies, and the voluntary nature and transparency of information disclosure by private firms differ significantly from those of their listed counterparts, potentially affecting the generalizability of the results. Second, although machine learning techniques have been employed to

quantify the forward-looking content of non-financial information, the choice of model and parameter adjustments may influence the stability and accuracy of the findings. Third, the methods used to measure analyst attention may be susceptible to subjective factors, which could impact how analysts interpret the information and its subsequent effect on market reactions. In future research, the author aims to further explore these limitations and endeavors to address them.

This paper consists of eight chapters. Chapter 1 serves as the introduction, laying the foundation for the research. Chapter 2 presents the literature review. Chapter 3 outlines the research hypotheses, while Chapter 4 describes the research design. Chapter 5 analyzes the empirical results, and Chapter 6 examines the mediating mechanisms. Chapter 7 provides heterogeneity tests, and finally, Chapter 8 summarizes the conclusions and implications drawn from this study.

Literature review

Non-financial information. Stakeholders, particularly investors, are increasingly insisting on comprehensive disclosures regarding the strategic landscape, risks, and opportunities faced by companies. Even within premier integrated reports, there exist inconsistencies in the presentation of forward-looking information, and the demands of stakeholders for such disclosures remain inadequately addressed (Mio et al. 2020). It is evident that investors and other stakeholders harbor a substantial appetite for forward-looking insights. Should forward-looking financial disclosures exhibit no variation from the prior year, especially following significant shifts in corporate performance, it may indicate an absence of pertinent information. Hu et al. (2024) articulated that forward-looking financial data encompasses relevant aspects of a company's performance; however, it neither influences the valuation of high-performing entities nor enhances the appraisal of underperformers. The majority of organizations tend to favor qualitative over quantitative forward-looking disclosures (Kilic and Kuzey 2018; Abedin et al. 2024). They further identified a positive correlation between gender diversity and corporate size with respect to forward-looking disclosures, whereas leverage exhibited a negative correlation.

Regarding the temporal aspect of information disclosure, Muslu et al. (2015) posited that short-term disclosures are more efficacious in steering future outcomes, noting that companies engaging in atypical forward-looking Management Discussion and Analysis (MD&A) disclosures tend to have diminished stock returns reflective of future earnings. In the context of extreme uncertainty, Krause et al. (2017) discovered that the volume of forward-looking disclosures often increases, particularly when analyzing disclosures pre- and post-global financial crisis. Examining cultural and institutional factors, Henry et al. (2021) investigated two characteristics of earnings press releases from companies listed on U.S. exchanges: the tone and frequency of forward-looking statements. They found that a more conservative tone coupled with a higher ratio of forward-looking assertions is typically perceived as enhancing the credibility of disclosures. Companies that are culturally and institutionally distanced from the U.S. generally exhibit less proactive disclosure behavior compared to their American counterparts. Moreover, the tone and frequency of forward-looking statements from cross-listed companies are often more informative than those from U.S. firms, with this informativeness increasing in relation to cultural and institutional distance.

In examining forward-looking performance disclosures, Athanasakou and Hussainey (2014) suggested that firms are inclined to issue more such disclosures when incurring increased debt or communicating adverse news within their financial reports. In

such managerial contexts, investor reliance on forward-looking performance disclosures is heightened by the quality of reported earnings in audited financial statements, as companies with a reputation for high-quality earnings enjoy augmented credibility in narrative disclosures. Anwar et al. (2021) explored the influence of the level and quality of forward-looking disclosures on stock returns, investigating whether a company's ownership structure moderates the relationship between the quality of these disclosures and stock performance.

Thus, it becomes apparent that existing literature predominantly scrutinizes the disclosure of forward-looking financial information, often overlooking the consequential role it plays. This paper endeavors to investigate the impact of non-financial forward-looking information disclosures on the efficacy of information within capital markets.

Capital market information efficiency. The extant body of scholarly work concerning the efficiency of information within capital markets has predominantly been examined through the dual lenses of influential determinants and their economic ramifications. This paper focuses on the literature from the perspective of factors affecting information efficiency in capital markets.

In the dynamic realm of capital markets, various factors intricately shape how efficiently information is processed. The media, as Tian et al. (2022) observed, serves as both a direct influence and a significant indirect force, impacting security valuations and capital costs through the widespread dissemination of information. Local media enhances market efficiency directly, as Jia et al. (2020) noted, while central media plays an indirect role by moderating the effects of political affiliations on information integration. Regulatory scrutiny, as detailed by Xu and Kong (2022), affects price synchronization among scrutinized entities, making share prices more reflective of firm-specific information and thereby increasing overall market efficiency. Analyst forecasts also play a critical role; Wu et al. (2024) found that optimistic revisions, especially from prominent analysts, reduce share price synchronization, indicating improved market efficiency. Ruan et al. (2021) proposed an extensible business reporting language as a universal standard for financial reporting, aiming to address deficiencies in traditional reporting methods related to regulatory disclosures and information costs. However, Huan et al. (2023) found that certain financing mechanisms, contrary to their intended goals, have paradoxically increased stock price synchronization among related securities, undermining their effectiveness in improving informational efficiency. Thus, each factor interacts in complex ways, shaping the overall efficiency of information in capital markets.

It can be seen that current research on the factors influencing the efficiency of information in capital markets does not cover non-financial information, and this study will help to extend existing research.

Hypotheses development

Non-financial Information farsightedness and capital market information efficiency. Based on the signalling theory, the supply side of capital market information transmits signals to the demand side to alleviate information asymmetry, which is one of the main factors affecting the information efficiency of the capital market. The special information possessed by listed companies may sometimes not be reflected in the share price, which increases the information asymmetry of the company and may lead to the limitation of company financing and the reduction of the information content of the share price, which, in turn, makes the information efficiency of the capital market decrease. Stock

price volatility is affected by a combination of market factors, industry factors, and firm-specific information, and in an irrational framework, stock prices can be affected not only by firm-specific information, but also by noisy information (Wu and Liu, 2022; Yang et al. 2021; Yan and Sun, 2022). As an effective complement to numerical information, textual information in individual stock research reports reflects firm-specific information in a more comprehensive and detailed way. The analyses of company fundamentals in annual reports, especially the assessment of the level of corporate governance, the prospects for strategic development, and the judgement of investment effectiveness, contain a lot of company-specific information that is difficult to quantify (Xiao and Shen, 2021). This company-level information is captured in textual form by stakeholders and is ultimately reflected in the share prices of individual stocks, but has less impact on the share prices of other companies in the same industry, thus effectively improving the capital market information efficiency of individual stocks. Based on this, the following hypothesis is proposed:

H1a: The more positive the farsightedness of non-financial information disclosure, the higher the capital market information efficiency.

However, there are two reasons why the R-squared of the Capital Asset Pricing Model (CAPM) is always less than one: first, company-specific information is incorporated into the share price, leading to price fluctuations; second, noise trading causes price fluctuations that cannot be fully explained by market or industry factors. Therefore, whether the R-squared reflects company-specific information or noise trading has attracted increasing attention and debate from scholars, resulting in two opposing views: the “information efficiency hypothesis” and the “irrational factor hypothesis.” The “information efficiency hypothesis” represented by Morck et al. (2000) and others, states that the level of R-squared reflects the amount of idiosyncratic information contained in the company’s share price. On the other hand, the Irrationality Factor Hypothesis suggests that a low level of informational efficiency in the capital market is not only indicative of high volatility in share prices, but also of a significant deviation of share prices from firm fundamentals (Teoh 2009). From the perspective of the irrationality factor hypothesis, the forward-looking content of non-financial information disclosed by companies does not necessarily improve the information efficiency of the capital market. On the contrary, it may lead to irrational trading, that is, treating noise information as valuable information. This is because noise traders, unlike rational traders, lack access to inside information about companies and the ability to think independently. Rational traders trade based on their understanding and judgement of the market. In contrast, noise traders tend to follow the opinions of others and are unwilling to think independently, making the phenomenon of the “herd effect” more serious and potentially increasing the synchronisation of share prices, thus reducing the information efficiency of the capital market. Based on this, the following hypothesis is proposed:

H1b: The more positive the farsightedness of non-financial information disclosed by companies, the lower the capital market information efficiency.

Moderating role of analyst coverage. Analysts, as information intermediaries in the capital market, possess strong information analysis and processing capabilities. They can utilise their rich knowledge base to effectively interpret the sentiment and forward-looking information conveyed in the non-financial information of listed companies, and combine their insights with their own to forecast the company’s development and

profitability (Zhang et al. 2022; Xin et al. 2022; William et al. 2013). As a result, companies that receive a lot of attention from analysts tend to be more favoured by the capital market, especially by investors. In order to convey the message that a company is performing well, management may use more positive and optimistic forward-looking language and vocabulary when disclosing non-financial information, which may lead to a more subjective tone in such information, thus increasing the randomness and creativity of the narrative (Yuan et al. 2022). When such forward-looking information is transmitted to the capital market, it may affect the judgement of analysts, which in turn may affect the investment decisions of investors, ultimately affecting the information efficiency of the capital market.

For companies with low analyst coverage, the lack of external stimuli and incentives leads management to pay less attention to the positive tone of non-financial information and the expression of forward-looking content (Xiao and Shen 2021), which reduces the usefulness and effectiveness of non-financial information, makes the impact of the emotional characteristics of non-financial information on the efficiency of information in the capital market weaker, and weakens the impact of the forward-looking non-financial information on the efficiency of information in the capital market, and therefore proposes the the following research hypothesis:

H2: Analyst coverage will play a role in moderating the relationship between forward-looking content of non-financial information and capital market information efficiency. For companies with high analyst coverage, the positive relationship between forward-looking content of non-financial information and capital market information efficiency will be more significant.

Methodology

Data. In light of the enactment of new accounting standards for enterprises in China commencing in 2007, this investigation leverages data from publicly listed companies on the Shanghai and Shenzhen A-share markets spanning the years 2007 to 2022 as the primary research dataset. The data is subjected to the following procedures: firstly, financial institutions are omitted from consideration; secondly, companies designated as ST or *ST, as well as those delisted within the stipulated timeframe, are excluded; thirdly, firms exhibiting gearing ratios exceeding 1 are disregarded; fourthly, only entities with a minimum of five consecutive years of data are retained for analysis; fifthly, only samples devoid of any data gaps for at least five consecutive years are retained; and finally, to mitigate the influence of outliers, a 1 to 99% trimming is applied to all micro-level continuous variables. The original dataset was sourced from the Guotaian database (CSMAR), supplemented by non-financial information disclosed by listed companies obtained from the official websites of the Shenzhen Stock Exchange, the Shanghai Stock Exchange and other source from listed companies. Additional data were acquired via Python software and subjected to analysis using NLP software for textual analysis. The data collection process is shown in Table 1.

Variables

Capital market information efficiency. This study draws on the research findings of Piotroski (2007) and Zijian et al. (2022), utilizing share price synchronization to measure the informational efficiency of the capital market, and applies the following model to estimate the R-squared of individual stocks.

$$R_{i,t} = \alpha_i + \beta_{i,1}R_{m,t} + \beta_{i,2}R_{i,t} + \varepsilon_{i,t} \quad (1)$$

Where $R_{i,t}$ represents the return of stock i in week t , $R_{m,t}$ denotes the return of the market index in week t , and $R_{i,t}$ signifies the

Table 1 The process of sample data selection.

Development of stock price synchronization metrics for annual firm-level data	Number of observations
Observations extracted from the CSMAR database spanning the years 2007 to 2022	40,573
- Entities listed within the financial sector	(1130)
- Listed companies subjected to special treatment	(1204)
- Ensuring a leverage ratio not below 1	(1399)
- Excluding data from companies listed for less than five years	(798)
Sample with stock price information content data	36,042
Assembly of non-financial forward-looking data sets for firm-year	Number of observations
Using Python to collect and analyse the forward-looking content content of non-financial information spanning the period 2007 to 2022	26,800
- Absence of data pertaining to control variables	(6477)
- Inclusion of listed companies within the financial industry	(1175)
- Incorporation of listed companies subjected to special treatment	(1216)
- Exclusion of entities with leverage ratios falling below 1	(1304)
- Omission of data for companies listed for less than five years	(798)
The resultant sample comprises data relevant to digital transformation	15,830

return of industry I in week t. The returns of industry I are weighted by the market capitalization of each company within the industry, in accordance with the industry classification standards set by the China Securities Regulatory Commission. Subsequently, the goodness-of-fit R^2 derived from the regression of model (1) undergoes logarithmic transformation, as illustrated in Eq. (2), to yield data on share price synchronization.

$$SYNCH_{i,t} = \text{Ln}(R^2/(1 - R^2)) \tag{2}$$

Non-financial information farsightedness. Drawing on Kang et al. (2018), Price et al. (2012) and Wu et al. (2020), the total number of words, positive words, and negative words in the textual content of non-financial information disclosed by companies was computed using the LM dictionary provided by Loughran and McDonald. Additionally, the forward-looking nature of the textual information was calculated utilizing the LM dictionary provided by Loughran and McDonald (Tim and McDonald, 2011).

$$\text{Nonfinancial_farsightedness} = \frac{\text{Number of positive words} - \text{number of negative words}}{\text{Number of positive words} + \text{number of negative words}} \tag{3}$$

The forward-looking nature of non-financial information is an indicator ranging from [-1, 1], with a higher value indicating a stronger forward-looking aspect within the textual content of the non-financial information.

Analyst coverage. This is calculated by tallying the number of analysts and their teams who monitored the company’s stock price and related matters throughout the year. All variable definitions and descriptions are shown in Table 2.

Research model. Drawing on the preceding analysis, we developed a four-step multilevel regression model to examine the influence of the forward-looking nature of non-financial information content on capital market information efficiency, and to test hypotheses H1 and H2.

In the first step, we assessed the relationship between capital market information efficiency and the control variables,

configuring the model according to Eq. (4).

$$\begin{aligned} SYNCH_{it} = & a_0 + a_1Roe + a_2Size + a_3Age + a_4Book_to_Market \\ & + a_5Growth + a_6Lev + a_7Shrcr + a_8VOL \\ & + a_9Roa + a_{10}Audit + a_{11}Board + a_{12}Dual \\ & + a_{13}Big4 + a^{14}Top1 + \Sigma Year + \Sigma Industry + \epsilon_{it} \end{aligned} \tag{4}$$

In Step 2, we investigate how the forward-looking aspect of non-financial information relates to capital market information efficiency, without incorporating control variables. Equation (5) illustrates the regression model utilized for this analysis.

$$SYNCH_{it} = \beta_0 + \beta_1\text{Nonfinancial_farsightedness} + \Sigma Year + \Sigma Industry + \epsilon_{it} \tag{5}$$

In Step 3, we explore how the inclusion of control variables affects the examination of the relationship between the forward-looking aspect of non-financial information and capital market information efficiency. Equation (6) illustrates the regression model utilized for this analysis.

$$\begin{aligned} SYNCH_{it} = & \lambda_0 + \lambda_1\text{Nonfinancial_farsightedness} + \lambda_2Age \\ & + \lambda_3\text{Book_to_Market} + \lambda_4Growth + \lambda_5Lev + \lambda_6Shrcr \\ & + \lambda_7VOL + \lambda_8ROA + \lambda_9Board + \lambda_{10}Dual + \lambda_{11}Big4 + \lambda_{12}Size \\ & + \lambda_{13}Audit + \lambda_{14}Top1 + \lambda_{15}Roe + \Sigma Year + \Sigma Industry + \epsilon_{it} \end{aligned} \tag{6}$$

The fourth step adds the moderating variable of analyst coverage to test the significance of the interaction term between forward-looking non-financial information and analyst attention, the model is shown in Eq. (7).

$$\begin{aligned} SYNCH_{it} = & \theta_0 + \theta_1\text{Nonfinancial_farsightedness} \\ & + \theta_2\text{Nonfinancial_farsightedness} \times \text{Follow} \\ & + \theta_3\text{InsInvestor} + \theta_4Age + \theta_5\text{Book_to_Market} \\ & + \theta_6Growth + \theta_7Lev + \theta_8Shrcr + \theta_9VOL + \theta_{10}ROA \\ & + \theta_{11}\text{Inshold} + \theta_{12}Board + \theta_{13}Dual \\ & + \theta_{14}Big4 + \theta_{15}Size + \theta_{16}Audit + \theta_{17}Top1 \\ & + \Sigma Year + \Sigma Industry + \epsilon_{it} \end{aligned} \tag{7}$$

Empirical analysis

Research model diagnostics. To elucidate the rationale behind the chosen methodologies and to substantiate the exclusion of alternative approaches, this section conducts an assessment of

Table 2 Variable definition.

Variable Names	Definition
SYNCH	Individual stocks utilize the reinvestment return rate, accounting for cash dividends, whereas markets and industries employ the current circulating market value weighted average method to compute stock price synchronicity.
SYNCH_2	Individual equities, markets, and sectors alike employ the return rate incorporating reinvestment of cash dividends, whereas markets and sectors utilize the total market value weighted average method to compute stock price synchronicity.
Nonfinancial_farsightedness	Using the Lexical Monitoring (LM) lexicon, the proportion of the difference in the number of affirmative and negative words in non-financial information to the sum of the two was calculated.
Nonfinancial_farsightedness_2	Using a thesaurus from National Taiwan University, the difference in the number of affirmatives and negatives in non-financial information was calculated as a proportion of the sum of the two.
Nonfinancial_farsightedness_3	Using the LM dictionary, the ratio of the gap between the number of affirmative words minus the number of negative words in the non-financial information and the total number of words in the annual report was calculated.
Follow	Augmenting the total count of individuals monitored by analysts for each stock annually by 1 and then applying the natural logarithm.
Forecast_Dispersion	The forecast dispersion percentage, calculated as the quotient of the standard deviation of analyst earnings forecasts divided by the stock price at the inception of the year.
Audit_OP	In the audit opinion of enterprise I in year t, a standard unqualified opinion is designated as 1; otherwise, it is assigned a value of 0.
Fin	The aggregate of traded financial assets, derivative financial assets, available-for-sale financial assets, held-to-maturity investments, net loans and advances, and investment real estate, divided by the total assets.
Firm Level	
VOL	The stock turnover rate for enterprise I in year t is calculated based on the number of outstanding shares.
Lev	Leverage is computed as the ratio of total liabilities to total assets.
Size	The natural logarithm of the total assets of the firm at the end of the year.
Roa	Net profit divided by the average total assets.
Book_to_Market	Book value per share and market value per share.
Growth	The revenue growth rate of firm i in the preceding year.
Age	The age of the listed company i.
Roe	Net profit divided by the average net assets.
Big4	Equal to 1 if firm i is audited by one of the international Big 4 audit firms, and 0 otherwise.
Management Level	
InsInvestor	The institutional investors' ownership percentage in shares.
Top1	The ownership ratio of the largest shareholder of enterprise I in year t.
Shrcr	The shareholding concentration of enterprise I in year t, determined by the shareholding ratio of the top ten shareholders.
Board	The logarithmically transformed size (number) of the board of directors of enterprise I in year t.
Dual	If the chairman of the company I is also the managing director, it takes the value of 1, otherwise 0.
Industry	A binary indicator variable, set to 1 if year t falls within the specified year range, and 0 otherwise.
Year	A binary indicator variable, set to 1 if company i belongs to the designated industry, and 0 otherwise.

multicollinearity through the calculation of the Variance Inflation Factor (VIF) for each variable within the model. The findings reveal that none of the VIF values surpasses 2, with the mean VIF remaining below 1.54. This suggests an absence of significant multicollinearity within the model. Furthermore, White's test was employed to investigate potential heteroskedasticity, yielding a probability value of $\text{prob} > \chi^2$ at 0.0569, which exceeds the 0.05 threshold. This result implies that heteroskedasticity is not present. Additionally, an examination for autocorrelation was conducted, resulting in a χ^2 probability of 0.0741, again above the 0.05 cutoff, indicating that autocorrelation does not exist within the research framework. Collectively, these findings affirm that the developed research model is devoid of multicollinearity, heteroskedasticity, and autocorrelation. This underscores the robustness of the model, asserting that the methodologies employed herein are both fitting and indispensable for the integrity of the research.

Descriptive statistical analysis. Table 3 delineates the descriptive statistics for a cohort of 4926 firms, encapsulating 15,830 observational data points. This table enumerates the arithmetic means, medians, standard deviations, and the extremities (minimum and maximum values) of all pivotal variables within this analysis. The mean stock synchronization (SYNCH) is 0.435,

with values spanning from a nadir of 0.020 to a zenith of 0.878, signifying a considerable dispersion. The median synchronization value, positioned at 0.441, intimates an equilibrated distribution, thereby indicating that stock synchronization is evenly dispersed across the spectrum, eschewing concentrations at either extreme.

The foresightedness of non-financial information (Nonfinancial_farsight) for the sampled entities presents both a mean and median of 0.002, with values oscillating between -0.022 and 0.026 . This wide range bespeaks a significant heterogeneity in the foresightedness among firms. The stock turnover ratio (VOL) exhibits a range from 0.547 to 18.389, with a mean of 5.467 and a median of 4.374, reflecting generally low turnover rates among the sampled listed companies, and substantial variance between typical values and outliers. This phenomenon suggests that, on average, the quintet of principal shareholders possesses approximately half of the shares in the sampled firms, indicative of relatively concentrated ownership structures.

The return on equity (ROE) evinces a mean of 0.067, a median of 0.069, a maximum of 0.388, and a minimum of -0.550 , with the proximity of mean and median values implying a homogeneous distribution of ROE across the majority of listed firms, with no propensity towards extreme values. Institutional investor shareholding ratios (InsInvestor) exhibit an average of 45.135, a

Table 3 Descriptive statistics.

Variable	N	Mean	P50	Standard deviation	Max	Min
SYNCH	15,830	0.435	0.441	0.202	0.878	0.020
Nonfinancial_farsightedness	15,830	0.002	0.002	0.010	0.026	-0.022
VOL	15,830	5.467	4.374	3.890	18.389	0.547
Roe	15,830	0.067	0.069	0.125	0.388	-0.550
InsInvestor	15,830	45.135	47.061	22.843	90.413	0.642
Lev	15,830	0.458	0.459	0.198	0.916	0.069
Roa	15,830	0.038	0.035	0.063	0.227	-0.239
Size	15,830	22.303	22.147	1.261	26.157	19.667
Book_to_Market	15,830	0.614	0.608	0.252	1.158	0.115
Dual	15,830	0.227	0.000	0.419	1.000	0.000
Growth	15,830	0.153	0.095	0.391	2.475	-0.567
Age	15,830	2.312	2.303	0.534	3.258	1.386
Big4	15,830	0.064	0.000	0.245	1.000	0.000
Shrcr	15,830	0.547	0.548	0.147	0.898	0.221
Top1	15,830	0.335	0.315	0.146	0.721	0.083
Board	15,830	2.144	2.197	0.199	2.708	1.609
Audit	15,830	0.974	1.000	0.160	1.000	0.000

median of 47.061, a maximum of 90.413, and a minimum of 0.642, illustrating significant disparities among the highest values, and suggesting a diverse distribution of institutional ownership within the sample. The average leverage ratio (Lev) spans from 0.069 to 0.916, with a mean and median of 0.458 and 0.459, respectively.

The book-to-market ratio (Book_to_market) oscillates between 0.115 and 1.158, with mean and median values of 0.614 and 0.608, respectively. Duality (Dual) manifests a mean value of 0.227, denoting that 22.7% of the sampled companies have board members who concurrently hold managerial positions. Sales growth (growth) fluctuates between -0.567 and 2.475, with mean and median values of 0.153 and 0.095, respectively. The age of the listed entities (Age) ranges from a minimum of 1.386 to a maximum of 3.258, with a mean and median of 2.312 and 2.303, respectively.

The proportion of firms engaging Big 4 accounting firms (Big4) averages 0.064, indicating that a mere 6.4% of the sampled firms employ Big 4 auditors. Shareholding concentration (Shrcr) spans from 0.221 to 0.898, with a mean of 0.547 and a median of 0.548, suggesting that, on average, the top ten shareholders hold approximately half of the shares, implying a relatively concentrated ownership structure. The shareholding of the top shareholder (Top1) ranges between 0.083 and 0.721, with mean and median values of 0.335 and 0.315, respectively. Board size (board) varies from 1.609 to 2.708, with a mean of 2.144 and a median of 2.197.

Correlation analysis. Table 4 expounds the correlation coefficients among the paramount variables in this study. The results elucidate a salient inverse correlation between stock synchronization and the perspicacity of non-financial information ($r = -0.052$, $p < 0.01$). Additionally, the analysis uncovers a notable negative association between the perspicacity of non-financial information and the proportion of shares held by institutional investors ($r = -0.020$, $p < 0.05$). There exists a consequential negative correlation between the perspicacity of non-financial information and stock turnover ratio ($r = -0.017$, $p < 0.05$), along with a marked inverse correlation with the debt-to-equity ratio ($r = -0.043$, $p < 0.01$). Furthermore, the data reveal a significant negative correlation between the perspicacity of non-financial information and board size ($r = -0.036$, $p < 0.01$), as well as a pronounced inverse association with firm age ($r = -0.097$, $p < 0.01$). In contrast, there is a significant

positive correlation between the perspicacity of non-financial information and the shareholding of the largest shareholder ($r = 0.017$, $p < 0.05$), and a noteworthy positive correlation with shareholding concentration ($r = 0.042$, $p < 0.01$).

Test of H1. Columns (1)–(3) of Panel A in Table 5 delineate the outcomes of the principal examination concerning the nexus between the “foresightfulness of non-financial disclosures and stock synchronization.” Employing a sequential regression methodology in the benchmark regressions, Column (1) incorporates controls for temporal and sectoral variables and introduces control variables without the inclusion of independent variables to ascertain the interrelationship between the control variables and the dependent variables. Column (2) solely incorporates controls for temporal and sectoral fixed effects, omitting the set of control variables. The regression coefficient for the foresightfulness of non-financial disclosures registers at -0.0498 , achieving statistical significance at the 1% level. In Column (3), after accounting for temporal and sectoral fixed effects and incorporating the set of control variables, the regression coefficient for the foresightfulness of non-financial disclosures is -0.0463 , also attaining statistical significance at the 1% threshold. This denotes that enhanced foresightfulness in corporate non-financial information disclosure markedly diminishes corporate stock synchronicity, thereby augmenting the informational content embedded within share prices, thus corroborating research hypothesis H1a. Collectively, the empirical evidence adduced in Panel A of Table 5 robustly corroborates H1a, elucidating a pronounced inverse correlation between the foresightfulness of non-financial information and stock synchronization. Moreover, the findings elucidate a salient positive correlation between the foresightfulness of non-financial information and the efficiency of capital market information, thereby providing additional substantiation for H1a.

Test of H2. Columns (1) and (2) of Panel A in Table 6 expound upon the pivotal test results for analyst surveillance as a moderating variable. Employing an incremental regression methodology in the benchmark regressions, Column (1) incorporates temporal and industry-fixed effects, subsequently introducing a constellation of control variables to scrutinize the nexus between analyst coverage and stock synchronization. The regression coefficient for analyst coverage manifests as -0.0407 , indicative of a negative correlation. The coefficient for the foresightfulness of non-

Table 4 Correlation matrix.

	SYNCH	Nonfinancial_farsightedness	InsInvestor	VOL	Lev	Size	Book_to_Market	Growth
SYNCH	1.000							
Nonfinancial_farsightedness	-0.052***	1.000						
InsInvestor	-0.041***	-0.020**	1.000					
VOL	0.031***	-0.017**	-0.355***	1.000				
Lev	-0.036***	-0.043***	0.212***	-0.074***	1.000			
Size	-0.054***	0.000	0.396***	-0.346***	0.429***	1.000		
Book_to_Market	-0.043***	-0.016	0.144***	-0.304***	0.416***	0.563***	1.000	
Growth	0.006	-0.008	0.065***	0.024***	0.056***	0.044***	-0.054***	1.000
Board	-0.005	-0.036***	0.233***	-0.090***	0.154***	0.211***	0.142***	0.010
Age	-0.013	-0.097***	0.249***	-0.168***	0.255***	0.314***	0.269***	-0.057***
Roe	-0.003	-0.010	0.201***	-0.116***	-0.130***	0.166***	-0.113***	0.274***
Top1	-0.027***	0.017**	0.567***	-0.213***	0.103***	0.216***	0.132***	0.027**
Shrcr	-0.015*	0.042***	0.603***	-0.333***	0.014*	0.298**	0.106***	0.093**
Roa	0.007	-0.001	0.158***	-0.110***	-0.317***	0.076***	-0.228***	0.248***
Dual	0.019**	0.012	-0.205***	0.059***	-0.089***	-0.087***	-0.121***	-0.005
Big4	-0.025***	0.006	0.261***	-0.156***	0.104***	0.368***	0.149***	-0.010
Audit	0.001	0.006	0.047***	-0.035***	-0.092***	0.065***	0.027***	0.046***

	Board	Age	Roe	Top1	Shrcr	Roa	Dual	Big4	Audit
SYNCH									
Nonfinancial_farsightedness									
InsInvestor									
VOL									
Lev									
Size									
Book_to_Market									
Growth									
Board	1.000								
Age	0.097***	1.000							
Roe	0.066**	-0.018**	1.000						
Top1	0.030***	0.013*	0.132***	1.000					
Shrcr	0.063***	-0.149***	0.189***	0.659***	1.000				
Roa	0.045***	-0.080***	0.912***	0.112***	0.187***	1.000			
Dual	-0.184***	-0.157***	-0.022***	-0.094***	-0.037***	0.000	1.000		
Big4	0.117***	0.116***	0.075***	0.169***	0.229***	0.051***	-0.055***	1.000	
Audit	0.002	-0.046***	0.224***	0.069***	0.064***	0.205***	-0.003	0.028***	1.000

*p < 0.1, **p < 0.05, ***p < 0.01.

Table 5 Test of H1: Panel A. Test of H1: Panel B. Test of H1: Panel C. Test of H1:Panel D.

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	SYNCH	SYNCH	SYNCH	SYNCH	SYNCH	SYNCH
Nonfinancial_farsightedness						
Insinvestor	-0.0388* (-2.03)	-0.0208** (-2.09)				-0.0214** (-2.03)
Lev	-0.0029 (-0.19)					-0.0382** (-2.02)
Size	-0.0333 (-1.63)					-0.0039 (-0.26)
Book_to_Market	-0.0214 (-1.34)					-0.0329 (-1.62)
Growth	0.0047 (0.55)					-0.0211 (-1.33)
Board	0.0192* (1.73)					0.0047 (0.56)
VOL	0.0198* (1.69)					0.0181 (1.64)
Age	0.0278** (2.00)					0.0189 (1.61)
ROE	-0.0198 (-0.78)					0.0219 (1.57)
Top1	-0.0120 (-0.80)					-0.0198 (-0.79)
Shrcr	0.0436** (2.46)					-0.0110 (-0.74)
ROA	0.0203 (0.74)					0.0427** (2.43)
Dual	0.0232 (0.94)					0.0197 (0.72)
Big4	-0.0208 (-0.37)					0.0220 (0.89)
Audit	0.0429 (0.81)					-0.0182 (-0.33)
Industry	Yes			Yes		0.0430 (0.82)
Year	Yes			Yes		Yes
Constant	-0.2093* (-1.86)			0.0086 (0.77)		Yes
Observations	15,830			15,830		-0.2105* (-1.82)
R-sq	0.0157			0.0026		0.0179
Adjusted R-sq	0.0090			0.0026		0.0112
Variables						
Nonfinancial_farsightedness						
Nonfinancial_farsightedness2						
Nonfinancial_farsightedness3						
Insinvestor	-0.0524*** (-5.37)					-0.0309*** (-3.11)
Lev						
Size						
Book_to_Market						
Growth						
Board						
VOL						
Age						
Roe						
Top1						
Shrcr						
Roa						
Dual						
Big4						
Audit						
Industry	Yes			Yes		Yes
Year	Yes			Yes		Yes

Table 5 (continued)

Variables	(1)		(2)		(3)		(4)		(5)		(6)	
	SYNCH_2	SYNCH	SYNCH_2	SYNCH	SYNCH_2	SYNCH	SYNCH_2	SYNCH	SYNCH_2	SYNCH	SYNCH_2	SYNCH
Constant	0.0176 (1.63)		0.0056 (0.05)		0.0045 (0.40)		-0.2195* (-1.91)		0.0045 (0.41)		-0.2194* (-1.91)	
Observations	15,830		15,830		15,830		15,830		15,830		15,830	
R-sq	0.0028		0.0201		0.0010		0.0167		0.0010		0.0166	
Adjusted R-sq	0.0028		0.0135		0.0010		0.0100		0.0009		0.0099	
The first phase												
	(1)		(2)		(3)		(4)		(5)		(6)	
Variables	Nonfinancial_farsightedness	SYNCH	Nonfinancial_farsightedness	SYNCH	Nonfinancial_farsightedness	SYNCH	Nonfinancial_farsightedness	SYNCH	Nonfinancial_farsightedness	SYNCH	Nonfinancial_farsightedness	SYNCH
Nonfinancial_farsightedness	0.0657*** (5.09)				0.0578*** (4.63)				-0.0318*** (-3.21)			
Investor					0.0105 (0.44)							
Lev					-0.0226 (-1.22)							
Size					0.0085 (0.32)							
Book_to_Market					0.0083 (0.40)							
Growth					0.0019 (0.21)							
Board					-0.0219 (-1.43)							
VOL					-0.0215 (-1.54)							
Age					-0.1263*** (-6.74)							
Roe					-0.0025 (-0.08)							
Top1					0.0214 (1.02)							
Shrcr					-0.0187 (-0.80)							
Roa					-0.0108 (-0.33)							
Dual					-0.0252 (-0.77)							
Big4					0.0558 (0.77)							
Audit					-0.0009 (-0.01)							
Industry	Yes		Yes		Yes		Yes		Yes		Yes	
Year	Yes		Yes		Yes		Yes		Yes		Yes	
Constant	0.0458*** (3.42)				-0.0076 (-0.04)				0.0043 (0.40)		-0.2190* (-1.99)	
Observations	15,830		15,830		15,830		15,830		15,830		15,830	
R-sq	0.0042		0.0435		0.0435		0.0011		0.0166		0.0166	
Adjusted R-sq	0.0041		0.0370		0.0370		0.0009		0.0009		0.0109	
The second phase												
	(1)		(2)		(3)		(4)		(5)		(6)	
Variables	Nonfinancial_farsightedness	SYNCH	Nonfinancial_farsightedness	SYNCH	Nonfinancial_farsightedness	SYNCH	Nonfinancial_farsightedness	SYNCH	Nonfinancial_farsightedness	SYNCH	Nonfinancial_farsightedness	SYNCH
Nonfinancial_farsightedness	-0.4203*** (-3.55)				-71.5269*** (-3.07)				-90.0067*** (-4.44)			
L1.Nonfinancial_farsightedness												
L2.Nonfinancial_farsightedness												
L3.Nonfinancial_farsightedness												
IMR	0.5843 (0.45)											
Industry	Yes		Yes		Yes		Yes		Yes		Yes	
Year	Yes		Yes		Yes		Yes		Yes		Yes	
Constant	0.2343 (1.26)				0.2968 (1.43)				0.0604 (0.25)		0.2919 (1.32)	
Observations	15,830		9945		9945		8549		8549		7233	
R-sq	0.0023		0.0160		0.0160		0.0206		0.0206		0.0216	
Adjusted R-sq	0.0022		0.0088		0.0088		0.0111		0.0111		0.0114	

*p < 0.1, **p < 0.05, ***p < 0.01.

Table 6 (continued)

Variables	(1) SYNCH_2	(2) SYNCH	(3) SYNCH
Dual	0.0834*** (3.54)	0.0181 (0.73)	0.0180 (0.73)
Big4	0.0221 (0.46)	-0.0159 (-0.29)	-0.0181 (-0.33)
Audit	-0.1095* (-1.94)	0.0415 (0.79)	0.0398 (0.76)
Industry	Yes	Yes	Yes
Year	Yes	Yes	Yes
Constant	0.0136 (0.12)	-0.2086* (-1.75)	-0.2061* (-1.75)
Observations	15830	15830	15830
R-sq	0.0203	0.0185	0.0175
Adjusted R-sq	0.0135	0.0117	0.0107
The first phase			
(1)			
Nonfinancial_farsightedness			
IV_farsightedness	-0.0349*** (-3.11)		-0.0322*** (-3.92)
Nonfinancial_farsightedness			-0.0327*** (-3.46)
Nonfinancial_farsightedness×Follow			-0.0443*** (-3.14)
Follow	-0.0345** (-2.28)		-0.0420*** (-2.21)
Lev	-0.0388** (-2.03)		0.0077 (0.50)
Size	-0.0029 (-0.19)		-0.0648*** (-2.75)
Book_to_Market	-0.0333 (-1.63)		-0.0058 (-0.34)
Growth	-0.0214 (-1.34)		0.0051 (0.61)
Board	0.0047 (0.55)		0.0172 (1.56)
VOL	0.0192* (1.73)		0.0192 (1.63)
Age	0.0198* (1.68)		0.0318** (2.25)
Roe	0.0278** (2.00)		-0.0205 (-0.81)
Top1	-0.0198 (-0.78)		-0.0068 (-0.46)
Shrcr	-0.0120 (-0.80)		0.0419** (2.38)
Roa	0.0435** (2.48)		0.0117 (0.42)
Dual	0.0203 (0.74)		0.0189 (0.77)
Big4	0.0231 (0.96)		-0.0168 (-0.31)
Audit	-0.0208 (-0.37)		0.0401 (0.76)
Industry	0.0429 (0.81)	Yes	Yes
Year	Yes	Yes	Yes
Constant	-0.2093* (-1.86)		-0.1989* (-1.70)
Observations	15,830		15,830
R-sq	0.0157		0.0176
Adjusted R-sq	0.0090		0.0108

*p < 0.1, **p < 0.05, ***p < 0.01.

financial information is -0.0352 , achieving statistical significance at the 1% level, while the coefficient for the interaction term between the foresightedness of non-financial information and analyst coverage is -0.0290 . Collectively, the empirical evidence presented in Panel A of Table 6 robustly corroborates hypothesis H2. The findings elucidate that augmented analyst coverage amplifies the beneficial impact of the foresightedness of non-financial information disclosures in mitigating firm stock synchronization. In essence, analyst coverage exerts a moderating influence on the relationship between the foresightedness of non-financial information and capital market information efficiency, thereby substantiating research hypothesis H2.

Robustness tests. Panel B of Tables 5 and 6 perform robustness tests on research hypotheses H1 and H2. This is achieved by substituting the measures of the explanatory and explanatory variables into models (4)–(7), allowing for an observation of the results of the multiple regression analysis.

Alteration of stock synchronization measurement method. The methodology for gauging stock synchronization underwent a transformation, transitioning from the initial methodology employing float-weighted averages to one employing total market capitalization-weighted averages. Following this modification, Column (1) in Table 5 exclusively adjusts for temporal and sectoral fixed effects, refraining from the introduction of a pre-determined set of control variables. The regression coefficient associated with the foresightedness of non-financial information registers at -0.0524 , exhibiting statistical significance at the 1% threshold. In Column (2), temporal and sectoral fixed effects are controlled for alongside the incorporation of a set of control variables, culminating in a regression coefficient for the foresightedness of non-financial information of -0.0530 , which similarly attains statistical significance at the 1% level. The validation of the robustness of H1a ensues upon the successful passage of the 1% statistical significance test. Meanwhile, Column (1) in Table 6 employs controls for temporal and sectoral fixed effects in tandem with the integration of a set of control variables; here, the regression coefficient for non-financial foresightedness stands at -0.0634 , successfully clearing the 1% statistical significance test. Additionally, the regression coefficient for the interaction between non-financial foresightedness and analyst attention is -0.0433 . Consequently, the validation of the robustness of research hypothesis H2 is affirmed.

Substitution of non-financial information prognostication quantification technique. Drawing inspiration from Shen et al. (2022), the determination of non-financial information prognostication undergoes refinement utilizing the Sinopian Sentiment Spectrum, an esoteric lexicon derived from the annals of Oriental linguistics, curated by the erudite scholars of National Taiwan University. Within this ethereal realm, an augmentation of Non-financial_farsightedness2 correlates with an elevated degree of sanguine premonition embedded within the textual fabric of non-financial discourse. The meticulous algorithmic delineation is expounded as follows:

$$\text{Nonfinancial_farsightedness2} = \frac{\text{Number of positive words} - \text{Number of negative words}}{\text{Number of positive words} + \text{number of negative words}} \quad (8)$$

The recalibration of non-financial prognostication is conducted through the utilization of the LM lexicon. Elevated values of Nonfinancial_farsightedness3 correlate positively with heightened levels of prescience inherent within the textual corpus of non-financial data. The precise computational algorithm is delineated

as follows:

$$\text{Nonfinancial_farsightedness3} = \frac{\text{Number of positive words} - \text{Number of negative words}}{\text{Number of words in the annual report}} \quad (9)$$

Columns (3) to (6) within Panel B of Table 5, alongside Column (2) of Table 6, unveil the postulation of variables in a reconstructed manner. Within the precincts of Table 5, Columns (3) to (4) witness the treatment where solely temporal and industrial constants are accounted for in Column (3), devoid of supplementary control variables. Herein, the coefficient estimation for the non-financial foresightfulness registers at -0.0319 , attaining the rigorous 1% threshold of statistical significance. Subsequently, in Column (4), while preserving temporal and industrial constants, an augmentation of control variables is introduced. Mirroring the prior observation, the coefficient appraisal for non-financial foresightfulness sustains its robustness at -0.0312 , exhibiting fidelity to the 1% statistical significance criterion. Moving forward to Columns (5) through (6) in Table 5, the regression analysis unveils a coefficient of -0.0309 in Column (5) and -0.0304 in Column (6), both of which transcend the stringent 1% statistical significance threshold, thereby further substantiating the study’s conjectures.

In parallel, Columns (2) through (3) of Table 6 furnish an analogous narrative. Through meticulous control for temporal and industrial constants, and the subsequent introduction of a battery of control variables, Column (2) illuminates a coefficient reading of -0.0296 for non-financial foresightfulness (Nonfinancial_farsightedness2), triumphantly traversing the 1% statistical significance benchmark. Simultaneously, the interaction term between non-financial foresightfulness and analyst follow (Nonfinancial_farsightedness2 \times Follow) commands a coefficient estimate of -0.0315 , thereby fortifying the argument’s robustness within the exalted precincts of statistical significance. Meanwhile, Column (3) unpacks the coefficient estimation for Nonfinancial_farsightedness3, impressively registering at -0.0208 , and its interaction with Follow marking -0.0316 , thus cementing the veracity of Research Hypothesis H2.

Endogeneity test

Instrumental variable approach. To mitigate the potential endogeneity concerns inherent within the model, the non-financial information foresightedness variables were subjected to regression against all exogenous variables, yielding residual E. Incorporating this residual E into model (10) as an explanatory variable, subsequent examination of the regression coefficient ρ aimed to ascertain its nullity. The obtained result, wherein the regression coefficient ρ manifested as 0.0157, substantiated the presence of endogeneity issues. Given the acknowledged endogeneity within the original model, recourse to instrumental variable methodology was deemed necessary for resolution.

$$\text{SYNCH}_{it} = \alpha_0 + \alpha_1 \text{Nonfinancial_farsightedness}_{i,t} + \alpha_i \text{Control}_{i,t} + \rho E + \mu \quad (10)$$

The median foresightfulness of non-financial information among peer companies within the same temporal and sectoral nexus has been appropriated as an instrumental variate (IV_farsightedness) for the foresightfulness of non-financial information. Employing this instrumental variate, a bipartite regression endeavor has been undertaken to scrutinize the correlation betwixt the designated instrumental variate and the endogenous explanatory variables, thereby delineating Model (11). The empirical findings evince that the regression coefficients of the instrumental variates manifest statistical significance at the alpha level of 1%, implying the instrumental variates’ congruence with the endogenous variables and their plausible explanatory

capacity towards a fraction of the non-financial information.

$$\text{Nonfinancial_farsightedness}_{i,t} = \alpha_0 + \alpha_i \text{Control}_{i,t} + \alpha_i \text{IV_farsightedness} + \varepsilon \quad (11)$$

Through two-stage regression, it is evident that the research model remains robust, with research hypotheses H1 and H2 validated, as indicated by the regression outcomes displayed in Panels C of Tables 5 and 6.

Heckman two-stage model. Utilizing the Heckman two-stage model, we analyze potential endogeneity concerns. To address endogenous effects, we first implement the binary selection model to calculate the inverse Mills ratio (IMR). The specifications are detailed as follows:

$$\text{Pr}(\text{Nonfinancial_farsightedness} = 1) = c_0 + c_1 \text{Lev}_{i,t} + c_2 \text{ROA}_{i,t} + c_3 \text{Size}_{i,t} + c_4 \text{Book_to_Market}_{i,t} + c_5 \text{Growth}_{i,t} + c_6 \text{Top1}_{i,t} + c_7 \text{Age}_{i,t} + c_8 \text{Shrcr} + c_9 \text{InsInvestor}_{i,t} + c_{10} \text{VOL}_{i,t} + c_{11} \text{ROE}_{i,t} + c_{12} \text{Board}_{i,t} + c_{13} \text{Dual}_{i,t} + c_{14} \text{Big4}_{i,t} + c_{15} \text{Audit}_{i,t} + \Sigma \text{Year} + \Sigma \text{Industry} + \varepsilon_{it} \quad (12)$$

The variable *Nonfinancial_farsightedness* is a binary indicator reflecting the foresight associated with non-financial information. It is categorized into two groups based on the mean value, with the group exhibiting higher visibility assigned a value of 1, while the other group is assigned a value of 0. Subsequently, the Inverse Mills Ratio (IMR) is computed. Incorporating the IMR into the research model presented in columns (1) of Panel D in Table 5 highlights that self-selection within the sample gives rise to an endogeneity issue. However, the coefficient of *Nonfinancial_farsightedness* maintains a consistent and significant sign, corroborating findings from prior research. This indicates that the original results remain valid even after addressing the self-selection concern, thereby reinforcing the robustness of the conclusions and substantiating the research hypothesis.

Lagged explanatory variables. The non-financial information disclosed by companies may not exert an immediate influence on the current stock market, leading to potential delays in stock price adjustments within the present period. To tackle these potential endogeneity concerns, this study includes lagged explanatory variables. As demonstrated in columns (2) to (4) of Panel D in Table 5, the continued significance of the results, even after assessing lagged explanatory variables over one to two periods, further substantiates the validity of the research hypothesis.

Analysis of influence mechanism

Through the scrutiny of H1, we have ascertained the conspicuous affirmative impact of non-financial information foresightedness on augmenting capital market information efficiency. Perusal of extant literature has revealed that the predominant determinants influencing capital market information efficiency encompass analysts' surplus prognostications (Chen 2020), audit opinions (Wang et al. 2022), corporate financialization (Sun and Liu, 2020), and executive chain networks (Jianqiong et al., 2022). As elucidated by Huang (2022), foresightedness exerts a salutary influence on the optimistic bias of analysts' surplus prognostications. Concurrently, Li and Jiang (2020) demonstrated that the more affirmative the net foresightedness of information, the more efficaciously it can engender the framing effect in information psychology, thereby mitigating the issuance probability of non-standard audit opinions. Moreover, Yan and Sun (2022), predicated on savings motives analysis, concluded that heightened managerial foresightedness corresponds with diminished levels of corporate financialization. Consequently,

the prescience of non-financial information content correlates closely with the precision of analysts' surplus prognostications, the typology of audit opinions, and the extent of corporate financialization, thus exerting a tangible influence on capital market information efficiency. Hence, this section delves into the ramifications of foresightedness on capital market information efficiency from the vantage points of analysts' prognostic precision, audit opinions, and corporate financialization.

Analysts' earnings projection precision. To validate the mediating influence of analysts' projection precision (*Forecast_Error*) in the linkage between the foresightedness of non-financial data and capital market information efficiency, the examination path "Foresightedness of non-financial data → Analysts' earnings projection precision" was employed. We adhere to the methodologies of the literature (Abarbanell and Lehavy 2003; Zhao and Li 2024), defining forecast errors as the absolute values of percentage discrepancies. Analysts' earnings projection error is construed as the absolute value of the difference between forecasted and mean actual earnings per share (EPS), scaled by the actual EPS.

Column (1) in Table 7 unveils the test results for analysts' surplus forecast accuracy as a mediating variable. The outcomes unveil that the foresightfulness within non-financial informational contents augments the optimistic bias in analysts' surplus forecasts. The regression coefficient for non-financial foresightedness on analysts' surplus forecast bias stands at -0.0338 , with a t -value of -2.35 , signifying significance at the 5% level. The mediation effect assessment showcases the mediating role of analysts' surplus forecast accuracy between non-financial foresightedness and capital market information efficiency.

Audit opinion. To authenticate the mediating effect of audit opinion type in the association between non-financial information foresightedness and capital market information efficiency, the test pathway is designated as "Non-financial Information Foresightedness → Audit Opinion." The audit opinion type is dichotomous, denoted as 0 or 1. Specifically, a value of 1 signifies the issuance of a non-standard unqualified opinion by the Certified Public Accountant (CPA), otherwise, it is denoted as 0.

The results for the audit opinion type mediating variable are displayed in Column (2) of Table 7. The regression coefficient for non-financial information foresightedness is -0.1721 , with a t -value of -3.36 , signifying significance at the 5% level. This suggests that a higher degree of foresightedness in non-financial information is associated with a reduced likelihood of the company receiving a non-standard audit opinion. Hence, audit opinion plays a significant mediating role between non-financial information foresightedness and capital market information efficiency. Greater foresightedness in non-financial information corresponds to a diminished probability of receiving a non-standard audit opinion, thereby potentially enhancing the efficiency of capital market information.

Corporate financialization. To substantiate the mediating influence of corporate financialization in the nexus between the foresightedness of non-financial information and capital market information efficiency, the examination path delineated is "foresightedness of non-financial information → corporate financialization". In line with Demir (2009), financial asset allocation is employed as a metric to gauge the extent of corporate financialization. The computational formula is as follows:

Corporate financialization (Fin) = (trading financial assets + derivative financial assets + available-for-sale financial assets + held-to-maturity investments + net loans and advances granted + investment properties)/total assets (13).

Table 7 Analysis of Influence Mechanism.

Variables	(1) Forecast_Error	(2) Audit_OP	(3) Fin
Nonfinancial_farsightedness	0.0355** (2.24)	-0.1721*** (-3.36)	-0.0149*** (-3.17)
lnInvestor	-0.0035 (-0.15)	0.0019 (0.77)	0.0640*** (2.72)
Lev	-0.0216 (-1.11)	-0.0238*** (-5.37)	-0.0046 (-0.23)
Size	0.0117 (0.48)	0.0105*** (2.81)	-0.0104 (-0.40)
Book_to_Market	-0.0360* (-1.74)	0.0131*** (3.90)	0.0126 (0.61)
Growth	-0.0036 (-0.30)	-0.0006 (-0.26)	-0.0062 (-0.72)
Board	-0.0241* (-1.76)	-0.0025 (-1.13)	-0.0004 (-0.02)
VOL	-0.0246 (-1.50)	0.0006 (0.21)	-0.0251* (-1.72)
Age	0.0266 (1.49)	-0.0078*** (-3.08)	0.0320* (1.71)
Roe	0.0724** (2.45)	0.0410*** (5.20)	-0.0077 (-0.28)
Top1	0.0130 (0.67)	0.0090*** (3.44)	-0.0172 (-0.84)
Shrcr	-0.0065 (-0.26)	-0.0076*** (-2.62)	-0.0523** (-2.13)
Roa	-0.0766** (-2.39)	-0.0101 (-1.33)	0.0294 (0.92)
Dual	-0.0073 (-0.24)	0.0013 (0.32)	0.0225 (0.67)
Big4	-0.1118* (-1.92)	-0.0006 (-0.08)	0.0723 (1.05)
Audit	0.0544 (0.82)	Yes Yes	-0.1582** (-2.45)
Industry	Yes	0.9914***	Yes
Year	Yes	(44.39)	Yes
Constant	0.2121 (1.08)	15830 0.0810	0.2987 (1.43)
Observations	15830	0.0748	15830
R-sq	0.0141	(2)	0.0319
Adjusted R-sq	0.0009	Audit_OP	0.0253

*p < 0.1, **p < 0.05, ***p < 0.01.

Column (3) of Table 7 presents the test outcomes for the variable acting as a mediator of corporate financialization. The impact of non-financial information foresightedness on corporate financialization (“Nonfinancial_farsightedness→Fin”) was scrutinized. The regression coefficient for non-financial information foresightedness stands at -0.0149, with a *t*-value of -3.17, signifying significance at the 1% level. This suggests that a stronger non-financial foresightedness correlates with a greater likelihood of reducing the proportion of corporate investment in financial assets. It illustrates the significant mediating effect of corporate financialization between non-financial information foresightedness and capital market information efficiency. The foresightedness within non-financial information content exerts a negative influence on corporate financialization, substantially enhancing capital market information efficiency.

Additional analysis

Heterogeneity analysis of media attention. The role of news media in disclosing corporate information and monitoring corporate autonomy and management is notable. As per Qiao and Chen (2019), when investors rely on company-level information for trading, an increase in news media coverage of a company suggests that stock prices incorporate more company-specific information, consequently leading to lower capital market information efficiency. Chen et al. (2013) emphasized that higher levels of media attention result in more non-fundamental information about the company and the driving factors being integrated into stock prices. Consequently, stock prices are more likely to deviate excessively from their fundamental values; in other words, media attention diminishes capital market information efficiency to a certain extent, with higher media attention correlating with lower capital market information efficiency (Xiao and Shen, 2021). In this study, selected listed companies were grouped based on their median media attention into two categories: high and low media attention. The primary model of non-financial information farsightedness and capital market information efficiency was applied to test these two groups separately,

assessing the impact of forward-looking non-financial information on capital market information efficiency across different levels of media attention.

Panel A of Table 8 displays the heterogeneous analysis results of media attention grouping. It is evident that there exists a significant disparity in the association between non-financial information farsightedness and capital market information efficiency across companies with varying levels of media attention. The enhancement effect of non-financial information farsightedness on capital market information efficiency is more pronounced in companies with higher media attention compared to those with lower media attention. Companies with higher media attention exhibit a more significant impact on capital market information efficiency when they are more proactive in disclosing forward-looking non-financial information. Conversely, companies with lower media attention, even when releasing non-financial information (including forward-looking content), do not exert a positive or negative influence on capital market information efficiency.

Heterogeneity analysis of internal control quality. In companies with deficient corporate governance, major shareholders often divert funds and assets to a select few individuals or interest groups lacking economic productivity. Insiders resort to various means to conceal the true cash flow and operational conditions of the company for personal gain, thereby increasing opportunities for stock speculation and manipulating stock prices. This leads to investors being misled by false information and engaging in blind stock trading, resulting in significant noise in the stock trading market (Liu and Liu 2016). Strengthening internal control regulatory systems within companies can restrain insiders from transferring corporate assets, thereby reducing capital market information efficiency (Zhong and Fu 2021). In this study, we employed the median of internal control quality indicators as a threshold to categorize sample companies into high and low internal control quality groups, aiming to examine the differential impact of internal control quality on the relationship between the

Table 8 Additional analysis: Panel A. Additional analysis: Panel B.

Variables	Sample group of high media coverage (1) SYNCH	Sample group of low media coverage (2) SYNCH
Nonfinancial_farsightedness	-0.0399*** (-2.99)	-0.0040 (-0.43)
InsInvestor	-0.0035 (-0.15)	0.0204 (1.35)
Lev	-0.0247 (-1.19)	0.0076 (0.54)
Size	0.0286 (1.05)	-0.0387** (-2.05)
Book_to_Market	-0.0187 (-0.80)	0.0109 (0.66)
Growth	0.0133 (1.21)	-0.0050 (-0.61)
Board	-0.0013 (-0.08)	0.0157 (1.45)
VOL	0.0074 (0.47)	-0.0308*** (-2.62)
Age	-0.0141 (-0.71)	0.1117*** (8.25)
Roe	-0.0039 (-0.11)	0.0261 (1.04)
Top1	0.0158 (0.71)	0.0078 (0.54)
Shrcr	-0.0010 (-0.01)	-0.0105 (-0.63)
Roa	-0.0065 (-0.18)	-0.0144 (-0.53)
Dual	0.0318 (0.98)	-0.0406* (-1.76)
Big4	-0.0493 (-0.63)	-0.1282*** (-2.71)
Audit	0.0258 (0.36)	0.0091 (0.15)
Industry	Yes	Yes
Year	Yes	Yes
Constant	0.0414 (0.17)	0.3825*** (3.17)
Observations	4907	10923
R-sq	0.0216	0.0378
Adjusted R-sq	0.0101	0.0312

Variables	Sample group of high internal control quality (1)SYNCH	Sample group of low internal control quality (2)SYNCH
Nonfinancial_farsightedness	-0.0433*** (-3.43)	-0.0166 (-1.31)
InsInvestor	0.0322* (1.08)	-0.0347 (-1.64)
Lev	0.0316** (2.08)	-0.0069 (-0.36)
Size	-0.0411** (-2.04)	-0.0067 (-0.26)
Book_to_Market	0.0108 (0.65)	0.0210 (0.99)
Growth	-0.0037 (-0.43)	0.0041 (0.37)
Board	-0.0024 (-0.21)	0.0144 (0.97)
VOL	-0.0044 (-0.36)	-0.0132 (-0.84)
Age	0.0951*** (6.84)	0.0771 (4.09)
Roe	-0.0623** (-2.57)	-0.0100 (-0.27)
Top1	-0.0226 (-1.37)	0.0137 (0.67)
Shrcr	-0.0153 (-0.83)	0.0001 (0.01)
Roa	0.0803*** (2.98)	0.0303 (0.79)
Dual	-0.0397* (-1.66)	-0.0054 (-0.18)
Big4	0.0090 (0.16)	-0.0001 (-0.01)
Audit	-0.0098 (-0.16)	0.0615 (0.88)
Industry	Yes	Yes
Year	Yes	Yes
Constant	0.0518 (0.34)	-0.2534 (-1.31)
Observations	8925	6015
R-sq	0.0261	0.0230
Adjusted R-sq	0.0195	0.0118

*p < 0.1, **p < 0.05, ***p < 0.01.

forward-looking nature of non-financial information and capital market information efficiency.

Panel B of Table 8 presents the results of the analysis on the heterogeneity of internal control quality. It is evident that companies with higher internal control indices exhibit a significant negative correlation between the forward-looking nature of their non-financial information and capital market information efficiency, whereas firms with lower internal control quality do not demonstrate a significant relationship. This phenomenon may stem from the fact that non-financial information disclosure mainly encompasses environmental, social responsibility, and corporate governance information. Companies with sound corporate governance and high internal control quality encounter fewer

temporal and spatial constraints on resource allocation, allowing them to better plan and implement corporate strategies. Consequently, they are more likely to exhibit positive foresight when disclosing non-financial information, possess lesser potential for internally manipulating stock trading, and are thus more likely to achieve higher capital market information efficiency.

Summary and conclusion

This study empirically investigates the relationship between the forward-looking nature of non-financial information and the information efficiency of the capital market using data from Chinese A-share listed companies from 2007 to 2022. We find that the inclusion of forward-looking content in disclosed non-

financial information significantly reduces stock price synchronisation and increases the information content of a firm's stock price, thereby improving capital market efficiency, and that analyst attention moderates this relationship. The accuracy of analysts' earnings forecasts, the type of audit opinion and the degree of financialisation of the firm mediate the relationship between forward-looking non-financial information and capital market information efficiency. Further analyses show that the sample of listed companies is divided into two groups according to the level of media attention they receive, and it is found that the degree of impact of forward-looking non-financial information on capital market information efficiency differs between the two groups, and that forward-looking non-financial information disclosed by firms with a high level of media attention has a more significant impact on capital market information efficiency. Similarly, the conclusion is also different when the listed companies are grouped according to the quality of their internal control, if the company's internal control is of high quality, the forward-looking non-financial information disclosed by the company has a more significant effect on the information efficiency of the capital market.

The findings of this study are of great significance to regulators and academics in understanding the impact of forward-looking content in non-financial information on the information efficiency of the capital market and its internal mechanism. These findings provide theoretical references and policy insights for China to strengthen the information disclosure system of listed companies, encourage enterprises to improve corporate governance, and enhance investor protection. Specifically, first, the findings of this study can help China strengthen the construction of the information disclosure system for listed companies by proposing better non-financial information disclosure principles and regulations to standardise the format and content of the corresponding disclosures. Secondly, this study can encourage enterprises to improve corporate governance, in order to improve the quality of information disclosure, listed companies will try to disclose non-financial information with positive forward-looking, in this way, the company will inevitably have to optimise the current state of corporate governance firstly, and improve the level of corporate governance. Thirdly, the decision made by investors before investment mainly relies on the content of non-financial information disclosed by listed companies, and if its content is more standardised and true and reflects the company's strengths, it may largely influence investors' judgement and decision to avoid losses caused by wrong judgement.

The needs of future research can be addressed through this study, specifically: First, regulators should provide guidance to listed companies on how to improve the quality of information disclosure. On the one hand, capital market regulators should establish quantifiable standards for forward-looking assessment of non-financial information and find dictionaries and indicators suitable for China's national conditions. On the other hand, regulators should continuously issue appropriate guidance and standards on how to disclose non-financial information. This provides ideas for future research, which can propose relevant studies to help regulators establish appropriate standards. Second, investors should improve their ability to interpret the implied meaning of non-financial information, pay attention to sentences in non-financial information that contain forward-looking statements, understand the potential meanings that the management tries to convey, and predict the company's future development and operation. Future research could explore in the literature how to help investors understand implied information. Third, focusing on the role of analysts' earnings forecast accuracy in reducing stock price synchronisation encourages analysts to use firm-specific information to promote rational pricing in the

capital market. Future research could also delve into the role analysts play in the governance of the capital market information environment. Fourth, since the degree of financialisation of companies can weaken the impact of non-financial information forward-looking on capital market information efficiency, it is important to pay attention to and take timely measures to deal with the trend of financialisation of companies (especially companies in the real industry), and future research can analyse this. Fifth, different levels of internal control quality lead to different results in the relationship between forward-looking non-financial disclosure and capital market information efficiency, suggesting that improving the level of internal and external corporate governance can help address information asymmetry. It is emphasised that higher internal control quality can improve the quality of corporate disclosure, promote the optimal allocation of resources in the capital market and facilitate the orderly, healthy and sustainable development of the capital market. Future research can discuss that improving the level of corporate governance helps to solve the information asymmetry problem.

Data availability

Non-financial information forward-looking data is collected manually, all other data can be found in the CSMAR database. The datasets generated during the current study are available in the database: <https://doi.org/10.7910/DVN/RJGTGX>.

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References

- Andreas A (2024) Evidence on the incremental information content of concurrent financial and non-financial corporate disclosures[J]. *Financ Res Lett* 60:104940
- Abedin ZM, Goldstein AM, Huang Q et al. (2024) Forward-looking disclosure effects on stock liquidity in China: Evidence from MD&A text analysis[J]. *Int Rev Financial Anal* 95(PB):103484–103484
- Athanasakou V, Hussainey K (2014) The perceived credibility of forward-looking performance disclosures[J]. *Account Bus Res* 44(3):227–259
- Abarbanell J, Lehavy R (2003) Can Stock Recommendations Predict Earnings Management and Analysts' Earnings Forecast Errors?[J]. *J Account Res* 41(1):1–31
- Chauhan Y, Kumar BS (2018) Do investors value the nonfinancial disclosure in emerging markets?[J]. *Emerg Mark Rev* 37:32–46
- Chen C-W, Pantzalis C, Park JC (2013) Press coverage and stock price deviation from fundamental value[J]. *J Financ Res* 36(2):175–214
- Chen D (2020) Self-media disclosure, analysts' earnings forecast accuracy and capital market information efficiency[J]. *Financ Acc Newsl* 837(01):51–55. <https://doi.org/10.16144/j.cnki.issn1002-8072.2020.01.009>
- Chen F, Wang P (2022) Research on the impact of audit opinion on capital market information efficiency—an analysis of the moderating effect based on analysts' attention[J]. *Friends Acc* 686(14):99–106
- Demir F (2009) Financial liberalization, private investment and portfolio choice: Financialization of real sectors in emerging markets[J]. *J Dev Econ* 88(2):0–324
- Morck R, Yeung B, Yu W (2000) The information content of stock markets: why do emerging markets have synchronous stock price movements? [J]. *J Financial Econ* 58(1):215–260
- Fang G, Dong Y, Ni C, Fu R (2015) Determinants and economic consequences of non-financial disclosure quality[J]. *Eur Acc Rev* 25(2):287–317
- Grewal J, Riedel EJ, Serafeim G (2019) Market reaction to mandatory nonfinancial disclosure[J]. *Manag Sci* 65(7):3061–3084
- Guo J, Wu D (2024) Capital market openness and bank credit risk: evidence from listed commercial banks[J]. *Financ Res Lett* 63105282
- Gao R, Wang Z, Zhou L (2024) Tournaments and contracts under asymmetric information[J]. *Economic Modelling* 139:106825
- Hassanein A, Hussainey K (2015) Is forward-looking financial disclosure really informative? Evidence from UK narrative statements[J]. *Int Rev Financ Anal* 41:52–61
- Henry E, Thewissen J, Torsin W (2021) International earnings announcements: tone, forward-looking statements, and informativeness[J]. *Eur Account Rev*

- Huan L, Nan S, Yongwei Y et al. (2023) The impact of corporate public market share repurchases on capital market information efficiency[J]. *Emerg Mark Financ Trade* 59(10):3220–3240
- Huang C (2022) Management farsightedness and analysts' optimism bias in earnings forecasts: empirical evidence from listed companies' annual report texts[J]. *J Guangxi Univ Financ Econ* 35(06):18–50
- Hu Y, Ye Y, Yu X et al. (2024) Managerial overconfidence and corporate information disclosure[J]. *Borsa Istanbul Rev* 24(2):263–279
- Jia N, Rai A, Xu SX (2020) Reducing capital market anomaly: the role of information technology using an information uncertainty lens[J]. *Manag Sci* 66(2):979–1001. <https://doi.org/10.1287/mnsc.2018.3235>
- Jianqiong W, Liao X, Cao S (2022) Executive chain networks and stock price synchronisation[J]. *Tech Econ* 41(09):157–169
- Kang T, Park DH, Han I (2018) Beyond the numbers: the effect of 10-K farsightedness on firms' performance predictions using text analytics[J]. *Telemat Inf* 35(2):370–381
- Kilic M, Kuzey C (2018) Determinants of forward-looking disclosures in integrated reporting[J]. *Manag Auditing J* 33(1):115–144
- Krause J, Sellhorn T, Ahmed K (2017) Extreme uncertainty and forward-looking disclosure properties[J]. *Abacus-A J Acc Financ Bus Stud* 53(2):240–272
- Lei D (2017) Understanding investors' reliance on disclosures of nonfinancial information and mitigating mechanisms for underreliance[J]. *Acc Bus Res* 47(4):431–454
- Li Y, Li YT (2020) The effect of trade secrets protection on disclosure of forward-looking financial information[J]. *J Bus Financ Acc* 47(3-4):397–437
- Li S, Jiang Y (2020) Does the farsightedness of textual information in listed companies' annual reports affect audit opinions? [J]. *Acc Res* 2020(05):178–192
- Li J, Yutao L, Yan L (2019) Social media and voluntary nonfinancial disclosure: evidence from Twitter presence and corporate political disclosure[J]. *J Inf Syst* 33:2
- Lin L, Xie D (2017) Do analysts recommend stock updates using management farsightedness? – A textual analysis based on earnings presentations[J]. *Manag World* 2017(11):125–145+188. <https://doi.org/10.19744/j.cnki.11-1235/f.2017.11.010>
- Liu G (2021) Non-financial information disclosure, foreign shareholding and the efficiency of corporate IPO pricing[J]. *Financ Acc Newsl* 881(21):53–56. <https://doi.org/10.16144/j.cnki.issn1002-8072.2021.21.011>
- Liu X, Liu Y (2016) Internal control efficiency, information disclosure quality and capital market information efficiency[J]. *Shandong Soc Sci* 250(06):146–150. <https://doi.org/10.14112/j.cnki.37-1053/c.2016.06.020>
- Liu GR, Qian H, Shi Y, Yuan DL, Zhou M (2024) How do firms react to capital market liberalization? Evidence from ESG reporting green washing[J]. *Corp Soc Responsib Environ Manag* 04
- Li SG, Jiang YM (2020) Does the Informational Tone of Listed Companies' Annual Report Texts Affect Audit Opinions? [J]. *Account Res* 05:178–192
- Loughran T, McDonald B (2016) Textual analysis in accounting and finance: a survey[J]. *J Acc Res* 54(4):1187–1230
- Mio C, Marchini PL, Medioli A (2020) Forward-looking information in integrated reports: Insights from “best in class”[J]. *Corp Soc Responsib Environ Manag* 27(5):2212–2224
- Muslu V, Radhakrishnan S, Subramanyam K, Lim D (2015) Forward-looking MD&A disclosure and the information environment. *Manag Sci* 61(5):931–948
- Nan XL, Zhang YB (2018) Financing and financing securities and capital market information efficiency—an empirical study based on the perspective of stock price synchronization[J]. *Invest Res* 37(02):102–121
- Ni Y, Ding W, Li D, et al. (2024) Internal information asymmetry and power distance[J]. *Res. Int. Bus Financ* 71:102477
- Peng Y, Shi L, Shi X, et al. (2024) Tone or term: Machine-learning text analysis, featured vocabulary extraction, and evidence from bond pricing in China[J]. *J Emp Financ* 78:101534
- Piotroski DJ (2007) Discussion of The Book-to-Price Effect in Stock Returns: Accounting for Leverage[J]. *J. Account Res* 45(2):469–479
- Price MS, Doran SJ, Peterson RD et al. (2012) Earnings conference calls and stock returns: The incremental informativeness of textual tone[J]. *J Bank Financ* 36(4):992–1011
- Qiao F, Wen C(2019) Media attention, accounting information quality and capital market information efficiency[J]. *Financ Account Commun* 830(30):8–11+21
- Ruan L, Liu H, Tsai SB (2021) XBRL adoption and capital market information efficiency[J]. *J Global Inform Manag* 29(6). <https://doi.org/10.4018/JGIM.20211101.0a35>
- McKay SP, Doran JS, Peterson DR, Bliss BA (2012) Earnings conference calls and stock returns: the incremental informativeness of textual farsightedness[J]. *J. Bank Financ* 36(4):992–1011
- Shen D (2021) Internet penetration and capital market information efficiency: evidence based on capital market information efficiency[J]. *Financ Forum* 26(11):47–56. <https://doi.org/10.16529/j.cnki.11-4613/f.2021.11.006>
- Shen J, Li S, Sun F (2022) Annual report farsightedness and corporate financial performance: heart to heart or heart to mouth? [J]. *Audit Econ. Res* 37(01):69–80
- Sun HF, Liu C (2020) Corporate financialisation and stock price synchronisation[J]. *Invest Res* 39(08):124–141
- Teoh SH, Yang, YG, Zhang Y (2009) R-Square and market efficiency. SSRN Working Paper
- Tian SY, Bai WQ, Shi WL (2022) Capital market opening and labour investment efficiency[J]. *Econ Res Ekonomika Istrazivanja*, 10. <https://doi.org/10.1080/1331677X.2022.2135555>
- Tim L, McDonald B (2011) When is a liability not a liability? Textual analysis, dictionaries, and 10-Ks[J]. *J Financ* 66(1):35–65
- Wang J, Jin C, Yaya S (2022) Do textual disclosure language features of annual reports' non-financial information affect the risk of share price collapse? [J]. *J Beijing Univ Technol Bus* 37(03):98–112
- Wanqi W, Zhaoguang Q (2024) Capital market opening and commercial bank risk: evidence from “Shanghai–Hong Kong Stock Connect”[J]. *Financ Res Lett* 59:104827
- Weihui H, Lv H, Qingqing Y (2024) Capital market liberalization and firms' OFDI performance: evidence from China[J]. *Financ Res Lett* 59
- Wenhao T, Xiang L, Jianfeng Z, et al. (2023) Internal capital markets and employee wage: evidence from China[J]. *Int Rev Financ Anal* 88
- William JM, Nathan YS, Mohan V (2013) Using earnings conference calls to identify analysts with superior private information[J]. *Rev Acc Stud* 18(2):386–413
- Wu H, Liu W(2022) Analyst surplus forecast revision and capital market information efficiency[J]. *Economic Jingwei* 39(01):98–107
- Wu Y, Wu S, Xu F, et al. (2024) Wisdom of crowds or awkward squad? Social interaction and the information efficiency of the Chinese capital market[J]. *Res Int Bus Financ* 71:102486
- Wu XD, Yao X, Guo LJ (2024) Is Textual Tone Informative or Inflated for Firm's Future Value? Evidence from Chinese Listed Firms[J]. *Econ Model* 94(republish):513–525
- Wang Y, Zhang Y, Hou D (2022) Does corporate ESG performance affect audit opinion? [J]. *Auditing Economic Res* 37(05):54–64
- Xin YY, Zeng X, Luo ZY (2022) Customers' annual report farsightedness and suppliers' innovation decisions: evidence from China[J]. *Eur J Innov Manag* <https://doi.org/10.1108/EJIM-12-2021-0585>
- Xinyu L, Huacheng W, Rong L (2023) A hidden channel of “blood transfusion”: internal capital market subsidies and zombie firms[J]. *Br Acc Rev* 55(6):101267
- Xu WJ, Kong TT (2022) Exchange questioning regulation and capital market information efficiency: direct impact and spillover effects [J]. *South Financ* 06:55–67
- Xue Y, Tian G, Li X (2022) Forward-looking disclosure and investment efficiency: “Nothing is said” or “something is true”? [J]. *Securities Mark Her* 362(09):14–22+57
- Xiao Q, Shen H(2021) Media attention, heterogeneous investor beliefs and capital market information efficiency[J]. *Financ Trade Res* 32(10):99–110
- Yan L, Sun ZJ (2022) Does management farsightedness influence firms' financialization decisions? –An analysis based on savings motives[J]. *Financ Acc Newsl* 2022(16):67–70. <https://doi.org/10.16144/j.cnki.issn1002-8072.2022.16.015>
- Yang F, Huang JY, Cai YB (2021) farsightedness of textual information in annual reports and regulatory inquiry letters: data from China[J]. *Emerg Mark Financ Trade* 58(2):417–427
- Yuan DL, Shang D, Ma YF, Li DH (2022) The spillover effects of peer annual report farsightedness for firm innovation investment: evidence from China[J]. *Technol Forecast Soc Chang* 177. <https://doi.org/10.1016/j.techfore.2022.121518>
- Zhang T, Zhang D (2020) Can contingent matter disclosure reduce capital market information efficiency? [J]. *J Zhongnan Univ Econ Law* 2020(03):3–13+158. <https://doi.org/10.19639/j.cnki.issn1003-5230.20200214.004>
- Zhang ZS, Luo MT, Hu ZT, Niu HY (2022) Textual emotional farsightedness and financial crisis identification in Chinese companies: a multi-source data analysis based on machine learning[J]. *Appl Sci* 12(13). <https://doi.org/10.3390/app12136662>
- Zhong FY, Fu S (2021) A study on internal control, accounting information quality and capital market information efficiency[J]. *Friends Acc* 650(02):97–103
- Zijian L, Chuntao L, Xunan F (2022) Non-financial information disclosure and capital market pricing efficiency[J]. *Financ Trade Econ* 43(09):38–52. <https://doi.org/10.19795/j.cnki.cn11-1166/f.20220906.010>
- Zhao Y, Li L (2024) Confucian culture and analysts' earnings forecast accuracy[J]. *Financ Res Lett* 65:105589

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Author contributions

Corresponding author was responsible for writing the first and revised drafts of the article, and First author was responsible for conceptual guidance and selecting topic. All authors have read and agreed to the published version of the manuscript.

Competing interests

The authors declare no competing interests.

Ethical approval

This article does not contain any studies with human participants performed by any of the authors.

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Additional information

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