



Research article

Forward looking statement, investor sentiment and stock liquidity

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ABSTRACT

Information is a critical element of capital markets, and liquidity is the lifeblood of capital markets. Relative to historical information, forward-looking information is of significant value to investors. Based on textual analysis calculations, we selected Chinese A-share listed companies as a research sample to explore the impact of forward-looking information disclosure level on stock liquidity. It is found that the higher the level of forward-looking information disclosure, the better the stock liquidity. Investor sentiment is the transmission mechanism through which the forward looking statement disclosure level affects stock liquidity. The heterogeneity analysis shows that the level of forward-Looking statement disclosure has a more significant effect on stock liquidity improvement for state-owned enterprises and enterprises in low-market regions than those in regions with high marketization levels. The article expands and enriches the research on forward-looking information disclosure, and also has some reference value for regulators to formulate laws and regulations and regulate forward-looking information disclosure.

1. Introduction

The International Integrated Reporting Framework (hereinafter referred as Framework), drafted and translated by the International Integrated Reporting Council (IIRC), strongly emphasizes forward-looking information. The framework specifies that enterprises should publish reports that answer questions about the challenges and uncertainties they may encounter in executing their strategies and the potential implications for their business models and future performance, highlighting expected changes over time, providing expectations about the external environment they are likely to face in the short, medium and long term; its basic guiding principles promote “strategic and forward-looking” corporate disclosure, including the provision of future-oriented information. The basic guiding principle advocates “strategic and forward-looking” corporate information disclosure, including providing future-oriented information. Forward-looking information includes the landscape and trends facing the enterprise, the enterprise’s future development strategy, the business plan for the next year, potential future risks and countermeasures. For investors, historical information and forward-looking information complement each other, and forward-looking information can make up for future information that historical information has not yet been mentioned or cannot provide, on the basis of which investors make judgments

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about the development status and future value of the enterprise. It can even be argued that forward-looking information has greater value to stakeholders compared to historical information. For example, forward-looking information is more important than historical information in stock price crash risk prediction [1]. In 2012, the China Securities Regulatory Commission promulgated the “Guidelines on the Content and Format of Information Disclosure by Enterprises that Issue Public Securities No. 2—Annual Report” (hereinafter referred to as “Guideline No. 2”), emphasizing that “the board of directors of an enterprise shall disclose its business plan for the new year, including (but not limited to) revenue, expense and cost plans, and business objectives for the new year, such as sales increase, market share expansion, cost increase or decrease, and R&D plan, etc., and the strategies and actions to be taken to achieve the above business objectives”. Therefore, the importance of forward-looking information from both a theoretical and practical perspective cannot be overstated.

Stock liquidity is the lifeblood of the securities market. Only the existence of sufficient liquidity in the financial market can satisfy the trading needs of both sides of the market and ensure the normal operation of the stock market. Severe liquidity depletion can even lead to a financial crisis [2]. Information is an important factor in the capital market. Information disclosure plays an important role in the operation of the capital market. Regarding the relationship between information disclosure and stock liquidity, many scholars have conducted relevant studies. Most of these studies concluded that the better the quality of information disclosure, the better the stock liquidity, because disclosing more information can effectively alleviate information asymmetry and increase stock liquidity [3]. However, most previous studies have focused on whether certain types of information are disclosed, the quality of disclosure, or textual attributes (tone, readability and similarity), and the level of disclosure of specific information, such as forward-looking information, has not received extensive attention, and although a few scholars have studied forward-looking statement disclosure, they have been limited to the determinants of forward-looking information [4], or the relationship with corporate governance [5,6], there is a gap in the research on the role of the level of forward-looking information disclosure on the stock market. So, does the level of forward-looking statement disclosure affect stock liquidity? If the two are related, what is the mechanism of action involved? Does this effect differ across contexts?

In order to answer the above questions, we selected Chinese A-share listed companies from 2011 to 2020 as our research sample and tried to explore the relationship between the level of forward-looking information disclosure and stock liquidity. It is found that: first, the higher the level of forward-looking statement disclosure, the better the stock liquidity. Second, investor sentiment plays a mediating role in the process of forward-looking statement disclosure level affecting stock liquidity. Third, after further distinguishing the nature of equity and the marketability level of the region in which the enterprise is located, it is found that the effect of forward-looking statement disclosure level on stock liquidity is more significant for non-state-owned enterprises and enterprises located in low marketability regions.

The contributions of this study are mainly three points: First, existing studies focus on the effects of voluntary disclosure, management tone, and annual report readability on stock liquidity [7–9]. Less literature deals with the impact of the level of textual information disclosure on stock liquidity. Our study instead discusses the relationship between the level of forward-looking statement disclosure and stock liquidity, expanding and enriching the research related to textual disclosure and providing new empirical evidence to the previous view. Second, most previous studies construct disclosure level indicators using dictionaries developed by their predecessors or constructing new dictionaries based on a certain data enterprise’s lexicon, which inevitably suffers from the drawback of lacking objectivity. Alternatively, the level of forward-looking disclosure is measured either by counting several forward-looking items disclosed in the company’s annual report to calculate the forward-looking disclosure score or by counting the forward-looking sentences that appear in the annual report [10–12]. Our study proposes a completely new way of constructing dictionaries from the perspective of word frequencies. This method can basically be used for the construction of all types of information dictionaries, and is highly applicable and simple to operate, as it automatically identifies and generates word frequencies with the help of python, which avoids human interference and is highly objective. Third, we find that the level of forward-looking information disclosure can have an impact on stock liquidity, and it is of great practical significance to remind stakeholders to pay attention to the disclosure of such information, which helps to regulate the scope and content of information disclosure and provide a basis for decision-making in the formulation of relevant laws and regulations.

The remaining structure of this study is organized as follows. Section 2 is the theoretical background and hypotheses; Section 3 is the methodology; Section 4 is the results; and Section 5 is the conclusion and implications.

2. Theoretical background and hypotheses

2.1. Impact of forward-looking information on stock liquidity

It has been shown that forward-looking information, listed companies’ forward-looking statement disclosures, such as management forecasts, press releases and conference calls, can effectively reflect the potential uncertainties of the enterprise and narrow the information asymmetry gap between enterprises and investors [13–15]. A large number of studies have verified, from both theoretical and empirical perspectives, that information disclosure improves stock liquidity. Theoretically, inadequate disclosure of corporate information may lead to poor stock liquidity [16]. This is because inadequate disclosure exacerbates information asymmetries, and worse, there may be insider trading using information, holding other factors constant, which would lead to larger bid-ask spreads and lower stock liquidity [17]. From an empirical point of view, both small and large stock trading increases with increased corporate disclosure [18]. This is supported by the study of Leuz and Verrecchia [19], who argue that increased disclosure will alleviate information asymmetry and that increased disclosure will help improve stock liquidity, especially the best difference between the bid and ask prices or an indicator of the quoted bid-ask spread. Meanwhile, Godfred [20] empirically documented that corporate

disclosure and transparency (TDS) reduces information asymmetry to some extent on the Ghana Stock Exchange (GSE), thereby improving liquidity. In conclusion, most of the studies have shown that increased disclosure affects stock liquidity.

Of course, how forward-looking information affects stock liquidity has been mentioned in previous studies. Consistent with other types of disclosure, increased disclosure of forward-looking information promotes increased stock liquidity. For example, Utami et al. [21] found that forward-looking information was significantly associated with stock liquidity while investigating the factors of stock liquidity of manufacturing enterprises listed on the Indonesian Stock Exchange. Based on the above analysis, it is easy to see that forward-looking information, as a voluntary disclosure by enterprises, is inextricably related to stock liquidity. Therefore, we propose the following research hypothesis.

Hypothesis 1(H1). : The level of forward-looking statement disclosure is significantly and positively related to stock liquidity.

2.2. Mediating mechanism of stock liquidity

As early as 1990, Edelman and Baker [22] suggested that there are many factors that affect stock liquidity, including not only the number of listed stocks, stock prices and issuers' fundamental factors, but also information disclosure and market sentiment. It follows that market liquidity is likely to be affected by investor sentiment in financial markets, and stock liquidity can change for the better or for the worse at any time as investor sentiment changes. Also, the disclosure of forward-looking information undoubtedly affects investor sentiment in the market, due to the fact that as an important source of enterprise information, forward-looking statement disclosure can help information users to better understand important factors for the future development of the enterprise [23].

Forward-looking information disclosure affects investor sentiment for two main reasons: First, Our experiments are based on market signaling theory. Signaling theory is an attempt by a company's management to differentiate itself from other companies in the market by providing information that clearly distinguishes it from other companies. Furthermore, our experiments are based on the principal-agent theory. The principal-agent theory assumes that managers and shareholders have different interests. Managers may convince shareholders by disclosing more information in order to gain trust. Listed company management disclosure is actually a signal to the outside world. Therefore, investors' sentiments will change accordingly if they receive a positive or negative signal. Second, forward-looking information provides a lot of incremental information [24], and investors pay much attention to and value forward-looking information, as Schleicher et al. [25] found that loss-making investors are more likely to use forward-looking information in financial reports as an important source of information because investors in loss-making enterprises need more information to estimate future earnings. It is easy to infer that when enterprise management discloses more forward-looking information, investors can get the information they need in their financial reports, investors will be optimistic about the enterprise's future prospects and increase their confidence in the enterprise's outlook, and investor sentiment at this time is on the positive side. If the forward-looking information is not disclosed sufficiently, investors cannot get the expected information in the text of the financial report or need a lot of time and energy to analyze the future development of the enterprise, which not only increases the search cost but also lacks the basis for judging the investment value of the enterprise, and investors' sentiment turns negative at this time.

The most crucial feature of investors as indispensable participants in the securities market is their investment decisions [26]. Investors' investment decisions largely determine individual stock trading behavior, and shifts in trading behavior lead to changes in stock liquidity. And psychology believes that decisions are guided by emotions. It follows that investor sentiment affects investment decisions and ultimately changes stock liquidity. This view is generally accepted and recognized. Liu [27] When the sentiment index rises, i.e., when investors are more optimistic, stock market liquidity is stronger and market trading volume increases. The conclusion that high investor sentiment is accompanied by stronger stock liquidity still holds after controlling for the effect of the market trading volume. Kumari [28] tested in a nonlinear conditional mean-variance framework the relationship between total stock market liquidity and investor sentiment and found that investor sentiment significantly affects stock market liquidity changes. Specifically, the more positive investor sentiment, the better stock liquidity. Based on the above analysis, we propose the following research hypothesis.

Hypothesis 2(H2). : Investor sentiment plays a mediating effect in the impact of forward-looking statement disclosure levels on stock liquidity.

2.3. Heterogeneity analysis of stock liquidity

The business management behavior and strategy choices of Chinese enterprises can be influenced by the external environment [29]. The level of forward-looking information disclosure can also be regarded as a management behavior of enterprises, which may also change with the external environment. At the same time, enterprises with different ownership nature may show differences in various aspects, and state-owned and non-state-owned enterprises may disclose different levels of information due to their different business objectives. The study by Celik et al. [12] also concluded that there are significant differences in the level of forward-looking information disclosure among companies of different nature. Moreover, because state-owned enterprises have natural political advantages, investors still have confidence in the development of state-owned enterprises even when adverse news occurs. It has been shown that in more market-oriented regions, management will be more inclined to act in accordance with market and regulatory requirements: on the one hand, firms will be more proactive in standing up to government regulators and providing clear and concise information that meets regulatory requirements; on the other hand, firms will be more cooperative with market demand side requirements, such as information users, to provide clear, concise, and valuable information [30]. Therefore, we hypothesize that management in regions with a high degree of marketization tend to provide more forward-looking information in order to improve market competitiveness. Based on the above analysis, we propose the following research hypotheses.

Hypothesis 3(H3). : The positive relationship between the level of forward-looking information statement disclosure and stock liquidity is more significant for non-state-owned enterprises compared to state-owned enterprises.

Hypothesis 4(H4). : The positive relationship between the level of forward-looking statement disclosure and stock liquidity is more significant for enterprises located in high market areas compared to enterprises located in low market areas.

3. Methodology

3.1. Sample selection and data sources

We select Chinese A-share listed companies from 2011 to 2020 as the research sample, and the data involved in this study include stock liquidity indicators, forward-looking statement information disclosure level, shareholding ratio of the first largest shareholder, shareholding ratio of institutional investors, and enterprise size. Among them, the data of stock liquidity index, shareholding ratio of the first largest shareholder, shareholding ratio of institutional investors and enterprise size are obtained from China Stock Market Accounting Research database (CSMAR). The forward-looking statement information disclosure level is calculated based on the text of Forward-Looking statement (FLS) chapter in the annual reports of listed companies with the help of python software analysis. The above samples are processed as follows: (1) enterprises in ST and *ST are excluded; (2) enterprises belonging to the financial industry are excluded; (3) enterprises with missing annual reports, unreproducible and missing data are excluded. After the above processing, the final sample is 1428 listed companies in China A-shares from 2011 to 2020. The data type belongs to panel data. 14,280 observations were included in our panel regressions.

3.2. Variable description

3.2.1. Explained variables

Stock liquidity. Stock liquidity is a multi-faceted and multi-level concept. There is no unified standard on how to measure it, and the existing literature mainly constructs stock liquidity indicators from the perspective of price, trading volume, and price-volume combination. We refer to the study of Boubaker et al. [9], which uses *Amihud* indicator to measure stock liquidity. This indicator fully takes into account trading price and volume factors, has low data requirements, can be constructed based on daily stock price and trading volume only, and many studies have shown that the *Amihud* indicator performs better among low-frequency liquidity indicators [31,32]. The indicator is defined as follows. We use equation (1) to calculate stock liquidity.

$$Illiq_{-y_{it}} = \frac{1}{D_{it}} \sum_{i=1}^{D_{it}} \frac{|R_{itd}|}{VOL_{itd}} * 10^6 \tag{1}$$

Where, R_{itd} and VOL_{itd} denote the return and trading amount of the stock i on the d day of the t year, respectively, and D_{it} is the total number of trading days of the stock i on the t year, which is an inverse indicator of stock liquidity. The larger the value of $Illiq_{-y}$, the greater the impact of the trading amount on the price and the less liquid the stock is. To ensure the robustness of the results, we select the mean annual trading volume, the total annual trading volume and the *Roll_impact_y* indicator as proxy variables for stock liquidity in the subsequent analysis.

3.2.2. Explanatory variables

Level of forward-looking information disclosure. We define forward-looking information disclosure level as the ratio of forward-looking information keyword word frequency to the total number of words in the forward-looking information section. The greater the value of this indicator, the more forward-looking information is disclosed and the higher the level of forward-looking information disclosure. The construction method of the forward-looking information disclosure level indicator is as follows: (1) Select choose the 2011–2020 annual reports of Chinese A-shares from Juchao Information Website. We wrote a program with the help of python computer language to crawl and save the annual reports of listed companies from Juchao. com for the past years, and the file format of the crawled annual reports is mostly pdf version; (2) Manually screen and extract the chapter of Future Development and Outlook of

Table 1
Discontinued words dictionary and Forward-looking dictionaries.

Panel A: 20 words in the discontinued words dictionary				
Ah	For example	And	No matter	Otherwise
Other than that	But	Especially	According to	In other words
Or	Suppose	Therefore	They	On the one hand
At the same time	About	So	Respectively	And
Panel B:Top 20 words in the forward-looking dictionary				
Development	Market	Industry	Products	Risks
Businesses	Enterprise	Management	Operations	New
Upgrade	Construction	Technology	Projects	Production
Industry	Strategy	Continuous	Improve	Promote

the Enterprise (FLS) from the annual reports. Outlook of the Enterprise (FLS chapter) in the annual report and save it in a txt file. The manual screening method improves accuracy for the construction of our subsequent prospective information dictionary; (3) Integrate the chapters of “Future Development and Outlook of the Enterprise” of all enterprises for all years into one txt file; (4) Clean up the text with the help of python software, eliminate all the numbers and all kinds of symbols in the txt file, and eliminate the discontinued words with very little information based on the list of discontinued words of HIT. We list the 20 deactivated words in Panel An of Table 1; (5) Clean up the text of FLS chapters by Jieba and count the word frequency. In other words, we use the jieba word splitting module in the python computer language to split the text into individual words and count the word frequency of each word; (6) Sort all the key words according to the word frequency, select the key words ranked from 0 to 200, and eliminate the key words that are obviously irrelevant to the forward-looking information, such as “country “If there are less than 200 keywords, the remaining 200 keywords will be replaced by subsequent words in order to form a dictionary of forward-looking information, Panel B of Table 1 lists the top 20 words of the forward-looking information dictionary; (7) The total number of words was calculated for each enterprise’s annual FLS chapter text after the cleanup based on Jieba splitting. This step calculates the $AlWrd$ in equation (2); (8) According to equation (2), the forward-looking information disclosure level index was calculated. The formula for calculating the forward-looking information disclosure level index is as follows.

$$FLS200_{it} = \frac{Word_{it}}{AlWrd_{it}} \quad (2)$$

Where, $FLS200_{it}$ indicates the level of forward-looking information disclosure for the enterprise i year t , $word_{it}$ is the sum of word frequency of forward-looking information keywords for the enterprise i year t chapter FLS , and $AlWrd_{it}$ is the total number of words for the enterprise i year t chapter FLS . The higher the value of $FLS200$, the higher the number of forward-looking information disclosed in the FLS chapter and the higher the level of forward-looking information disclosure.

3.2.3. Mediator variables

Investor sentiment. We select investor sentiment as a mediating variable, referring to Yang et al. [2], and adopt the sentiment of posts in the Oriental Fortune stock bar, which is the largest online financial forum in China, where investors exchange and interact with stocks through postings. Investor sentiment is defined as follows. We use equation (3) to calculate Investor sentiment.

$$Sentiment_{it} = \ln \left(\frac{1 + \sum_{d=1}^D N_{pos, itd}}{1 + \sum_{d=1}^D N_{neg, itd}} \right) \quad (3)$$

Where, $sentiment_{it}$ indicates the investor sentiment of the enterprise i for the year, $N_{pos, itd}$ and $N_{neg, itd}$ indicate the number of positive posts and negative posts in the enterprise’s bar sub forum of the company on the d day of the t year.

3.2.4. Control variables

After referring to the previous literature [2,8,9,33,34] and synthesizing the practices of these literatures, we selected a series of control variables, including the percentage of shares held by the largest shareholder, the percentage of shares held by institutional investors, the gearing ratio, company size, the inverse of the share price, company age, the percentage of independent directors, and the stock return volatility. Also, industry-level fixed effects, and industry fixed effects are controlled for. The specific definitions are shown

Table 2
Definition of main variables.

Variable Type	Variable Name	Variable abbreviation	Variable Definition
Explained variables	Stock Liquidity	<i>illiq_y</i>	Amihud indicator, which measures stock liquidity, is sourced from the China Stock Market Accounting Research database and is calculated as in equation (1)
Explanatory variables	Forward-looking statement disclosure levels	<i>FLS200</i>	Forward-looking statement disclosure level, the ratio of forward-looking keyword word frequency to the total number of words in the FLS chapter in that year, calculated as in equation (2)
Control variables	Percentage of shareholding of the largest shareholder	<i>Shrcr1</i>	Shareholding ratio of the first largest shareholder, the number of shares held by the first largest shareholder of the enterprise in the year as a percentage of the total number of shares
	Shareholding of institutional investors	<i>Insi</i>	The ratio of the number of shares held by the enterprise’s institutional investors to the total number of shares in that year
	Gearing ratio	<i>Lev</i>	Gearing ratio, which is the ratio of total liabilities to total assets
	Enterprise Size	<i>Size</i>	Enterprise size is measured by the enterprise’s market capitalization, which is the logarithm of the enterprise’s market capitalization at the end of the year
	Reciprocal of stock price	<i>Invprc</i>	The inverse of the stock price
	Enterprise Age	<i>Age</i>	Enterprise age is the number of years the enterprise has been in existence
	Percentage of independent directors	<i>Poid</i>	Percentage of the number of independent directors to the total number of the enterprise’s board of directors for the year
Intermediate variables	Stock Return Volatility	<i>Volat</i>	Volatility of daily stock returns
	Investor Sentiment	<i>Sentiment</i>	Investor sentiment based on East Money stock bar posts calculated as in equation (3)

in Table 2.

3.3. Descriptive statistical analysis

In order to avoid the effect of extreme values, we performed tailoring (Winsorize) at the 1% and 99% quartiles for all continuous variables. Table 3 presents the results of descriptive statistics for the main variables. These indicators demonstrate the diversity and variability of the sample. As shown in Table 3, the minimum value of the *Illiq_y* indicator is 0.0003, the maximum value is 5.8155, and the standard deviation is 0.0901, indicating a gap in the liquidity of the sample stocks. The range of values of the *FLS200* is from 0 to 1. If the indicator is 0, it means that the FLS section in the annual report of that year does not disclose information that is forward-looking, and if the indicator is 1, it means that all the contents of the FLS section of that year are forward-looking information. The higher the value of this indicator, the more forward-looking information is disclosed and the higher the level of forward-looking information disclosure. The maximum value of *FLS200* is 0.6056 and the minimum value is 0.3291, which indicate that the level of forward-looking information disclosure varies from enterprise to enterprise from year to year. A few years have a high level of forward-looking information disclosure and some years have a low level of forward-looking information in the FLS section. The standard deviation of the shareholding ratio of institutional investors (*Insi*) and the shareholding ratio of the first largest shareholder (*Shrcr1*) are 22.7861 and 15.0092, respectively, which shows that the degree of variation in the shareholding ratio of institutions and the concentration of shareholding among the listed A-share stock markets in China is large. The minimum value of the gearing ratio (*Lev*) is 0.0560, and the maximum value is 0.8550, indicating that there is a significant difference in the solvency of the sample enterprises. The maximum value of enterprise size (*Size*) is 25.6683, and the minimum value is 20.9950, which shows that there is a large difference in the size of the sample enterprises.

Table 4 presents the descriptive statistics of *FLS200* by industry and year. Panel A shows the results of descriptive statistics by industry, and panel B shows the results of descriptive statistics by year. According to Table 4 panel A, it can be seen that the mean value of *FLS200* is about 0.4 for all industries, with the maximum value occurring in the manufacturing industry at 0.8065 and the minimum value at 0.0958 in the extractive industry; in general, the differences in *FLS200* across industries are not significant. By industry, i.e., the results of panel B, the maximum value of *FLS200* is 0.8519, which occurred in 2018, and the minimum value is 0.0958, which occurred in 2011. In terms of minimum values, *FLS200* shows an overall increasing trend.

Fig. 1 is divided into two parts, the upper part A shows the trend of *FLS200* indicator and the lower part B shows the trend of *Illiq_y* indicator. According to Fig. 1, *Illiq_y* shows a decreasing trend and *FLS200* shows an increasing trend from 2012 to 2014, while *Illiq_y* shows an increasing trend and *FLS200* shows a decreasing trend from 2014 to 2015 and from 2017 to 2018, while *Illiq_y* shows a decreasing trend and *FLS200* shows an increasing trend from 2019 to 2020. Overall, in most years, *FLS200* and *Illiq_y* show a reverse trend.

3.4. Model setting

Our data are panel data. Drawing on Zhang et al. [35], and Filimonova et al. [36], we choose a fixed effects model. The reason is that by referring to previous literature, it is known that stock liquidity varies across industries and years. We include controls for time effects and industry effects in order to control for unobservable effects. To test the relationship between the level of forward-looking statement disclosure and stock liquidity, we constructed the following regression model.

$$Illiq_{-y_{it}} = \alpha_0 + \beta_0 FLS200_{it} + \beta_1 Shrcr_{it} + \beta_2 Insi_{it} + \beta_3 Lev_{it} + \beta_4 Size_{it} + \beta_5 Lnvprc_{it} + \beta_6 Age + \beta_7 Poid_{it} + \beta_8 Volat_{it} + Year + Ind + \epsilon_{it} \tag{4}$$

The explanatory variable is *Illiq_y*, which measures stock liquidity, and the explanatory variable is *FLS200*, which represents the level of forward-looking statement disclosure. The control variables include the percentage of shares held by the largest shareholder, the percentage of shares held by institutional investors, the gearing ratio and enterprise size, etc. α_0 is a constant term, *Year* and *Ind* represent year fixed effects and industry fixed effects, respectively, and ϵ_{it} is a random error term. We focus on the direction and significance of the level of forward-looking statement disclosure after controlling for the effects of enterprise characteristics factors,

Table 3
Descriptive statistics.

Variables	Obs	Mean	Std. Dev.	Min	Max
<i>illiq_y</i>	14,280	0.0494	0.0901	0.0003	5.8155
<i>FLS200</i>	14,280	0.4684	0.0573	0.3291	0.6056
<i>Shrcr1</i>	14,280	34.7034	15.0092	8.4484	74.9648
<i>Insi</i>	14,280	47.7540	22.7861	0.5781	90.6714
<i>Lev</i>	14,280	0.4463	0.1986	0.0560	0.8550
<i>Size</i>	14,280	22.7140	0.9621	20.9950	25.6683
<i>lnvprc</i>	14,280	0.1144	0.0733	0.0170	0.3760
<i>Age</i>	14,280	3.1703	0.2175	2.6391	3.6109
<i>Poid</i>	14,280	0.3785	0.0719	0.2500	0.600
<i>Volat</i>	14,280	0.0274	0.0088	0.0121	0.0550
<i>Sentiment</i>	14,280	0.2735	0.2880	-0.4055	1.1147

Table 4
FLS200 descriptive statistics.

Panel A : FLS200 Descriptive Statistics by Industry									
Ind	A	B	C	D	E	F	G	H	I
Obs	195	369	8764	594	404	1001	597	71	735
Mean	0.4189	0.4401	0.4745	0.4359	0.4754	0.4695	0.4294	0.4225	0.4888
Std. Dev.	0.0437	0.0596	0.0572	0.0544	0.0494	0.0579	0.0530	0.0475	0.0583
Min	0.2649	0.0958	0.1372	0.2745	0.1504	0.2551	0.1439	0.3257	0.2700
Max	0.525	0.6354	0.8065	0.7576	0.6897	0.8519	0.5815	0.5327	0.6695
Ind	K	L	M	N	O	P	Q	R	S
Obs	813	176	83	124	4	11	38	149	152
Mean	0.4806	0.4505	0.4680	0.4371	0.4692	0.4414	0.3973	0.4152	0.4718
Std. Dev.	0.0647	0.0620	0.0580	0.0719	0.1039	0.0432	0.0377	0.0562	0.0565
Min	0.2051	0.2741	0.3431	0.2170	0.4161	0.3784	0.2992	0.2420	0.3211
Max	0.7135	0.6333	0.5868	0.6522	0.6250	0.5230	0.4786	0.5452	0.6296

Panel B : FLS200 Descriptive Statistics by Year					
Year	2011	2012	2013	2014	2015
Obs	1428	1428	1428	1428	1428
Mean	0.4715	0.4718	0.4730	0.4740	0.4709
Std. Dev.	0.0677	0.0603	0.0608	0.0605	0.0595
Min	0.0958	0.1139	0.1038	0.1588	0.1439
Max	0.8065	0.6509	0.7135	0.6905	0.6923
Year	2016	2017	2018	2019	2020
Obs	1428	1428	1428	1428	1428
Mean	0.4677	0.4667	0.4646	0.4605	0.4621
Std. Dev.	0.0589	0.0562	0.0575	0.0565	0.0563
Min	0.1462	0.2912	0.2051	0.2562	0.2583
Max	0.7143	0.7432	0.7415	0.8519	0.6842

Note: A - agriculture, forestry, animal husbandry and fishing, B - extractive industries, C - for manufacturing, D -electricity, heat, gas and water production and supply, E – construction; F - wholesale and retail trade; G - transportation, storage and postal services; H - accommodation and catering; I - information transmission, software and information technology services; K - real estate; L - rental and business services; M – scientific research and technical services; N - water, environment and public facilities management; O - residential services, repairs and other services; P - education; Q - health and social work; R - culture, sports and entertainment; S - integrated.

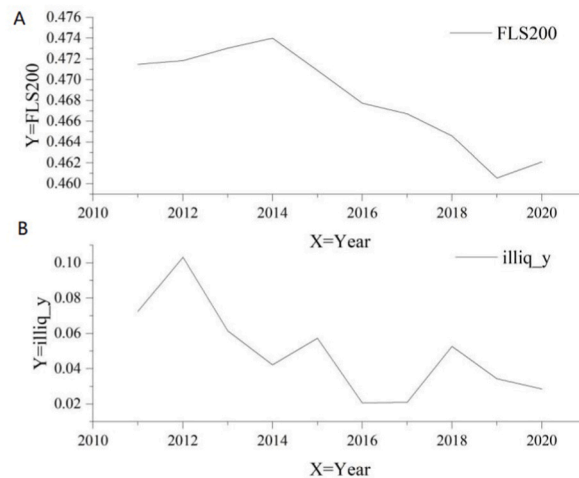


Fig. 1. Plots the trends of *FLS200* and *Illiq_y* from 2011 to 2020.

industry and year on stock liquidity. Therefore, in the above model, we focus on the coefficient β_0 of *FLS200*, which, if hypothesis 1 holds, is expected to be negative and significant when *FLS200* is used as a proxy variable for stock liquidity.

4. Results

4.1. Baseline regression results

Hypothesis 1 predicts that forward-looking statement disclosure improves stock liquidity. To test this hypothesis, we conducted an empirical test using model (4), and the regression results are shown in Table 5.

Column (1) of Table 5 does not include control variables and controls for time-fixed effects and industry fixed effects only. Column (2) adds enterprise-level control variables and does not control for time and industry-fixed effects. Column (3) includes a range of control variables as well as time and industry fixed effects. According to columns (1) and (2) of Table 5, the regression coefficients for the level of forward-looking statement disclosure (*FLS200*) are -0.0051 and -0.0035 , respectively, but they are not significant. As shown in column (3) of Table 5, the regression coefficient of the level of forward-looking statement disclosure is -0.0163 , which is significant at the 1% level, indicating that the higher the level of forward-looking statement disclosure, the better the stock liquidity (the smaller the value of *Illiq_y*). In terms of values, in column (3) of Table 5, for example, *Illiq_y* decreases by 0.0163 units for each unit increase in *FLS200*, indicating that, other things being equal, forward-looking statement disclosure significantly improves stock liquidity, verifying hypothesis 1. Regarding the control variables, the regression coefficients of *Shrcr1* and *Insi* are significantly positive at the 1% level, indicating that the greater the percentage of shares held by the first largest shareholder and the percentage of shares held by institutions, the greater the stock the worse the liquidity, which is consistent with the findings of the literature on the related [9,37,38]. The regression coefficients of *size* and *Age* are divided into -0.0298 and -0.0101 , indicating that large-scale and older enterprises have better stock liquidity, which is consistent with the literature on the relationship between enterprise size (or company age) and stock liquidity [2]. In addition, we find that variables such as gearing (*Lev*), share price inverse (*Invprc*), the proportion of independent directors (*Poid*) and earnings volatility (*volat*) are related to stock liquidity, and the findings are generally consistent with those of the existing literature.

4.2. Endogeneity test

4.2.1. PSM

To control for potential selectivity bias, the control group was reconstructed using the PSM propensity score matching method. The sample was divided into two groups with high and low forward-looking statement disclosure levels according to the median of the forward-looking statement disclosure levels (*FLS200*) as the boundary, and the propensity score was calculated by the logit model, and the corresponding control group sample was found by one-to-one no-release matching. Finally, the matched samples were collated and regressed again, and the regression results after PSM matching are presented in Table 6. The results in column (3) of Table 6 indicate that there is still a significant negative correlation between the level of forward-looking statement disclosure and the *Illiq_y* indicator at the 5% level, and the findings are consistent with those above.

4.2.2. Instrumental variable analysis

To address the endogeneity issue, we selected the mean value of forward-looking statement disclosure level of all enterprises in the same year (*FLS.mean*) as the instrumental variable and used two-stage least squares to control for the endogeneity issue, and the regression results are shown in Table 7. The first-stage regression results show that the instrumental variable (*FLS.mean*) is reasonably chosen and remains highly correlated with *FLS200*; the second-stage results show that the fitted values of *FLS200* and *Illiq_y* show a significant negative correlation, i.e. The positive relationship between the level of forward-looking statement disclosure and stock liquidity does not change, indicating that the conclusion that increasing the level of forward-looking statement disclosure can improve stock liquidity still holds after taking into account the endogeneity issue.

4.3. Robustness checks

4.3.1. Re-selection of indicators for measuring the level of forward-looking information disclosure

We select *FLS200* as a proxy variable for the level of forward-looking statement disclosure in the benchmark regression, which is calculated based on 200 keywords in the forward-looking information dictionary. To ensure that the study findings are robust, we re-estimate the forward-looking statement disclosure indicator. This is done as follows: the keywords in the forward-looking information dictionary are scaled down, the top 100 keywords are selected to form a new dictionary, and the keywords ranked after 100 are eliminated. The keywords ranked higher are undoubtedly more relevant to forward-looking, and the forward-looking dictionary constructed in this way can avoid the existence of some words in the dictionary that are less relevant to forward-looking information and improve the accuracy of the forward-looking statement disclosure indicator. In short, we measure the forward-looking statement disclosure indicators again by reconstructing the forward-looking information lexicon by using *FLS100* to measure the level of forward-looking information disclosure. The regression results for *Illiq_y* and *FLS100* are presented in Table 8. According to Table 8, there is still a significant negative correlation between *Illiq_y* and *FLS100*, and the conclusion that forward-looking information disclosure helps improve stock liquidity remains unchanged.

4.3.2. Replacement of regression method

Since enterprise-level factors may affect both the level of forward-looking statement disclosure and stock liquidity, to avoid such interference, we re-test hypothesis H1 using an enterprise fixed effects model, and the regression results are shown in Table 9. According to the results in Table 9, the estimated regression coefficient of *Illiq_y* is -0.0136 after the inclusion of enterprise fixed effects, which is significantly negative at the 10% level. Therefore, we can see that the negative correlation between *Illiq_y* and *FLS200* still holds after controlling for individual enterprise characteristics, and the conclusion is consistent with the previous section.

4.3.3. Substitution of explanatory variables

We select the total annual stock trading volume, the mean annual stock trading volume and the *Roll_impact_y* indicator as proxy

Table 5
Baseline regression analysis.

	(1)	(2)	(3)
<i>Variables</i>	<i>illiq_y</i>	<i>illiq_y</i>	<i>illiq_y</i>
<i>FLS200</i>	-0.0051 (0.0072)	-0.0035 (0.0057)	-0.0163*** (0.0060)
<i>Shrcr1</i>		0.0004*** (0.0000)	0.0003*** (0.0000)
<i>Insi</i>		0.0002*** (0.0000)	0.0002*** (0.0000)
<i>Lev</i>		-0.0112*** (0.0018)	-0.0133*** (0.0018)
<i>Size</i>		-0.0342*** (0.0004)	-0.0298*** (0.0004)
<i>lnvprc</i>		-0.0050 (0.0050)	0.0114*** (0.0044)
<i>Age</i>		-0.0105*** (0.0016)	-0.0101*** (0.0015)
<i>Poid</i>		0.0096** (0.0046)	0.0161*** (0.0043)
<i>Volat</i>		-0.0919** (0.0393)	-0.2004*** (0.0737)
Constant term	0.0709*** (0.0042)	0.8383*** (0.0109)	0.7486*** (0.0120)
Time fixed effects	YES	NO	YES
Industry fixed effects	YES	NO	YES
Sample size	14,280	14,280	14,280
R2	0.2384	0.3955	0.4934

Note: (1) *, **, *** indicate significant at the 10%, 5%, and 1% levels, respectively; (2) Robust standard errors are in parentheses.

Table 6
PSM test.

	(1)	(2)	(3)
<i>Variables</i>	<i>illiq_y</i>	<i>illiq_y</i>	<i>illiq_y</i>
<i>FLS200</i>	0.0005 (0.0082)	-0.0035 (0.0057)	-0.0133** (0.0067)
<i>Shrcr1</i>		0.0004*** (0.0000)	0.0004*** (0.0000)
<i>Insi</i>		0.0002*** (0.0000)	0.0002*** (0.0000)
<i>Lev</i>		-0.0112*** (0.0018)	-0.0146*** (0.0021)
<i>Size</i>		-0.0342*** (0.0004)	-0.0300*** (0.0005)
<i>lnvprc</i>		-0.0050 (0.0050)	0.0118** (0.0052)
<i>Age</i>		-0.0105*** (0.0016)	-0.0096*** (0.0017)
<i>Poid</i>		0.0096** (0.0046)	0.0138*** (0.0047)
<i>Volat</i>		-0.0919** (0.0393)	-0.2139** (0.0838)
Constant term	0.0647*** (0.0048)	0.8383*** (0.0109)	0.7497*** (0.0138)
Time fixed effects	YES	NO	YES
Industry fixed effects	YES	NO	YES
Sample size	11,064	14,280	11,064
R2	0.2430	0.3955	0.5012

Note: (1) *, **, *** indicate significant at the 10%, 5%, and 1% levels, respectively; (2) Robust standard errors are in parentheses.

Table 7
Regression results of instrumental variables.

	First stage		Second stage
<i>Variables</i>	<i>FLS200</i>	<i>Variables</i>	<i>illiq_y</i>
<i>FLS_mean</i>	1.0112*** (0.1024)	<i>FLS200Fitted value</i>	-0.2437*** (0.0703)
<i>Shrcr1</i>	2.46E-05 (0.0000)	<i>Shrcr1</i>	0.0003*** (0.0000)
<i>Insi</i>	3.10E-05 (0.0000)	<i>Insi</i>	0.0002*** (0.0000)
<i>Lev</i>	0.0126*** (0.0027)	<i>Lev</i>	-0.0105*** (0.0021)
<i>Size</i>	-0.0024*** (0.0006)	<i>Inmarv</i>	-0.0303*** (0.0004)
<i>lnvprc</i>	0.0148* (0.0077)	<i>lnvprc</i>	0.0150*** (0.0055)
<i>Age</i>	0.0139*** (0.0023)	<i>Age</i>	-0.0069*** (0.0019)
<i>Poid</i>	0.0166** (0.0065)	<i>Poid</i>	0.0199*** (0.0046)
<i>Volat</i>	-0.0381 (0.0861)	<i>volat</i>	-0.2008*** (0.0597)
Constant term	-0.0085 (0.0457)	Constant term	0.8424*** (0.0312)
Time fixed effects	YES	Time fixed effects	YES
Industry fixed effects	YES	Industry fixed effects	YES
Sample size	14,280	Sample size	14,280
R2	0.1010	R2	0.4322

Note: (1) *, **, *** indicate significant at the 10%, 5%, and 1% levels, respectively; (2) Robust standard errors are in parentheses.

variables for stock liquidity and re-regress model (4). Among them, the larger the total annual stock trading volume and the mean annual stock trading volume, the more liquid the stock is; *Roll_impact_y* indicator is the ratio of *roll* indicator to the trading amount, and the larger the value of this indicator, the less liquid the stock is. Due to space constraints, we omit the table of the results of this regression. Taken together, Our regression results show that: there is no substantial change in the conclusion that increasing the level

Table 8
Robustness tests: replacement of explanatory variables.

	(1)	(2)	(3)
<i>Variables</i>	<i>illiq_y</i>	<i>illiq_y</i>	<i>illiq_y</i>
<i>FLS100</i>	-0.0025 (0.0081)	0.0020 (0.0065)	-0.0189*** (0.0067)
<i>Shrcr1</i>		0.0004*** (0.0000)	0.0003*** (0.0000)
<i>Insi</i>		0.0002*** (0.0000)	0.0002*** (0.0000)
<i>Lev</i>		-0.0112*** (0.0018)	-0.0134*** (0.0018)
<i>Size</i>		-0.0342*** (0.0004)	-0.0298*** (0.0004)
<i>lnvprc</i>		-0.0048 (0.0050)	0.0111** (0.0044)
<i>Age</i>		-0.0105*** (0.0016)	-0.0101*** (0.0015)
<i>Poid</i>		0.0094** (0.0046)	0.0160*** (0.0043)
<i>Volat</i>		-0.0923** (0.0393)	-0.2027*** (0.0736)
Constant term	0.0695*** (0.0039)	0.8357*** (0.0109)	0.7486*** (0.0120)
Time fixed effects	YES	NO	YES
Industry fixed effects	YES	NO	YES
Sample size	14,280	14,280	14,280
R2	0.2384	0.3955	0.4935

Note: (1) *, **, *** indicate significant at the 10%, 5%, and 1% levels, respectively; (2) Robust standard errors are in parentheses.

Table 9
Robustness test: enterprise fixed effects.

	(1)	(2)	(3)
<i>Variables</i>	<i>illiq_y</i>	<i>illiq_y</i>	<i>illiq_y</i>
<i>FLS200</i>	-0.0117 (0.0085)	-0.0035 (0.0057)	-0.0136* (0.0079)
<i>Shrcr1</i>		0.0004*** (0.0000)	0.0004*** (0.0001)
<i>Insi</i>		0.0002*** (0.0000)	0.0004*** (0.0000)
<i>Lev</i>		-0.0112*** (0.0018)	-0.0232*** (0.0036)
<i>Size</i>		-0.0342*** (0.0004)	-0.0365*** (0.0011)
<i>lnvprc</i>		-0.0050 (0.0050)	0.0115 (0.0086)
<i>Age</i>		-0.0105*** (0.0016)	0.1358** (0.0577)
<i>Poid</i>		0.0096** (0.0046)	0.0014 (0.0051)
<i>Volat</i>		-0.0919** (0.0393)	-0.3768*** (0.0839)
Constant term	0.0334*** (0.0089)	0.8383*** (0.0109)	0.4650** (0.2081)
Time fixed effects	YES	NO	YES
Enterprise fixed effects	YES	NO	YES
Sample size	14,280	14,280	14,280
R2	0.5593	0.3955	0.6362

Note: (1) *, **, *** indicate significant at the 10%, 5%, and 1% levels, respectively; (2) Robust standard errors are in parentheses.

of forward-looking statement disclosure helps to improve stock liquidity

4.3.4. Other robustness checks

To avoid the effect of omitted variables on the regression results, text tone and text readability were added to the baseline model, drawing on Xie and Lin [39] and Zeng et al. [40] to measure the text tone of FLS chapters in the following two ways: the first calculation is (number of positive words - number of negative words)/(number of positive words + number of negative words), defined as *tone1*; the second formula is (number of positive words - number of negative words)/total number of words, defined as *tone2*. Drawing on the method of Wang et al. [30], the average sentence length was used to portray text readability; therefore, we defined text readability (*read*) as equal to the total number of words/punctuation, the higher the value, the less readable the text. We omit the results of this regression due to space constraints. However, we still found some interesting results., Regression results show a significant negative correlation between *FLS200* and *Illiq_y* indicators at different levels, indicating that an increase in the level of forward-looking information disclosure has an improving effect on stock liquidity. What's more. The regression coefficients of *tone1* and *tone2* are positive but insignificant, and the regression coefficient of *read* is positive and significant at the 1% level. It indicates that the more positive the tone, the worse the stock liquidity; the higher the text readability, the better the stock liquidity. Possible reasons for this phenomenon are: the text tone of the FLS section of the enterprise may be the result of management manipulation, investors are able to identify abnormally positive tone with the help of the degree of consistency between the information of different modalities [41], and false positive tone does not improve stock liquidity; higher text readability of the FLS section means that investors process information more efficiently and easily get the required information from the text. Easily obtain the required information from the text, leading to positive changes in investor sentiment and a greater willingness to engage in stock trading activities, which ultimately improves stock liquidity.

4.4. Heterogeneity analysis

4.4.1. SOEs and Non-SOEs

The nature of ownership is the most typical enterprise characteristic in the Chinese capital market context, and enterprises with different ownership natures also exhibit large differences in a variety of economic aspects [2]. Therefore, from the perspective of differences in ownership nature, the extent to which enterprises disclose forward-looking information may be related to the nature of ownership. To examine whether there is a difference in the effect of the level of forward-looking information disclosure on stock liquidity among enterprises with different ownership nature, we divide the sample into state-owned and non-state-owned enterprises and conduct group regressions.

Fig. 2 is divided into two parts, the upper part shows the regression coefficients and significance for the sample of non-SOEs and the lower part shows the regression coefficients and significance for the sample of SOEs.¹ According to Fig. 2, it is easy to see that the regression coefficient of *FLS200* is significant at the 5% level in the sample of non-SOEs, while the regression coefficient of *FLS200* is 0.0044 in the sample of SOEs, but is not significant. It can be seen that there is a significant difference in the effect of the level of forward-looking statement disclosure on the improvement of stock liquidity under different enterprise natures. Further, it can be observed that the effect of the level of forward-looking statement disclosure on stock liquidity is more pronounced in non-state-owned enterprises compared to state-owned enterprises. In addition, we report the regression results for the different enterprise natures samples in Supplementary Table 1.

Possible reasons for this phenomenon are as follows: first, because of the natural political advantage of SOEs, investors do not significantly increase or decrease their stock trading due to the amount of information disclosed by the enterprise, and changes in the level of forward-looking information disclosure do not significantly alter their investment decisions, and thus stock liquidity does not change significantly. Second, SOEs have dual objectives, including explicit economic goals and potential policy and social goals [42], which are significantly different from non-SOEs that have profitability as their goal, and the truthfulness of information disclosed by SOEs is much greater than that of non-SOEs. The level of forward-looking information disclosure of SOEs with political attributes will not change significantly unless there are huge changes in the socio-economic environment. Therefore, the effect of forward-looking information statement disclosure level on stock liquidity is more significant in non-SOEs.

4.4.2. Low marketization region and high marketization region

China is a vast country, due to the differences in natural resources and geographic location between provinces, the culture and economic development of each region are different. As a result, the external environment faced by enterprises varies greatly. In regions with a higher degree of marketization, due to competitive pressure, corporate executives are willing to cater to and meet the needs of investors by providing more detailed and accurate information, which improves the level of information disclosure to a certain extent. At the same time, regions with a higher degree of marketization have more adequate external supervision. Management needs to provide clear, explicit, and valuable information as required by the market and regulations [30]. Therefore, the impact of the level of forward-looking information disclosure on stock liquidity under different degrees of marketization is considered. This is done by using Fan et al.'s marketability index (market) as a proxy variable to measure the degree of marketability in each region [43]. The full sample is divided into 2 subsamples: the low marketization group and the high marketization group, using the median marketization level as the boundary, and the 2 subsamples are regressed separately.²

Fig. 3 is divided into two parts. The upper part shows the regression coefficients and significance for the sample in low marketization areas and the lower part shows the regression coefficients and significance for the sample in high marketization areas.² According to Fig. 3, it can be seen that the regression coefficient of *FLS200* is significant at the 1% level in the sample of enterprises located in low marketization regions, while the regression coefficient of *FLS200* is insignificant in the sample of enterprises located in high marketization regions, which shows that there is a gap in the impact of the level of forward-looking statement disclosure on stock liquidity among enterprises in different marketization regions. Combining the results in Fig. 3 reveals that the level of forward-looking statement disclosure has a more significant effect on stock liquidity for enterprises located in low-marketing regions compared to enterprises located in high-marketing regions. In addition, we report the regression results for different marketization regions in the Appendix (Supplementary Table 2).

Possible reasons for this phenomenon are that enterprises in low-market regions have long faced a more relaxed external environment in the form of less competitive pressure, lower regulatory intensity, and less robust regional regulations than enterprises located in high-market regions. Except for mandatory disclosures, the degree of disclosure is mostly determined by the management of listed companies, resulting in uneven levels of forward-looking information disclosure by these enterprises. The result of this situation is that once there is a significant change in the level of forward-looking information disclosure, investors react quickly to it in the form of a change in investment decisions, which ultimately leads to a change in stock liquidity. However, enterprises located in high-market areas always face a stringent external environment, and the level of forward-looking statement disclosure tends to be flat and hardly changes significantly. Therefore, the effect of forward-looking statement disclosure level on stock liquidity is more significant among enterprises located in low-market regions.

¹ For the convenience of the plot, the coefficients here are the absolute values of the original coefficients.

² For the convenience of the plot, the coefficients here are the absolute values of the original coefficients.

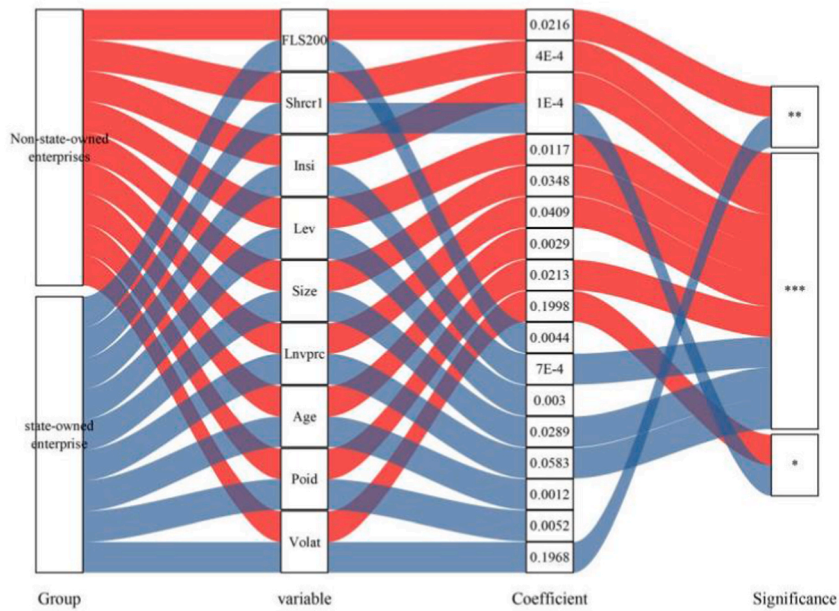


Fig. 2. Plots the regression coefficients for different enterprise properties.

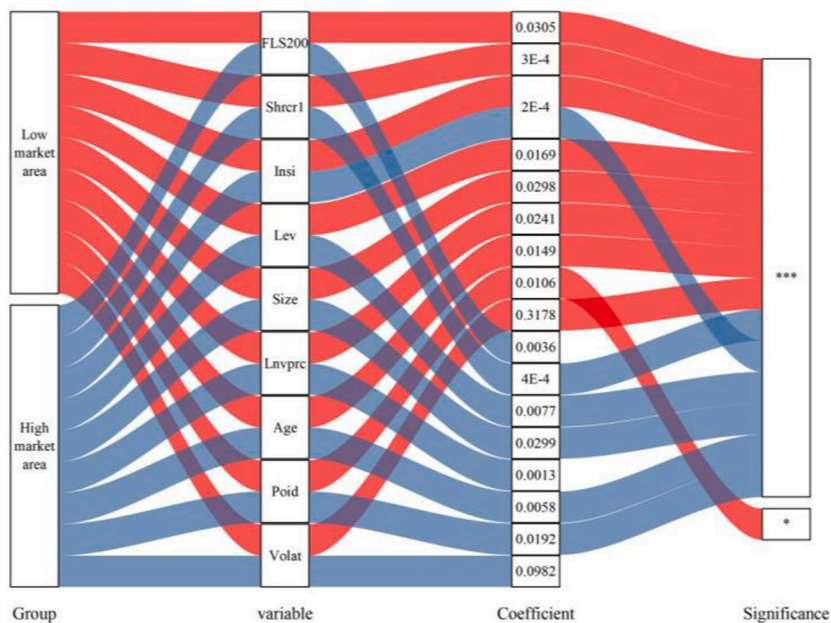


Fig. 3. Plots the regression coefficients for different levels of marketization.

4.5. Mediating effect

The results of the benchmark regression suggest that increasing the level of forward-looking information disclosure improves stock liquidity. So, what causes forward-looking information to affect stock liquidity? In other words, what is the transmission mechanism by which the level of forward-looking statement disclosure acts on stock liquidity? Based on the previously mentioned market signaling theory and principal-agent theory, as well as other elements of logical analysis, we hypothesize that investor sentiment may play a mediating role in the process by which the level of forward-looking information disclosure improves stock liquidity. To test whether investor sentiment is the path between this process, we construct the following mediating effects model.

$$Illiq_{-y_{it}} = \alpha_0 + \beta_0 FLS200_{it} + \beta_1 Shcrd_{it} + \beta_2 Insi_{it} + \beta_3 Lev_{it} + \beta_4 Size_{it} + \beta_5 Lnvprc_{it} + \beta_6 Age + \beta_7 Poid_{it} + \beta_8 Volat_{it} + Year + Ind + \varepsilon_{it} \quad (5)$$

$$Sentiments_{it} = \alpha_1 + \beta_9 FLS200 + \beta_{10} Shcrd_{it} + \beta_{11} Insi_{it} + \beta_{12} Lev_{it} + \beta_{13} Size_{it} + \beta_{14} Lnvprc_{it} + \beta_{15} Age_{it} + \beta_{16} Poid_{it} + \beta_{17} Volat_{it} + Year + Ind + \varepsilon_{it} \quad (6)$$

$$Illiq_{-y_{it}} = \alpha_2 + \beta_{18} FLS200_{it} + \beta_{19} Sentiments_{it} + \beta_{20} Shcrd_{it} + \beta_{21} Insi_{it} + \beta_{23} Lev_{it} + \beta_{24} Size_{it} + \beta_{25} Lnvprc_{it} + \beta_{26} Age + \beta_{27} Poid_{it} + \beta_{28} Volat_{it} + Year + Ind + \varepsilon_{it} \quad (7)$$

where $Sentiments_{it}$ is the mediating variable based on investor sentiment calculated from East Money stock posts; the rest of the variables have the same meaning as above.

Table 10 reports the results of the test for the transmission mechanism of the level of forward-looking statement disclosure affecting stock liquidity. The regression results of model (5) are shown in column (3) of Table 3 above. The regression coefficient of $FLS200$ is -0.0163 and is significant at the 1% level. The regression results of model (6) are shown in column (1) of Table 10, and the regression coefficient of $sentiments$ and $FLS200$ is 0.0682 , which is significant at the 10% level. The regression results of model (7) are shown in column (2) of Table 10. The regression coefficient of $FLS200$ is significantly negative at the 1% level and the regression coefficient of $sentiments$ is significantly positive at the 1% level. Taken together, the results show that investor sentiment is an incomplete mediator of the level of forward-looking statement disclosure affecting stock liquidity. This is explained as follows: the management of a listed company discloses a higher level of forward-looking information in order to differentiate itself from other companies in the market to convince shareholders (or other stakeholders), and gain trust. This forward-looking information becomes a positive signal from the management to the outside world, causing a change in investor sentiment and ultimately in the liquidity of the company's stock. Hypothesis 2 holds. Both market signaling theory and principal-agent theory are confirmed.

5. Conclusion and implication

Liquidity is the lifeblood of capital markets. Forward-looking information enables investors and other users to assess current plans and future projections of an enterprise's future financial performance [44,45]. Relative to historical information, forward-looking information is extremely valuable to investors [46]. In this study, we selected Chinese A-share listed companies from 2011 to 2020 as a research sample, and explored the impact of forward-looking information disclosure level on stock liquidity based on the section of "Future Development and Prospects of Enterprises" in the annual reports of listed companies, while constructing forward-looking information disclosure level indicators with the help of text analysis techniques. After controlling for factors such as enterprise size, gearing, industry and year, we find that an increase in the level of forward-looking statement disclosure improves stock liquidity. Further analysis reveals that the level of forward-looking statement disclosure acts on stock liquidity by affecting investor sentiment. Heterogeneity analysis shows that the effect of forward-looking statement disclosure on stock liquidity is more pronounced among non-state-owned enterprises, located in low-market areas, than among state-owned enterprises, located in high-market areas. Finally, our conclusions still hold after conducting robustness tests such as replacing the forward-looking statement disclosure level indicator, using different stock liquidity indicators, instrumental variable haircuts, and enterprise fixed effects.

Our study intends to help information users raise awareness of forward-looking information of listed companies, provide decision reference for regulators to formulate forward-looking information disclosure laws and regulations, and remind corporate management to pay attention to the disclosure of forward-looking information. Regulating the disclosure of forward-looking information not only increases investors' confidence in the future development of enterprises, but also helps to form a more transparent information disclosure environment and alleviate information asymmetry. Therefore, we make the following three recommendations.

First, China does not have a formalized policy and regulation on forward-looking information disclosure. Only the "Guidelines on the Content and Format of Information Disclosure by Companies Issuing Public Securities No. 2 - Content and Format of Annual Reports (Revised 2012)" issued by the CSRC requires managers to disclose forward-looking information relating to the future development of the company, including industry development trends for the next year, company development strategies, the capital supply and demand, operational forecasts and risk assessments, etc. This general description does not provide specific and strict requirements for listed companies to disclose forward-looking information. Therefore, the department of supervision establish and improve laws and regulations on forward-looking information disclosure and strengthen the supervision of forward-looking information disclosure. The regulators formulate clear and uniform disclosure scope and standards to form a complete information disclosure system and improve the quality of forward-looking information disclosure. This can solve the problem of uneven level of information disclosure of listed companies at the root.

Second, Government management enhances education on market participants' professional knowledge and builds a platform for monitoring investor sentiment. Government management conducts special education activities to cultivate investors' professionalism and improve their awareness of forward-looking information disclosure and their ability to discern implied information. Government management monitors investor sentiment in real time and publishes sentiment indicator data in a timely manner to avoid the spread of excessive enthusiasm or pessimism and to reduce abnormal trading activities caused by irrational sentiment.

Third, Local governments at all levels should accelerate the process of marketization everywhere and play a decisive role of the market. Local governments are determined to maintain a good market order, financial and legal environment and fully protect the

Table 10
Path analysis (forward-looking statement disclosure - investor sentiment - stock liquidity).

Variables	(1)	(2)
<i>FLS200</i>	<i>Sentiments</i> 0.0682* (0.0371)	<i>illiq_y</i> −0.0173*** (0.0059)
<i>Sentiments</i>		0.0151*** (0.0012)
<i>Shrcr1</i>	0.0005*** (0.0002)	0.0003*** (0.0000)
<i>Insi</i>	0.0004*** (0.0001)	0.0002*** (0.0000)
<i>Lev</i>	−0.0055 (0.0119)	−0.0132*** (0.0018)
<i>Size</i>	−0.0013 (0.0027)	−0.0298*** (0.0004)
<i>Invprc</i>	−0.7664*** (0.0355)	0.0229*** (0.0045)
<i>Age</i>	−0.0084 (0.0103)	−0.0099*** (0.0015)
<i>Poid</i>	0.1116*** (0.0300)	0.0144*** (0.0043)
<i>Volat</i>	−9.5383*** (0.3973)	−0.0566 (0.0761)
Constant term	0.4868*** (0.0759)	0.7413*** (0.0120)
Time fixed effects	YES	YES
Industry fixed effects	YES	YES
Sample size	14,280	14,280
R2	0.2833	0.4988

Note: (1) *, **, *** indicate significant at the 10%, 5%, and 1% levels, respectively; (2) Robust standard errors are in parentheses.

rights and interests of investors; at the same time, local governments improve the ability and demand of investors, enhance the competitive pressure for corporate survival and urge management to consciously and voluntarily improve the level of forward-looking information disclosure.

Fourth, the management of listed companies took the initiative to improve the level of forward-looking information disclosure. Based on market signaling theory and principal-agent theory, the management of listed companies had disclosed more forward-looking information is a positive signal to the outside world, so that stakeholders receive more information, easier to convince them and gain their trust, which helps to reduce the financing cost of enterprises and improve market competitiveness. Therefore, for whatever reason, companies should be proactive in increasing forward-looking information disclosure. A catalog of forward-looking information disclosures can be developed within the company to set out the details and scope of forward-looking information disclosures and strictly follow the disclosure standards.

In this study, we constructed a forward-looking information lexicon through textual analysis methods and further calculated forward-looking information disclosure level indicators. However, the limited sample of this study may cause bias in the forward-looking information lexicon due to the availability and accessibility of data. Future studies can build on this point and conduct in-depth research based on a large sample size.

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Author contribution statement

Chenggang Li: Conceived and designed the experiments.
Ying Yan: Performed the experiments, analyzed and interpreted the data.
Xiwei Liu: Contributed reagents, materials, analysis tools or data.
Shengnan Wan: Analyzed and interpreted the data, Wrote the paper.
Yunbao Xu: Contributed reagents, materials, analysis tools or data.
Hongwei Lin: Contributed reagents, materials, analysis tools or data.

Data availability statement

Data from China Stock Market Accounting Research database (CSMAR) and RESSET database. <http://db.resset.com>; <http://www.gtarsc.com/>.

Declaration of interest's statement

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.heliyon.2023.e15329>.

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