

Forwarding-Looking Statements in Annual Report and Firms' Financing Constraints: A Machine-Learning Approach

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Synopsis

The research problem

This study examines the relationship between the frequency of looking-forward statements in annual report and firm's financing constraints.

Motivation or theoretical reasoning

Firms operating in developing markets face much more severe financing constraints than those operating in developed countries. Information disclosure in annual report play an important role to alleviate financing constraints caused by the agency problem. The era of big data provides scholars an opportunity to overcome the technical barriers and develop a more objective way to measure forward-looking statements. Several recent studies have confirmed that it generates significant investor and analyst responses (Muslu et al., 2015; Li, 2020). However, there is still a lack of empirical evidence in debt market, especially in developing countries. Drawing on incremental information theory and impression management theory, this paper chooses Chinese as the setting to examine the role of forward-looking statements in interpreting future-oriented information to market participants.

The test hypotheses

H_{1a}: The increased forwarding-looking statements in annual report could alleviate firms' financing constraints.

H_{1b}: The increased forwarding-looking statements in annual report could exacerbate firms' financing constraints.

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Target population

Corporate managers and stakeholders including investors, international regulators, and standard setters.

Adopted methodology

Ordinary least square regressions and propensity score matching method.

Analyses

We construct a new forward-looking statements index based on the Word2Vec machine learning approach. We first obtain the word sets representing forward-looking statement in the context of an annual report, and then calculate the word frequency of every words obtained from natural language processing and text analysis. Then, we take all A-stock listed firms in China from 2007 to 2019 as the sample and examine the relationship between the frequency of forwarding-looking statements in annual report and financing constraints. In addition, we conducted several robustness tests, such as the instrumental variables approach and the propensity score matching method that replicated our main results.

Findings

We find that a firm's frequency of looking-forward statements in annual report is negatively associated with its financing constraints. The results of channel analysis indicate that the increased looking-forward statements in annual report could alleviate firms' financing constraints through mitigating information asymmetry and agency costs. The above relationship is more pounced in state-owned enterprises and firms with higher annual report readability. In addition, this paper also employs the instrumental variables approach and the propensity score matching method to estimate the model. The results still hold after addressing endogeneity and robustness tests.

Keywords: Forward-looking statement; financing constraint; signal effect; text mining; machine learning

1. INTRODUCTION

Financing constraints are precisely defined by Lamont et al. (2001) as “frictions that prevent the firm from funding all desired investments, which may be due to credit constraints or inability to borrow, inability to issue equity, dependence on bank loans, or illiquidity of assets”. There is a lot of evidence suggesting that the financing constraint is one of the biggest barriers to firms' growth and investment (Musso and Schiavo, 2008;

Campello et al., 2010; Cull et al., 2015; Kim, 2021). Beginning in 2020, the COVID-19 epidemic cause more serious financing issues for firms across the country as a result of unfavourable conditions like the delayed job resumption and decreased consumer demand.

The information asymmetry is one of the most important reasons for financing constraints (Myers and Majluf, 1984; Francis et al., 2005; Cull et al., 2015; Chi et al., 2020). And information disclosure by listed companies serves as an external governance mechanism to help investors and regulators monitor management behaviour and lower moral hazard (Hermalin and Weisbach, 2012). This alleviates the adverse selection problem caused by information asymmetry. Past historical information and straightforward financial information are no longer sufficient due to the increasingly complicated and turbulent operating environment of the global capital market (Tetlock, 2007; Merkley, 2014; Mio et al., 2020). Instead, there is a growing demand, particularly from investors, for future-oriented information related to companies: “this perspective on the future, however, is what investors and all stakeholders truly need” (PWC, 2016). And numerous regulators bodies, such as the Accounting Standards Board (ASB) and the Integrated Reporting (IR) framework, have issued reports encouraging listed companies to voluntarily disclose additional non-financial information, especially information regarding their future development and growth. Both of them emphasis the importance of forward-looking perspective. The federal securities laws even provide a safe harbor to protect firms' forward-looking statements from legal liability (Carl et al., 1996; Cazier et at., 2020).

Forward-looking statement is a concise communication about how an organization's strategy, governance, performance and prospects, in the context of its external environment, contribute to the generation of value in the short, medium and long term. Several recent studies have examined

the market reaction to the forward-looking statements and verified its informativeness (Muslu et al., 2015). Bozanic et al. (2018), for example, confirmed that forward-looking statements generate significant investor and analyst responses. Li (2020) proposes that qualitative and non-earnings forward-looking statements can convey meaningful information that investors can use to evaluate firm value.

However, there is scant empirical research on the emerging market. Especially, firms operating in developing markets face much more severe financing constraints than those operating in developed countries (Leon, 2015; Wu, 2022). Among these developing countries, China's economy has grown to be the largest. However, Chinese businesses were ranked 92nd out of 190 economies in the world in terms of their capacity to obtain financing in the Doing Business 2020 report, which was released publicly by the World Bank Group on September 2021. It demonstrates how Chinese firms seriously suffered from "difficult financing" and "expensive financing." In addition, the ratio of equity issuance to bond issuance in China's recent five-year ratio of equity to bond issuance is approximately 3:7, demonstrating the significance of debt financing. Therefore, this paper chooses Chinese as the setting to examine the role of forward-looking statements in interpreting and disseminating future-oriented information to market participants, especially in debt market of developing countries.

The era of big data provides scholars an opportunity to overcome the technical barriers and develop a more objective way to measure forward-looking statements. Traditional measures of forward-looking disclosure, like the scoring approach (Kent and Ung, 2003) and paragraph statistics method (Hussainey et al., 2003), are heavily influenced by individual subjective judgment. With the improvement of text mining technology, this

paper improves word frequency statistics method. The method of "seed Word set +Word Embedding similar word expansion" is adopted to obtain the word set representing forward-looking statements in the annual report, so as to construct the forward-looking statements index with comprehensiveness and financial specificity.

This paper takes all A-stock listed firms in China from 2007 to 2019 as the sample and examine the relationship between the frequency of forwarding-looking statements in management discussion and analysis (MD&A, hereafter) and financing constraints. The results show the negative association between looking-forward statements and firms' financing constraints. The results of endogeneity test and robustness test still support this conclusion. The results of the mechanism test show that the forward-looking statements alleviate the financing constraints by mitigating the degree of information asymmetry and agency problems. The further analysis shows the above relationship is more pounced in state-owned enterprises (SOEs) and firms with higher annual report readability.

This paper contributes to the literature in the following ways. Firstly, the forward-looking statements can break through the limitations of accounting standards and directly describe the future prospects of the company to the users of financial reports. However, it is easy to be manipulated by the management. Even if it meets the doubts of external investors, the management can use the information advantage to make

disclaimer explanations. Therefore, there is still a lack of large sample empirical evidence whether the forward-looking statements disclosed by Chinese listed companies can be recognized by investors or creditors. This article fills in the gaps in this area. Second, most of the existing research on financing constraints focus on the macro perspective, such as the uncertainty of economic policy. This paper stands at the point of annual report disclosure, which provides a new micro perspective for the management to improve the financing constraints of enterprises, enriching the understanding of the relationship between firms' information provision and investor/lenders' decision-making. Third, unlike traditional scoring methods, paragraph statistics method and etc., this paper uses text mining technology and keyword-based textural analysis to identify forward-looking statements disclosed in firms annual report, which is more objective.

The remainder of the paper is organized as follows. Section 2 outlines prior research related to disclosure and develops hypotheses. Section 3 describes the data source and the research design. Section 4 presents the main results and alternative models to test for robustness. Section 5 conducts the further analysis. Section 6 concludes.

2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

2.1 The growing demand on forward-looking statements

In the early development of capital market, historical information has

always been the main body and normal of information disclosure. Since the global financial crisis in 2007, the value of existing enterprise reports has been questioned. On the one hand, there is information overload; on the other hand, there is still a lack of information about the early warning of financial crisis. Enterprises cannot fully disclose all their information, and it is difficult to integrate key information about risks and opportunities effectively. Past historical information and simple financial information are no longer sufficient (Tetlock, 2007; Merkley, 2014 Mio et al., 2020). There is a growing demand, particularly from investors, for future-oriented information. And numerous regulators have issued reports encouraging listed companies to voluntarily disclose more non-financial information, especially information regarding their future development and growth. For example, the Accounting Standards Board (ASB) (2006) is encouraging firms to include forward-looking narrative information in the Operating and Financial Review, the Reporting Statement is a formulation of best practice and not an enforceable accounting standard. Meanwhile, the Integrated Reporting (IR) framework embeds a forward-looking perspective: in the guiding principles for drafting the report (strategic focus and future orientation), in the Content Elements that communicate the strategy, risks, and opportunities, and in the outlook of the entity. In addition, the federal securities laws provide a safe harbor intended to shield firms' forward-looking statements from legal liability. (Carl et al., 1996;

Cazier et al., 2020).

China started relatively late in this regard. Chinese Securities Regulatory Commission revised the content and format rules of information disclosure of listed companies in December 2005, and for the first time explicitly required MD&A to disclose "Outlook for the Company's future development". In February 2012, the Shanghai Stock Exchange issued the Memorandum of Requirements for the Preparation of Management Discussion and Analysis, which once again emphasized the importance of narrative information disclosure in the annual reports of listed companies, especially the disclosure of forward-looking statements again and state that "the company should have a vision for the future development, should discuss and analyze the future development strategy, the next year's business plan and the company may face risks, encourage quantitative analysis."

2.2 The definition and explanation of forward-looking statements

The concept of forward-looking statements can be traced back to Section 175 of the Securities Act of 1933. Then, in the study of financial reporting, Schneider and Dubow (1996) were the first to provide a more detailed description: 1) It includes information such as income (or loss), earnings (or loss) per share, capital expenditure, dividend distribution, capital structure, and other financial project forecasts. 2) Information from management on future business plans and objectives, including plans or

objectives pertaining to the product or service provider; 3) Statements of future economic performance, including the financial position contained in MD&A or the operating results.

Unlike management earnings forecasts, which only focus on quantitative estimates of future earnings that are typically treated as forecasts in disclosure research, the forward-looking statement is a broader concept, adding the set of qualitative and/or non-earnings forward-looking statements often overlooked in disclosure research (Bozanic et al., 2018). Hussainey et al. (2003) verify that firms providing more forward-looking statements in their annual reports help the market to predict future earnings changes more accurately. Such meaningful interaction between quantitative estimates and forward-looking statements could enhance the understanding of managers' disclosure choices and offer guidance to regulators on how to improve corporate reporting (Chen & Liao, 2015; Chan & Chong, 2017). In addition, as one type of narrative disclosure, it complements the company's disclosure of financial information (Cole and Jones, 2004; Bozzolan et al., 2009; Yan, 2010; Muslu et al., 2015). Compared with the existing research on risk information disclosure, descriptive innovation disclosure, the other idiosyncratic information, forward-looking statement is not a specific type of information disclosure, but include all kinds of information conducive to prediction. It reveals management expectation in a more widely way.

Based on the above literature and taking into account the rise of emerging technologies such as big data and artificial intelligence, this paper defines forward-looking statements in the annual report as a kind of incremental information that can provide stakeholders with the ability to understand corporate development trends and predict the future value of a company. They can be divided into the following four categories according to the content of disclosure: a) information about the future development trends of the industry, the competitive market landscape, and development strategies; b) information about the company's information on its own strategies, business plans, capital needs and utilization plans; c) information on business performance forecasts and business objectives; and d) information on risks, challenges and countermeasures faced by the company. In addition, according to the level of uncertainty of the matters reflected in the information and its completion progress, it can be specifically grouped into the following three categories: a) information in perfect tense (soft asset information, mainly including on-balance sheet intangible assets, off-balance sheet intangible assets, goodwill, etc.); b) information in progress (R&D investment, contingencies and earnings forecasts); c) information in future tense (strategic information, including core competencies, business plans, etc.), as detailed in Figure 1 shows.

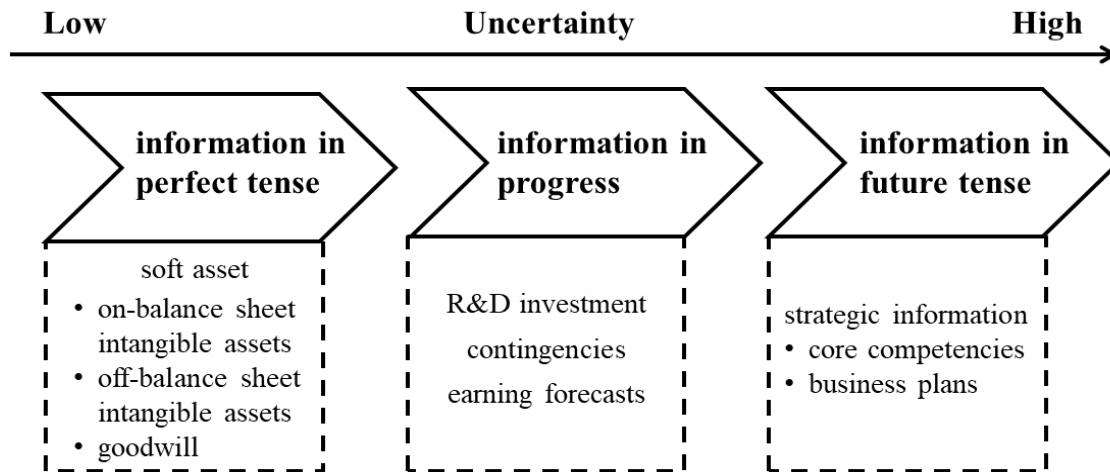


Figure 1: Diagram of forward-looking statements content

2.3 New measurement of forward-looking statements in the era of big data

Empirical research on forward-looking statements in China is still in its early stages. On the one hand, the MD&A system has only recently been introduced in China and the related regulation is inadequate. On the other hand, since forward-looking statements is a type of text information, quantitative empirical research on it is not supported by pertinent database, and its measurement faces significant technical challenges.

Manual scoring methods or survey rating methods are the earliest methods for measuring forward-looking statements. (Barron et al., 1999; Kent and Ung, 2003). Scholars choose multiple dimensions for evaluation, or they choose one of them, or they sum them up. These methods severely restrict the scope of research objects and greatly affected by personal subjective factors. As a result, the scientific of this approach needs to be strengthened. A common approach in subsequent research is to use the number of paragraphs in MD&A (Hussainey et al., 2003) or the number of

related information items to measure the level of forward-looking statements. However, as MD&A consists of two parts of information, review and outlook, this method will be interfered by the management style and the summary of business conditions, and its objectivity is still insufficient.

The word frequency statistics method has become more popular in recent years due to advancements in text mining technology (Li, 2010; Muslu et al., 2015; Bozanic et al., 2013). However, the key words used are chosen based on an artificially defined table, which lacks objectivity and adequate theoretical support and may also overlook many words that can represent foresight in the context of a corpus of Chinese financial report data. Based on Wingo database, this paper further improves the method. The method of "seed Word set + Word Embedding similar word expansion" is adopted to obtain the word set representing forward-looking statements in the annual report, so as to construct the forward-looking statements index with comprehensiveness and financial specificity.

2.4 Hypotheses development

The hypotheses development of this paper will be based on two perspectives presented in the existing research: information supplemental role and information manipulative role (Ertugrul et al., 2017). According to the information supplemental view, the MD&A has a certain information increment, which is related to contemporaneous stock return, auditor's

going concern opinion, and future revenue growth and return on assets (ROA) (Francis et al., 2003; Feldman et al., 2010; Davis and Tama-Sweet, 2012; Mayew et al., 2014)

A greater proportion of forward-looking statements are often viewed as contributing to more credible disclosures, which support the trust and viability of the company (Henry et al., 2021). It provides users incremental information to forecast firm's future and, to some extent, reduces information asymmetry between investors, creditors, and management (Bryan, 1997; Muslu et al., 2015; Mio et al., 2020). Specifically, forward-looking statements can not only help investors to better predict the company's future performance and stock price (Cole and Jones, 2004), but also help to improve the accuracy of analysts' forecasts and reduce the divergence of forecasts (Barron et al., 1999). Further, the forward-looking statements in the MD&A also help predict the company's next inventory movement (Sun, 2010) and bankruptcy risk (Mayew et al., 2014). To sum up, existing research verified its usefulness in improving the accurate judgment of the company's future value, and reducing their uncertainty when evaluating the company.

For the creditors and investors, quantitative forward-looking prediction is more intuitive, and investors can directly make specific investment plans based on the predicted results (Kent and Ung, 2003), which involves the company's disclosure of future business plans, such as innovation research

plans, business expansion plans and supplier cooperation plans, etc. (Hirst et al., 2008; Baginski et al., 2002). It is also an important opportunity for the company to communicate with potential shareholders and creditors. This effective supplement to quantitative data reduces adverse selection of uninformed traders and thus reduces the financing constraints of enterprises. In extreme cases, if the company's information is very opaque, external financial providers will not be able to assess the company's future performance and risk, and will not fund the company. Therefore, after controlling for other factors, the higher the quality of forward-looking statements, the lower the degree of information asymmetry between the company and external fund providers, and the easier it is for the company to obtain external capital and the smaller the financing constraint when other conditions are fixed. Based on the incremental information theory, this paper proposes H1a:

H1a: The increased forwarding-looking statements in annual report could alleviate firms' financing constraints.

According to impression management theory, the narrative disclosure can be an effective form of anticipatory impression management by CEO (Elsbach et al., 1998; Hassanein and Hussainey, 2015). Existing research suggests that investors and analysts may be less willing to rely upon forecasts that are viewed as less credible or less precise. In the extreme, investors and analysts may view other forward-looking statements as non-

verifiable and not precise, and assign very little weight to those statements.

Firstly, management in Chinese market have more incentive to exaggerating firms' future performance. On the one hand, the laws and regulations on text information disclosure system in Chinese capital market are still vague, particularly in regards to the lack of pertinent provisions on the disclosure content of MD&A. And the MD&A section is not currently subject to external audit or assurance (Brown and Knechel,2016). These issues make management manipulation less costly, increasing their incentive to exaggerating firms' future performance. On the other hand, the agency problem between management and shareholders in Chinese capital market is relatively serious. Management have more incentive to make strategy disclosure of financial statements in order to make performance target, stock options, and career planning. Especially when earnings management manipulation is limited, forward-looking statements can be used as an alternative strategy. Users may therefore doubt that management is trying to better exaggerate the company's future plans and conceal risks through text manipulation and regard more forward-looking statements as a tool for impression management.

Second, the forward-looking statements leave management more discretion to freely express linguistic and stylistic content. Evidence in Rogers and Stocken (2005) suggests that an inability to monitor ex post increases the likelihood of ex ante manipulation. The qualitative nature of

forward-looking narratives and their frequent focus on soft and non-earnings-related topics makes it much harder for outsiders to effectively monitor the accuracy of these statements and even increase the users' processing cost. Based on the impression management theory, this paper proposes H1b:

H1b: The increased forwarding-looking statements in annual report could exacerbate firms' financing constraints.

3. RESEARCH DESIGN

3.1 Sample Selection

This study begins with the sample of all A-stock listed firms in China from 2007 to 2019 and make the following selection: (1) financial and insurance listed companies are excluded¹; (2) ST and *ST companies are excluded; (3) samples with missing values in the regression analysis were eliminated. Finally, 24,018 firm-year observations are obtained. The forward-looking statement data are obtained from WinGo database, other financial data are mainly from CSMAR database and Wind database. Additionally, in order to eliminate the influence of extreme values, we winsorizes all continuous variables at 1% and 99% levels.

3.2 Measurement of Key Variables

¹ This is due to the fact that listed firms in the financial and insurance sector have distinct regulatory systems and report structures than companies in other sectors. Additionally, sample companies' industry classification is in accordance with the "Classification Guidelines for Listed Companies" that the China Securities Regulatory Commission published in 2012.

3.2.1 Measuring forward-looking statements:

Forward-looking statements refer to information in the text that relates to the future growth and performance of firms, such as the industry development trend, the company's competitors in the next year, business plans, strategies, opportunities and challenges, demand of funds in the next year, risks and adverse factors the firm will have to deal with, etc.

This paper follows the methodology in Li (2010), Muslu et al. (2015), Cho and Muslu (2021) to define the level of FLS as the number of “forward-looking words” divided by the total words in the MD&A section of the annual report*100. The steps involved in creating this indicator are as follows:

- a. Firstly, we convert 2007-2019 annual reports of A-share listed firms into txt documents, and use python to clean up data, especially identify and extract the future outlook part in MD&A section.

- b. By referring to policies and regulations on forward-looking statement, research literature and textual information disclosed by listed companies, this paper develop a total of 23 seed word sets related to forward-looking statement, including plans, anticipation, future, goal, may, intend, anticipate, forecast, hope, expect, expectation, hereafter, next year, the year after, aim, if, opportunity, chance, prospect, outlook, believe, vision, challenge.

- c. With the help of the word segmentation system "deep learning

similar words" of Wingo platform, the content of the txt document organized in the first step is processed with structured data. The WinGo similarity word database uses the Word Embedding neural network language model, which represents words into multidimensional vectors according to the context semantic information. And 97 similar words are obtained by calculating the vector similarity, including next step, follow-up, the future market, uncertainty, the long-term, etc.

d. After word segmentation of the cleaned and sorted txt document in Step a, we converted the unstructured text data into word vectors for storage.

e. R language is used to calculate the word frequency of the word set.

The model is listed as follows:

$$FLS_{i,t} = \frac{\text{forward - looking words in MD\&A}_{i,t}}{\text{total words in MD\&A}_{i,t}} * 100$$

The higher the value, the higher the level of forward-looking statements.

3.2.2 Measuring financing constraints:

$KZ_{i,t}$ denotes the KZ index of firm i in year t , and it is employed to measure firm-specific levels of financing constraints. This paper follows Kaplan and Zingales(1997), Guariglia and Yang (2016) to calculate the index in the following way:

$$KZ_{i,t} = -1.002 \times \frac{CF_{i,t}}{Assets_{i,t-1}} + 0.283 \times Q_{i,t} + 3.139 \times \frac{Debt_{i,t}}{Assets_{i,t}} -$$

$$39.368 \times \frac{DIV_{i,t}}{Assets_{i,t-1}} - 1.315 \times \frac{Cash_{i,t}}{Assets_{i,t-1}} \quad (1)$$

where CF is cash flow; Assets denotes total assets; Q represents Tobin's Q, Debt represents total debt, which is calculated by the sum of the short-term and long-term debt; DIV is dividends; and Cash is cash and cash equivalents. A firm with a higher KZ index can be assumed to be more financially constrained.

3.3 Empirical Model

We examine the relationship between forward-looking statements and financing constraints using the following model (2).

$$KZ_{it+1} = \beta_0 + \beta_1 FLS_{it} + \beta_2 Size_{it} + \beta_3 Leverage_{it} + \beta_4 Growth_{it} + \beta_5 Top1_{it} + \beta_6 Age_{it} + \beta_7 Dual_{it} + \beta_8 Boardsize_{it} + \beta_9 TobinQ_{it} + \beta_{10} Liquidity_{it} + \beta_{11} Loss_{it} + \beta_{12} HHI_{it} + \varepsilon_{it} \quad (2)$$

To initially overcome the endogeneity problem, industry and year fixed effects are used in the model regression, and both independent variable and control variables are lagged by one fiscal year. The dependent variable KZ_{it+1} and independent variable FLS_{it} are described in 3.2. To mitigate omitted variable bias concerns, we also control for a set of variables that impact financing constraints, which include: firm size (*Size*), firm leverage (*Leverage*), growth of sales (*Growth*), ownership concentration (*Top1*), firm age (*Age*), if one person sit on both CEO and the board of director (*Duality*), number of Board members (*Boardsize*), firm value (*TobinQ*), firm liquidity (*Liquidity*), the firm has loss during the year

(*Loss*), industry concentration (*HHI*). In addition, referring to Petersen (2009), we use standard errors corrected for heteroskedasticity and clustered by firm. The specific definition of variables is shown in Table 1.

Table 1 Variable Definitions

Type	Variable	Definition of variables
Dependent variable	<i>KZ</i>	Firm-specific measure of financing constraints calculated as described in subsection 3.2
Independent variable	<i>FLS</i>	The level of forward-looking statements, that is, the proportion of the total word frequency of forward-looking related words in the total word of the MD&A*100
Control variable	<i>Size</i>	The natural logarithm of total assets at the fiscal year end
	<i>Leverage</i>	The ratio of total liabilities to total assets at the fiscal year end
	<i>Growth</i>	The growth rate of sales
	<i>Top1</i>	The ratio of largest shareholder to the total ownership
	<i>Age</i>	The natural logarithm of (current year-listyear+1)
	<i>Duality</i>	It equals to 1 if one person sits on both CEO and the board of director; otherwise, 0
	<i>Boardsize</i>	The natural logarithm of total number of board of directors
	<i>TobinQ</i>	The market value of equity scaled by total assets
	<i>Liquidity</i>	The ratio of current liability to total liability
	<i>Loss</i>	It equals to 1 if the firm has loss during the year; otherwise, it is 0
	<i>HHI</i>	The intensity of firms in each industry, which was measured by the Herfindahl-Hirschman Index of the number of firms
	<i>Year</i>	If it belongs to a certain year, it is 1; otherwise, it is 0
	<i>Industry</i>	According to the industry classification of China Securities Regulatory Commission, when the

company belongs to a certain industry, it is 1 or 0 otherwise.

4. EMPIRICAL RESULTS

4.1 Descriptive Statistics

Table 2 reports descriptive statistics on the main variables used to estimate Eq. (2). The level of financing constraint (*KZ*) has a mean of 0.504 and a standard deviation of 2.229, which indicates that there are heterogeneous differences due to different financing constraints of individual firms. The proportion of forward-looking statements in MD&A (*FLS*) has a mean value of 0.820 and a median of 0.787, which are consistent with those reported in prior studies (e.g. Guariglia and Yang, 2016, Henry et al., 2021). The distributions of the control variables are also similar to those found in previous related research

TABLE 2: DESCRIPTIVE STATISTICS

Variables	N	mean	sd	min	p25	p50	p75	max
<i>KZ</i>	24018	0.504	2.229	-6.224	-0.726	0.806	2.017	5.182
<i>FLS</i>	24018	0.820	0.290	0.266	0.612	0.787	0.992	1.685
Size	24018	22.138	1.254	19.894	21.218	21.963	22.870	25.961
Leverage	24018	0.435	0.203	0.055	0.273	0.433	0.590	0.867
Growth	24018	0.192	0.414	-0.514	-0.006	0.120	0.283	2.665
Top1share	24018	35.390	14.948	8.780	23.460	33.690	45.660	74.300
Age	24018	2.147	0.745	0.693	1.609	2.303	2.773	3.258
Dual	24018	0.245	0.430	0	0	0	0	1
Boardsize	24018	2.148	0.201	1.609	1.946	2.197	2.197	2.708
TobinQ	24018	2.206	1.369	0.919	1.332	1.763	2.557	8.750
Liquidity	24018	0.821	0.179	0.257	0.730	0.880	0.965	1
Loss	24018	0.076	0.265	0	0	0	0	1
HHI	24018	0.126	0.127	0.020	0.048	0.084	0.150	0.740

4.2 Baseline Regression Results

Table 3 presents the estimation results of Eq. (2). In Column (1), we

only introduce forward-looking statements (*FLS*) and industry-year fixed effects. In Column (2), we incorporate control variables. The coefficients on *KZ* in (1) and (2) are -0.216 and -0.149, respectively, which are both significantly negative at the 1% level ($t=-0.216$ and -2.62 , respectively). The baseline results reveal a strong negative association between *FLS* and firms' financing constraints (*KZ*), which confirm the hypothesis H1a that firms' higher frequency of forward-looking statement in annual report can effectively alleviate their financing constraints. This evidence verifies the forward-looking statements play an information supplemental role rather than manipulative role.

TABLE 3 BASELINE REGRESSION RESULTS

VARIABLES	Dependent variable: <i>KZ</i>	
	(1)	(2)
<i>FLS</i>	-0.216*** (-2.88)	-0.149*** (-2.62)
Size		-0.378*** (-14.62)
Leverage		6.338*** (50.14)
Growth		-0.082** (-2.49)
LargestHolderRate		-0.010*** (-6.97)
Age		0.183*** (5.91)
Dual		0.030 (0.65)
Boardsize		-0.455*** (-4.51)
TobinQ		0.010 (0.49)
Liquidity		-1.110*** (-10.12)
Loss		0.606***

		(14.20)
HHI		0.135
		(0.69)
Constant	1.068***	8.023***
	(3.84)	(13.77)
Observations	24,018	24,018
R-squared	0.126	0.388
Controls	No	YES
Year FE	YES	YES
Industry FE	YES	YES
Firm	Clustered	Clustered

*, **, and *** indicate significance at the 0.1, 0.05 and 0.01 levels, respectively, for two-tailed tests. The t-stats, shown in parentheses, are based upon standard errors clustered by firm.

4.3 Plausible channel

4.3.1 Information asymmetry

Extensive information disclosure by reducing asymmetric information can possibly mitigate a firm's financing constraints. The forward-looking statements in annual reports increases information transparency by providing a more informative signal of further performance for creditors and investors. The proportion of FLS can serve as a useful management credibility cue to investors in deciding whether to rely on corporate disclosures. Therefore, this paper uses the degree of earnings management and whether it is audited by the "Big Four" to construct the information asymmetry heterogeneity situation to test this mechanism.

Following Hutton et al. (2009), this paper uses the modified Jones model to estimate discretionary accruals (*DA*) as a proxy for the level of earning management. Then, we divide the sample into a group with high information transparency and a group with low information transparency

by the median of absolute value of DA . A firm with higher absolute value of DA indicates the information environment less transparency.

In addition, audit, as a form of external supervision, is critical to the quality of information disclosed by listed firms. In the capital market, it is generally expected that the big 4 firms provide greater independence from clients, ensuring the audited firms' greater transparency (Nair et al., 2019). Therefore, this paper divides the samples into "Big 4" audit sample group and non "Big 4" audit sample group based on whether the listed company has been audited by the "Big 4" audit firms.

Sub-sample regression is carried out for model (2) to test the role of information asymmetry in the relationship between forward-looking statements and financing constraints. The table 4 presents the results. In column (5) and (6), the results show that in the sample group of non-"Big Four" audit, the improvement of forward-looking statements has a more significant negative correlation with the alleviation of financing constraints, that is, they play a stronger role, indicating that forward-looking statements affect financing constraints to some extent by changing the degree of information asymmetry.

The results in column (3) – (6) of table 4 shows the baseline relationship are more pronounced in less transparency groups and non-big4 audit firms. These findings demonstrate that the disclosure of forward-looking statements can play a more complementary role in reducing

information asymmetry when annual report information transparency is low, thereby alleviating financing constraints.

4.3.2 Agency cost

One of the major factors influencing information asymmetry is the agency problem. When the agency problem is severe, the level of information asymmetry usually increases. Following Dai et al. (2016), the proportion of the sum of sales expenses and administrative expenses in the operating income is taken as the proxy of the agency cost, and the median value is taken as the standard to divide the sample groups of high agency cost and low agency cost. In Table 4, column (2) shows the regression results of the low agency costs group, FLS has no significant correlation with the financing constraint variable KZ. Column (1) shows the regression results of the high agency costs group. FLS and KZ are significantly negatively correlated at the 5% level. The above results show that the mitigating effect of forward-looking statements on financing constraints is more pronounced in the high agency costs group than in the low agency costs group. Therefore, it can be concluded that the mechanism of forward-looking statements to alleviate financing constraints by reducing agency costs is verified

TABLE 4 PAUSIBLE CHANNEL ANALYSIS RESULTS

VARIABLES	Dependent variable: KZ					
	Agency Cost		Information transparency		Audit Firm	
	High	Low	Low	High	Non big4	Big4
	(1)	(2)	(3)	(4)	(5)	(6)

FLS	-0.172** (-2.26)	-0.110 (-1.49)	-0.173** (-2.40)	-0.116 (-1.64)	-0.140** (-2.37)	-0.129 (-0.72)
Size_w	-0.450*** (-11.60)	-0.300*** (-9.34)	-0.393*** (-13.12)	-0.362*** (-12.19)	-0.382*** (-13.29)	-0.289*** (-4.63)
Leverage	6.287*** (38.51)	6.463*** (36.04)	6.063*** (40.32)	6.610*** (43.88)	6.294*** (48.97)	7.183*** (15.42)
Growth_w	-0.121** (-2.50)	0.008 (0.19)	-0.064 (-1.58)	-0.158*** (-3.03)	-0.072** (-2.10)	-0.261** (-1.97)
Top1	-0.011*** (-5.54)	-0.009*** (-4.76)	-0.011*** (-5.93)	-0.010*** (-5.70)	-0.010*** (-6.63)	-0.010** (-2.31)
Age	0.263*** (6.40)	0.111*** (2.70)	0.163*** (4.40)	0.214*** (5.63)	0.208*** (6.50)	-0.104 (-0.91)
Dual	0.071 (1.22)	-0.060 (-0.94)	0.073 (1.34)	-0.017 (-0.30)	0.032 (0.69)	-0.204 (-1.19)
Boardsize	-0.540*** (-3.96)	-0.296** (-2.28)	-0.549*** (-4.49)	-0.318*** (-2.69)	-0.482*** (-4.52)	-0.221 (-0.77)
TobinQ	0.030 (1.28)	-0.108*** (-3.21)	-0.025 (-1.02)	0.057** (2.27)	0.023 (1.15)	-0.380*** (-5.80)
Liquidity_w	-1.083*** (-7.85)	-0.886*** (-5.55)	-1.259*** (-9.34)	-0.991*** (-7.33)	-1.093*** (-9.64)	-1.144*** (-3.45)
Loss	0.535*** (9.55)	0.519*** (8.11)	0.629*** (11.54)	0.515*** (8.05)	0.590*** (13.64)	0.205 (1.02)
HHI	0.169 (0.62)	0.111 (0.39)	0.149 (0.60)	0.110 (0.46)	0.055 (0.27)	0.168 (0.28)
Constant	10.083*** (11.47)	5.950*** (8.24)	8.946*** (13.19)	6.966*** (10.25)	8.178*** (12.58)	4.754*** (2.74)
Observations	12,307	11,711	12,675	11,316	22,423	1,399
R-squared	0.386	0.408	0.369	0.412	0.386	0.592
Controls	YES	YES	YES	YES	YES	YES
Year fixed effect	YES	YES	YES	YES	YES	YES
Industry fixed effect	YES	YES	YES	YES	YES	YES
Firm	Clustered	Clustered	Clustered	Clustered	Clustered	Clustered

*, **, and *** indicate significance at the 0.1, 0.05 and 0.01 levels, respectively, for two-tailed tests. The t-stats, shown in parentheses, are based upon standard errors clustered by firm.

4.4 Endogeneity and Robustness Tests

The empirical result of H1 demonstrates that increased forward-looking statements in MD&A significantly alleviate the financing constraints. Although the value of the financing constraint for the following period (t+1) are used as the explained variable in the baseline regression

model, this study will employ the instrumental variable method and the propensity score matching method to further mitigate the potential endogeneity problem and strengthen the research conclusion.

4.4.1 Instrumental Variable

Since firms in the same industry face similar industry characteristics, market environment and regulatory requirements, there is a correlation between firms' forward-looking statements and their industry's. However, the disclosure content of other firms will not be affected by the financing constraints of the individual firms. Therefore, following prior research (Kim et al., 2014), the average FLS of other firms in the same fiscal year, is selected as the instrumental variable in this paper. At the same time, given the highly correlated relationship between industry dummy variables and industry management disclosure, there is a risk of multicollinearity. As a result, the year fixed effect regression is used.

The results are demonstrated in columns (1) and (2) of Table 3. The coefficients on the fitted value of the predict value is significantly negative for KZ index at 10% level, suggesting that the negative relation between FLS and financing constraint holds after controlling for endogeneity based on the instrumental variable methodology

4.4.2 Propensity Score-Matching

The propensity score matching (PSM) method is also used to reduce the possible self-selection bias. Firstly, the sample firms are divided into

high, middle and low groups according to the frequency of forward-looking statements. This paper then estimate a logit model year by year in which we use the dummy of high group as the dependent variable. Finally, each treated firm is matched 1:1 with a control firm based on the estimated propensity score using the nearest neighbour method with no replacement. The results of regression with matched observations are shown in column (3) of table 4. The estimation of FLS is -0.275 and significant at 1%, which is in line with the baseline regression results.

TABLE 4 INSTRUMENTAL VARIABLE AND PSM RESULTS

VARIABLES	IV regression		PSM
	FIRST STAGE	SECOND STAGE	Dependent
	Dependent variable: FLS (1)	Dependent variable: KZ (2)	variable: KZ (3)
Ave	57.189*** (11.45)		
Predict		-0.751* (-1.69)	
FLS			-0.275*** (-3.32)
Size	-0.003 (-0.66)	-0.262*** (-13.82)	-0.389*** (-11.75)
Leverage	-0.023 (-1.12)	5.109*** (54.83)	6.486*** (37.76)
Growth	-0.001 (-0.17)	-0.078*** (-3.10)	-0.025 (-0.48)
Top1	0.000 (0.29)	-0.008*** (-7.43)	-0.010*** (-5.26)
Age	0.011** (2.36)	0.122*** (4.93)	0.166*** (3.92)
Dual	0.007 (1.03)	0.029 (0.83)	0.042 (0.67)
Boardsize	-0.022 (-1.30)	-0.398*** (-5.14)	-0.464*** (-3.45)
TobinQ	0.000 (0.19)	0.018 (1.29)	0.009 (0.34)

Liquidity	-0.039** (-2.02)	-0.888*** (-9.98)	-1.077*** (-6.86)
Loss	-0.002 (-0.24)	0.485*** (14.09)	0.600*** (7.98)
HHI	-0.033 (-1.28)	0.094 (0.62)	0.132 (0.50)
Constant	0.485*** (4.79)	6.345*** (10.52)	8.079*** (11.03)
Observations	23,998	23,998	8,092
R-squared	0.047	0.401	0.396
Controls	YES	YES	YES
Year fixed effect	YES	YES	YES
Industry fixed effect	YES	YES	YES
Clustered	FIRM	FIRM	FIRM

*, **, and *** indicate significance at the 0.1, 0.05 and 0.01 levels, respectively, for two-tailed tests. The t-stats, shown in parentheses, are based upon standard errors clustered by firm.

4.4.3 Firm-fixed effects

With reference to Ball et al. (2013) and Kim and Zhang (2016), we further control for firm fixed effects to mitigate potential endogeneity caused by omitted variables. The coefficients of FLS is still significantly negative at the 5% level, as seen from column (1) in Table 5, which demonstrates the consistency of our results.

4.4.4 Alternative measurement of forward-looking statements

In the baseline model, we proxy forward-looking statement using the frequency of forward-looking related words in the total word of the MD&A following the literature. However, forward-looking statements are included not only in the MD&A sections, but also throughout the annual report, such as in the notes of the financial statements. As a result, we estimate the proportion of forward-looking words in the total number of words in the whole annual report, which was used to generate the alternative forward-

looking statements index, indicated as *FLS2*. The column (2) in Table 5 presents the estimation. This coefficient of *FLS2* is significantly negative, which illustrates that our findings are robust to this alternative measure of independent variable.

4.4.5 Considering the impact of the MD&A disclosure policy

The MD&A disclosure policy was amended and improved by the China Securities Regulatory Commission in 2012. It requires the management to disclose information related to the company's future development and performance, including the business plan, development strategy of challenges and opportunities, risk, etc., emphasizing the significance of forward-looking statements. Forward-looking statement is therefore more normative. Based on this, we limit the sample period from 2012 to 2019 and re-estimate Eq. (2). The coefficient of FLS in columns (6) of table 5 is still significantly negative at 5% level.

TABLE 5 OTHER ROBUSTNESS TEST RESULTS

VARIABLES	KZ (4)	KZ (5)	KZ (6)
FLS	-0.103** (-2.38)		-0.156** (-2.31)
FLS2		-0.341** (-2.16)	
Size	0.106** (2.07)	-0.372*** (-14.42)	-0.353*** (-13.24)
Leverage	3.734*** (16.67)	6.315*** (50.00)	6.367*** (47.21)
Growth	-0.207*** (-5.79)	-0.086*** (-2.60)	-0.075* (-1.94)
Top1	-0.010*** (-3.49)	-0.010*** (-6.91)	-0.012*** (-7.69)
Age	0.484***	0.180***	0.145***

	(4.25)	(5.81)	(4.39)
Dual	-0.000	0.030	0.008
	(-0.00)	(0.65)	(0.17)
Boardsize	-0.039	-0.458***	-0.355***
	(-0.26)	(-4.54)	(-3.29)
TobinQ	-0.019	0.011	0.023
	(-1.20)	(0.56)	(1.12)
Liquidity	-0.533***	-1.105***	-1.080***
	(-4.43)	(-10.07)	(-8.98)
Loss	0.196***	0.603***	0.604***
	(5.60)	(14.10)	(12.61)
HHI	-0.247	0.137	-0.174
	(-1.02)	(0.69)	(-0.70)
Constant	-3.273**	7.956***	6.965***
	(-2.68)	(13.64)	(11.23)
Observations	24,018	24,018	18,174
R-squared	0.664	0.387	0.374
Controls	YES	YES	YES
Year fixed effect	YES	YES	YES
Industry fixed effect	NO	YES	YES
Firm fixed effect	YES	NO	NO
Clustered	INDUSTRY	FRIM	FIRM

*, **, and *** indicate significance at the 0.1, 0.05 and 0.01 levels, respectively, for two-tailed tests. The t-stats, shown in parentheses, are based upon standard errors clustered by firm/industry.

5. Further analysis

5.1 Heterogeneity analysis of firm ownership

In the case of China, compared with state-owned enterprises (SOEs hereafter), the development history of non-state enterprises (non-SOEs hereafter) is shorter, with more abundant in the bank credit record. The asymmetric information between banks and SOEs is relatively low, and ample evidence shows that SOEs have better access to the credit market (Allen et al., 2005; Megginson et al., 2014). Therefore, private firms are financially more constrained than state-owned enterprises (SOEs). This paper further estimates Eq. (1) for two ownership groups: SOEs non-SOEs

and the regression results are reported in Table 6. The estimate of the coefficient for the SOE group is insignificant, while the non-SOE group is significant at 5% level, which shows that the information supplemental role of forward-looking statements in alleviating the financing constraints of firms is more significant in non-state-owned enterprises.

5.2 Heterogeneity analysis of readability

MD&A with lower readability can increase users' time and processing cost by making them to extract useful information less effectively, increasing the firm's agency costs. On the contrary, higher readability will lead to less uncertainty regarding the firms' default risk and thus alleviate their financing constraints (Bonsall and Miller, 2017). Drawing on the WINGO database, this paper defines readability as the frequency with which word pair collocation order appears in the corpus. The higher the frequency, the easier it is to understand the text and the more readable it is. The median of MD&A text readability was used to divide samples in this paper. The regression results of columns (3) and (4) in Table 6 show that the more readable the MD&A text is, the more forward-looking statements can reduce the degree of financing constraint. As a result, hypothesis 1 is confirmed.

5.3 Analysis on the real effect of forward-looking statements

Using the impact on the scale of firms' external financing as an example, this paper further investigates the real effect of the forward-looking

statements on the alleviation of financing constraints. Following McLean and Zhao (2014), this paper measure share issuance as the change in book equity, minus the change in retained earnings, all scaled by lagged assets and measure debt issuance as the change in short-term debt, plus the change in long-term debt, plus the change in payable bond, all scaled by lagged assets. The variable DE represents the total external financing scale, the sum of debt issuance and share issuance. We then regress the FLS on DE. The coefficient is 0.012 and significant at 10% level, as shown in column (5) of table 6. It shows that one of real effects that forward-looking statements alleviates corporate financing constraints is to improve the scale of external financing.

TABLE 6 FURTHER ANALYSIS RESULTS

VARIABLES	Dependent variable: KZ				DE (5)
	The nature of property		Textual readability		
	SOE (1)	Non-SOE (2)	High (3)	Low (4)	
FLS	-0.058 (-0.60)	-0.162** (-2.10)	-0.415* (-1.77)	-0.138 (-0.63)	0.012** (2.00)
Size_w	-0.367*** (-7.23)	-0.421*** (-11.86)	-0.385*** (-10.56)	-0.401*** (-12.10)	-0.010*** (-4.74)
Leverage	6.046*** (26.06)	6.373*** (36.87)	6.315*** (34.50)	6.230*** (37.27)	0.122*** (9.38)
Growth_w	-0.213*** (-3.88)	0.017 (0.37)	-0.110* (-1.95)	-0.028 (-0.59)	0.028*** (5.86)
Top1	-0.002 (-0.70)	-0.014*** (-6.78)	-0.010*** (-4.62)	-0.009*** (-4.88)	0.000 (0.09)
Age	0.107 (1.41)	0.174*** (3.97)	0.163*** (3.80)	0.168*** (4.20)	-0.031*** (-10.28)
Dual	0.061 (0.60)	0.008 (0.14)	-0.044 (-0.66)	0.073 (1.18)	0.003 (0.66)
Boardsize	-0.175 (-1.01)	-0.564*** (-4.11)	-0.519*** (-3.45)	-0.437*** (-3.45)	-0.001 (-0.12)
TobinQ	0.021	-0.000	0.036	-0.005	0.025***

	(0.42)	(-0.01)	(1.16)	(-0.20)	(11.33)
Liquidity_w	-1.159***	-1.228***	-1.153***	-1.297***	0.023*
	(-5.69)	(-8.33)	(-7.01)	(-9.01)	(1.88)
Loss	0.136*	0.523***	0.364***	0.414***	-0.016
	(1.66)	(8.28)	(4.99)	(6.17)	(-1.61)
HHI	0.205	-0.078	0.120	0.186	-0.014
	(0.68)	(-0.24)	(0.41)	(0.69)	(-0.77)
Constant	7.219***	9.338***	8.390***	8.517***	0.190***
	(6.07)	(12.02)	(9.98)	(11.49)	(3.99)
Observations	6,381	13,394	9,953	9,941	16,145
R-squared	0.424	0.357	0.387	0.382	0.060
Controls	YES	YES	YES	YES	YES
Year fixed effect	YES	YES	YES	YES	YES
Industry fixed effect	YES	YES	YES	YES	YES
Firm	Clustered	Clustered	Clustered	Clustered	Clustered

*, **, and *** indicate significance at the 0.1, 0.05 and 0.01 levels, respectively, for two-tailed tests. The t-stats, shown in parentheses, are based upon standard errors clustered by firm.

6 CONCLUSIONS

The government, businesses, and academia have been interested in finding ways to reduce financing constraints for many years. The existing research generally believes that information asymmetry is the most important cause of financing constraints. Due to the numerous market uncertainties, it is getting harder to fully assess a company's value using only its historical information, therefore, future-oriented information is getting more and more attention. With the development of computer algorithms and information processing technology, text analysis, in particular, has gradually offered new ideas for resolving information issues in the capital market and a new solution path for resolving information asymmetry in financing constraints.

When the economic fundamentals are better than the situation shown

by the quantitative information, once the management impartially transmits the real forward-looking statements of the company to the outside, it will help investors to better predict the future performance of the enterprise, and then there will be incremental information. However, in China's capital market, due to the non-standard disclosure of MD&A content in China's capital market and the lack of auditing, the cost of MD&A intonation manipulation by the management is relatively low, which increases the possibility of MD&A intonation manipulation. Investors or creditors may regard it as a kind of impression management by the management, which exaggerates the fundamental information of the company. To mislead investors. Based on the above analysis. Therefore, this paper puts forward the competing hypothesis.

Using the sample of all A-stock listed firms in China from 2007 to 2019, this paper examines the relationship between the frequency of forwarding-looking statements and financing constraints. The results show that a firm's frequency of looking-forward statements in annual report is negatively associated with its financing constraints level. The results of channel analysis indicate that the increased looking-forward statements in annual report could alleviate firms' financing constraints through mitigating information asymmetry and agency costs. The above relationship is more pounced in SOEs and firms with higher annual report readability. The results hold after the robustness tests. A further important implication from

our findings is that the drivers and usefulness of voluntary disclosure, especially of 'soft', unverifiable information should be incorporated into audit or supervision as soon as possible to protect the rights and interests of financial reports users.

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