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IPO comment letter responses and stock price volatility in the STAR market

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ABSTRACT

The public disclosure of IPO comment letter responses represents a significant institutional innovation within the registration-based IPO system. This study investigates the impact of IPO comment letter responses on post-IPO stock price volatility. Our findings indicate that both the quantity and quality of information in issuer responses are inversely correlated with stock price volatility. Additionally, this impact is pronounced when issuers invest more in R&D or face higher operational risk. Mechanism tests suggest that response information quantity (quality) is positively associated with changes in the information quantity (quality) of final-version prospectuses, while negatively correlated with informed trading and bid-ask spread. Lastly, we observe a diminishing effect of responses on post-IPO stock price volatility as time passes. These findings have implications for issuers to mitigate stock volatility risk and for regulators to advance reforms in the registration-based IPO system.

KEYWORDS

Comment letter responses; stock price volatility; R&D; prospectus

1. Introduction

To enhance the marketisation of the capital market, the China Securities Regulatory Commission (CSRC) announced the extension of the registration-based IPO system to encompass all sectors of the Chinese capital market on 17 February 2023. Within the IPO process, which includes approval, pricing, and issuance, pricing stands out as the most pivotal component for market efficiency. Prior to this announcement, the registration-based IPO system had been successfully operational in the STAR Market for over three years. As a pioneering platform for the registration-based IPO system, the STAR Market has demonstrated that financial reform can drive technological innovation. Referred to as the 'Chinese NASDAQ', the STAR Market caters to science and technology innovation companies that fall within the industries encouraged by the Chinese government. This

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market is expected to foster breakthroughs for these innovation-driven firms, a crucial aspect of economic transformation and upgrading.

From 22 July 2019, the inaugural day of the STAR Market, until 31 December 2021, IPO firms raised RMB 508 billion. By the end of 2021, their total market value had exceeded RMB 5.95 trillion. As per the prospectuses of IPO companies listed on the STAR Market, approximately 28.8% of their employees are engaged in research and development, with R&D expenditure averaging 10.1% of their operating income. Their return on assets (ROA) and leverage are 14.6% and 38.1%, respectively. Compared to IPO companies on the main board, STAR Market IPO firms exhibit characteristics of higher R&D investment, increased profitability, and lower leverage. However, the high-tech and light asset characteristics of these firms pose challenges for investors in pricing their IPOs and amplifies the volatility of their stock prices. Therefore, enhancing the quality of information disclosure by IPO companies, reducing information asymmetry between companies and investors, and improving IPO pricing efficiency have become top priorities for the full implementation of the registration-based IPO system reform in China.

Since the opening of the STAR Market, some stocks have experienced significant price fluctuations. For instance, Ziguang Storage (688086.SH), the first optical storage chip stock, witnessed a maximum intraday price surge of 300% on its IPO's first day, followed by a decline exceeding 90% due to scandals and lawsuits. Autobio Diagnostics (688516.SH), which went public around the same time as Ziguang Storage, initially offered its shares at RMB 23.28, achieving a first-day return of 167%. However, its stock price experienced a subsequent decline over the next five trading days, even falling below its opening price. After this initial decline, Autobio's stock price eventually soared to RMB 322, marking an increase of over 1000% from its offering price. The high volatility of stocks in the STAR Market presents heightened risks for investors. A transparent information environment can alleviate stock price volatility (Dasgupta et al., 2010; Healy et al., 1999; Lei et al., 2016; Xin et al., 2014). The public disclosure of IPO comment letters and firms' responses is an important innovation within the registration-based IPO system. Can IPO comment letter responses provide additional information, reduce stock price volatility, and enhance pricing efficiency? This study aims to address this question.

Comment letters are designed to enhance information disclosure quality and reduce information asymmetry between investors and companies (Bozanic et al., 2017). Ertimur and Nondorf (2006) find that stronger management abilities lead to fewer questions in IPO comment letters. Li and Liu (2017) demonstrate that comment letters can curb management's speculative motives, resulting in companies lowering their expected offering prices in prospectuses. Lu et al. (2020) and Lyu et al. (2021) indicate that the stronger the reputation of an accounting firm and underwriter, the fewer rounds of IPO inquiries occur. Additionally, Zhang et al. (2021) establish a negative correlation between the number of questions in comment letters and IPO underpricing and cumulative excess returns. However, previous research predominantly focuses on the number of questions in IPO comment letters and rarely on the quality of information in companies' responses, with exceptions such as Xue and Wang (2022b) and Xue and Wang (2022a). Their studies reveal that the information quantity and quality of response letters from IPO candidates is inversely correlated with pricing divergence among institutional investors and the first-day return of IPOs. Under the registration-based IPO system in the US, IPO comment letters are disclosed 20–45 days

after a company goes public (Lowry et al., 2020). This delayed disclosure makes it challenging to investigate the impact of IPO comment letters on IPO pricing efficiency. Under China's approval-based IPO system, prior to the registration-based system, IPO candidates only disclosed the questions posed by the CSRC in the first-round comment letters, leaving investors unaware of the content of the company's responses and subsequent comment letters. The disclosure of IPO comment letter responses in the Chinese STAR Market offers a unique opportunity to explore the impact of the information quantity and quality of IPO comment letter responses on post-IPO stock price volatility.

This paper focuses on IPO companies listing on the STAR Market between 22 July 2019, and 31 December 2021, and investigates whether and how comment letter responses affect stock price volatility around IPOs. We find that (1) The information quantity and quality of IPO comment letter responses is inversely correlated with stock price volatility for IPO companies. Specifically, more detailed responses, higher visualisation degrees, lower densities of accounting terminology or inverse connectives result in lower stock price volatility in the short windows following the IPO date. (2) The impact of IPO comment letter responses on stock price volatility is more pronounced in companies with higher R&D investment or greater operational risk. (3) The effect of IPO comment letter responses on stock price volatility is more pronounced when more questions are technology-related or when responses are more timely. (4) Mechanism tests indicate that the information quantity and quality of the final version of the prospectus improves after the IPO inquiry process, leading to a reduced likelihood of informed trading and narrower bid-ask spreads. (5) Finally, the impact of IPO comment letter responses on stock price volatility gradually diminishes over time after IPOs.

Our study contributes to the literature in several ways:

First, IPO comment letter responses provide investors with incremental information to evaluate and price IPO companies, addressing the high information asymmetry between them. While prior literature has primarily focused on prospectuses to examine post-IPO market performance (Jia & Bian, 2019; Wu et al., 2022), this paper illustrates that IPO comment letter responses constitute a vital information resource which has a significant impact on post-IPO stock price volatility.

Second, our study extends the literature on the economic consequences of IPO comment letter responses from the pre-IPO to the post-IPO period. Xue and Wang (2022b) and Xue and Wang (2022a) investigate the impact of IPO comment letter responses on the quoted price of institutional investors during the IPO book-building process and IPO underpricing, respectively. To our knowledge, there is no existing literature exploring the impact of IPO comment letter responses on stock price volatility, and this study seeks to bridge that gap.

Last, our findings highlight a new channel for issuers to provide additional information and reduce information asymmetry with investors. Previous studies have shown that companies receiving comment letters on annual reports experience reduced institutional investor holdings (Gietzmann & Isidro, 2013), declining stock prices (Chen et al., 2018), and increased financing costs and share price collapse risks (Hu et al., 2020; G. Zhang et al., 2021). This paper suggests that companies can leverage comment letters to provide supplementary information through high-quality responses, thereby mitigating these adverse effects of regulatory comment letters on companies.

2. Institutional background and hypothesis development

2.1. Institutional background

On 5 November 2018, President Xi Jinping delivered a keynote speech at the inaugural Chinese International Import Expo, announcing the establishment of the STAR Market at the Shanghai Stock Exchange and the implementation of a registration-based IPO system. Subsequently, on 30 January 2019, the China Securities Regulatory Commission (CSRC) issued the *'Implementation Opinions on the Establishment of the STAR Market and the Pilot of Registration-based IPO System at the Shanghai Stock Exchange'*, aligning it with national strategies and focusing on serving high-tech enterprises. The STAR Market is designed to cater to world-class science and technology enterprises, acting as the primary battleground for economic development and supporting weaker industries. On 22 July 2019, the first 25 companies were listed on the STAR market, marking the start of a new era in the Chinese capital market.

By 31 December 2021, a total of 377 companies had gone public on the STAR Market. Among them, 127 were certified as Specialized, Special, and New Enterprises by the State Ministry of Industry and Information Technology, constituting 33% of the companies on the STAR Market. Additionally, companies like UCloud, Jingjin Electric, Huiyu Pharmaceutical, and Segway-Ninebot have been listed with double voting rights. Notable technological advancements include chip giant SMIC achieving significant breakthroughs in photolithography, resulting in a 147.7% increase in net profit in 2021. Another noteworthy case is CanSinoBIO, which went public according to the unprofitable listing criteria. In 2021, it generated RMB 4.3 billion in revenue and turned losses into profits. As a pioneer of the registration-based IPO system, the STAR Market has prominently showcased its high-tech characteristics and provided an excellent financing channel and growth opportunities for technology startups.

2.2. Hypothesis development

Information asymmetry is a crucial factor that affects stock price volatility (Venkatachalam, 2000; Xin et al., 2014). Unanticipated good news may cause a rise in stock prices, while unanticipated bad news can cause a decrease in stock prices. Existing literature on stock price volatility primarily centres around the aspect of information disclosure. An increase in the quantity and improvement in the quality of information tend to result in reduced stock price volatility (Dasgupta et al., 2010; Han et al., 2020). It is widely acknowledged that firms with substantial R&D investments tend to exhibit higher levels of information asymmetry and stock price volatility (Chan et al., 2001). However, the timely disclosure of information related to the progress of R&D projects can mitigate stock price volatility (Yao et al., 2013). In this context, this paper posits that the quantity and quality of information revealed in responses to IPO comment letters on the STAR Market can decrease information asymmetry between issuers and investors, as well as among investors. Consequently, this is expected to lead to a reduction in the stock price volatility of IPO companies.

On one hand, responses to IPO comment letters provide investors with valuable insights into a company's core technology, business model, financial condition, and corporate governance, thus alleviating information asymmetry between issuers and

investors. Given the limited information available for IPO companies, their responses to IPO comment letters represent a crucial source of information. Supervisors from stock exchanges conduct comprehensive reviews of IPO applicants' materials and send comment letters, to which IPO companies must respond and subsequently disclose their responses. This inquiry-and-response process substantially augments the information accessible to investors. In practice, questions posed by supervisors on similar topics such as revenue recognition, related party transactions, or corporate governance tend to be alike across IPO applicants. However, responses from different IPO candidates to these similar questions can significantly vary. In other words, the quantity and quality of responses differ among IPO applicants. Given the pivotal role of technology and core competitiveness for IPO candidates in the STAR Market, these factors are essential for investors to make forecasts and evaluate these companies. When the quantity and quality of responses to IPO comment letters are higher, investors gain a more comprehensive understanding of the issuer's technology, innovation, market position, and growth potential. This aids investors in pricing IPO companies and reducing stock price volatility following IPO. Conversely, when the quantity of information in an issuer's response is limited or the quality is lower, investors receive relatively restricted information, making it more challenging for them to comprehend the company. As a result, the information asymmetry between the issuer and investors is heightened, leading to increased stock price volatility.

On the other hand, the information contained in IPO comment letter responses can help reduce information asymmetry among investors, thereby decreasing the volatility of a company's stock price. Research has indicated that greater divergence among investors has a negative impact on stock price volatility (Chen & Zhang, 2009; Hong & Stein, 2007). Increased divergence among investors tends to result in greater stock price fluctuations. In the capital market, there is a substantial variance in investors' ability to obtain and interpret information. For instance, investors with professional backgrounds are more likely to comprehend the potential value of invention patents. Furthermore, investors with personal relationships with the company may have access to private information (Cohen et al., 2010). When an issuer provides a larger quantity and higher quality of responses to comment letters, the cost for investors to access and interpret information decreases. The information advantage of investors with professional backgrounds and personal relationships is diminished, and the level of divergence among investors is reduced, ultimately leading to decreased stock price volatility following IPO.

In summary, from the listing day to the day of the first financial report after IPO, the most significant source of information for investors comprises the prospectus and the responses to IPO comment letters provided by companies during the IPO process. The information quantity and quality in these responses play a pivotal role in reducing information asymmetry between issuers and investors, as well as among investors. Consequently, we hypothesise:

H1: *Ceteris paribus*, the quantity and quality of information in IPO comment letter responses are negatively correlated with post-IPO stock price volatility.

The STAR Market aims to provide a new financing platform for high-tech companies with financial needs and encourages them to invest in research and development (R&D). However, R&D investment and innovation may exacerbate information asymmetry (Aboody & Lev, 2000). More advanced innovations often entail longer R&D cycles and higher associated risks. Even scientists cannot accurately assess the probability of success for a specific R&D investment. Since R&D is central to a company's core competitiveness, companies typically lack the incentive to voluntarily disclose relevant information to prevent the leakage of core technology. Consequently, the greater the company's R&D investment, the higher the degree of information asymmetry. In such scenarios, investors require more relevant information to make well-informed judgements about a company's future business prospects. The information contained in IPO comment letter responses represents one of the few sources of information that can significantly mitigate information asymmetry. Therefore, we anticipate that the impact of IPO comment letter responses on stock price volatility will be more pronounced for companies with high R&D intensity. Hypothesis 2 is formulated as follows:

H2: The quantity and quality of information in IPO comment letter responses will have a stronger impact on stock price volatility in companies with higher R&D investment compared to companies with lower R&D investment.

In contrast to the main board markets, the STAR Market is distinguished by its high level of technology, openness, and information transparency. It adopts market-based pricing mechanisms and provides listing opportunities for companies with red-chip structures, special voting rights, and even those with negative profitability but possessing cutting-edge technology. However, the intricate listing requirements, differentiated corporate governance, and high-tech attributes imply elevated investment risk in the STAR market. To mitigate this risk, the Shanghai Stock Exchange conducts comprehensive inquiries into the ownership structure, business model, and operating risks of IPO applicants. This process assists investors in understanding investment risks and reduces the degree of information asymmetry between issuers and investors.

We anticipate that in companies with higher operating risks, the responses to IPO comment letters can have a stronger impact on reducing stock price volatility. Thus, we propose Hypothesis 3 as follows:

H3: The quantity and quality of information in IPO comment letter responses will exert a greater impact on stock price volatility in companies with higher operating risk compared to companies with lower operating risk.

3. Research design

3.1. Sample selection and data source

We include all 377 IPO companies that went public on the STAR Market from 22 July 2019, to 31 December 2021, in our sample. For each firm, we download three versions of prospectuses at various stages of the IPO process. Additionally, we collect IPO comment letter responses disclosed by these 377 firms, totalling 970 response documents. Our textual analysis is conducted using Python3 on both prospectuses and responses. Our analysis revealed that 26 companies, based on the unprofitable IPO criterion, exhibited distinct differences in terms of return on assets (ROA), leverage, and R&D when compared to companies based on other IPO criteria. Consequently, we have excluded these 26 companies from our sample, resulting in a final sample of 351 IPO firms.

We obtain STAR Market IPO data from website of the Shanghai Stock Exchange and Eastmoney.com, while financial data is obtained from IPO prospectuses, China Stock Market & Accounting Research Database (CSMAR) and Wind databases. Given the diverse listing standards in the STAR Market and the potential for extreme variations in firm characteristics, we winsorise all continuous variables at the 2.5% level to mitigate the influence of outliers.

3.2. Main variables

3.2.1. Stock volatility

Following Wang and Wang (2017), Song and Tang (2019), and Wei et al. (2019), we use the standard deviation of stock returns within 180 days after the first listing date to measure post-IPO stock price volatility (*Volatility*). To enhance the clarity of our regression results, we have multiplied the *Volatility* value by 10. In our robustness tests, we employ the market-adjusted standard deviation of stock returns over a 180-day period following the initial listing date (*Volatility_Adj*) as a proxy.

3.2.2. The information quantity of IPO comment letters' responses

The questions in IPO comment letters mainly focus on six aspects: the issuer's equity structure, core technology issues, the issuer's business, corporate governance and independence, financial accounting information and management analysis, and potential risks. While the questions in these comment letters are often similar, the responses from different IPO applicants can vary significantly. More comprehensive responses provide greater information content. We use the ratio of the character count in response letter to the character count in the question to measure the information 'quantity' of responses from a IPO company as follows:

$$CLquantity = A_1/Q_1 + A_2/Q_2 + \dots + A_n/Q_n/n$$

In this equation, n represents the total number of questions in multi-round IPO comment letters, Q_n represents the character count in the n th question, and A_n represents the character count of the issuer's response to question n .

3.2.3. The information quality of IPO comment letters' responses

Measuring the information quality of comment letter responses directly is challenging, as quality can manifest in various aspects of textual information. For instance, in the 'Guidelines on Information Disclosure Content and Format No. 41 - Prospectus for Listing on the STAR Market', IPO applicants are required to adhere to principles like clarity, understandability, logical coherence, and the use of charts, pictures, or other intuitive disclosure methods. We adopt the approach introduced by Xue and Wang (2022b) and Xue and Wang (2022a) to construct our quality measurement. This measurement encompasses three dimensions: visualisation (*Visualization*), accounting term density (*ATdensity*), and adversative expression density (*Adverse*) in IPO comment letter responses.

The first dimension we consider is the degree of information visualisation (*Visualization*). Sedor (2002) illustrates that different methods of presenting the same information can lead to varying levels of understanding among information users. Given that many IPO companies on the STAR Market possess advanced and specialised tech terminology in their disclosures, visual aids such as tables and images can enhance investors' comprehension of the company's core technology. As such, we employ the variable *Visualization* as the first measure of information quality. It is calculated as the proportion of area occupied by pictures and tables in a comment letter response. A higher value of *Visualization* indicates a higher quality of comment letter responses.

The second variable is accounting term density (*ATdensity*). According to Wang et al. (2018), annual reports with a higher density of financial and accounting terminology tend to be more complex and less comprehensible. To assess this, we establish a dictionary using the Bloomberg Professional Finance and Economics Vocabulary. Using this dictionary, we count the occurrences of accounting terminology in each comment letter response, defining this count as *ATdensity*. The higher the value of *ATdensity*, the more challenging it is to grasp the disclosed information. For ease of interpretation, we multiply the value by -1 in empirical tests, so a higher *ATdensity* denotes a higher quality of the comment letters' responses.

The third dimension we examine is the density of adversative conjunctions (*Adverse*). Adversative conjunctions (e.g. 'however' 'but' 'yet') link contradictory or substantially different events, often indicating inflection, concession, unexpectedness, or comparison. Such words introduce inconsistency in logic and can make the text more difficult to comprehend. We create an adversative conjunction dictionary based on Connective Elements in Modern Chinese Discourse (Liao, 1986). We then calculate the frequency of adversative conjunctions in a comment letter response based on this dictionary, defining it as *Adverse*. A higher value of *Adverse* implies greater difficulty in understanding the disclosed information. Similar to *ATdensity*, we multiply the value by -1 in empirical tests, so a higher score of *Adverse* signifies a higher quality of a comment letter response.

3.2.4. The measure for overall quantity and quality of responses

We devise a comprehensive index to measure both the quantity and quality of a IPO comment letter response. Here is an enhanced explanation of our approach:

First, we sort the sample from low to high according to *CLquantity* then set 1 to *R_Quantity* for the first one-third observations, set 2 to the middle one-third observations and set 3 to the highest one-third observations. Second, we sort the sample from low to high according to *Visualization/ATdensity/Adverse* then set 1 to *R_Visual/R_ATdensity/*

$R_Adverse$ for the first one-third observations, set 2 to the middle one-third observations and set 3 to the highest one-third observations. Then $R_Quality$ is the average of R_Visual , $R_ATdensity$ and $R_Adverse$. Finally, CL_QQ is defined as the sum of $R_Quantity$ and $R_quality$, which is a comprehensive index for the information quantity and quality of IPO comment letter response. The higher the value of CL_QQ , the higher information quality of comment letter responses.

3.3. Control variables

Following Song and Tang (2019), Hu and Wang (2021), and Xue and Wang (2022b), we control for the characteristics of IPO comment letters, issuance and IPO candidates, respectively. Specifically, the control variables include review rounds of IPO (CL_rounds), the natural logarithm of the number of questions in IPO comment letter ($CL_questions$), IPO fees ($IPOofferfee$), market sentiment ($Sentiment$), total assets ($Size$), return on assets (ROA), leverage (Lev), research and development expenditures (RD), underwriter reputation ($Underwriter$), and auditor reputation ($Audit$). The detailed definitions of variables are shown in Table 1.

Table 1. Variable definitions.

Variables	Definition
<i>Volatility</i>	The standard deviation of stock returns within 180 calendar days after IPO. To improve the readability of regression results, we multiply the value by 10.
<i>CLquantity</i>	$CLquantity = (A1/Q1 + A2/Q2 + \dots + A_n/Q_n)/n$, n represents the total number of questions in the IPO comment letters, Q_n represents the character count in the n th question, and A_n represents the character count of the issuer's response to question n .
<i>Visualization</i>	the proportion of area occupied by pictures and tables in a comment letter response
<i>ATdensity</i>	<i>ATdensity</i> is defined as the density of accounting terms in a comment letter response, multiplied by -1 . Specifically, a word dictionary is constructed using the 'Bloomberg Professional Finance and Economics Vocabulary'.
<i>Adverse</i>	<i>Adverse</i> is defined as the frequency of adversative connectives in a comment letter response multiplied by -1 . Adversative connectives dictionary based on 'Connectives in Modern Chinese' (Liao, 1986)
<i>CL_QQ</i>	First, we sort the sample from low to high according to <i>CLquantity</i> then set 1 to <i>R_Quantity</i> for the first one-third observations, set 2 to the middle one-third observations and set 3 to the highest one-third observations. Second, we sort the sample from low to high according to <i>Visualization/ATdensity/Adverse</i> then set 1 to <i>R_Visual/R_ATdensity/R_Adverse</i> for the first one-third observations, set 2 to the middle one-third observations and set 3 to the highest one-third observations. Then <i>R_Quality</i> is the average of <i>R_Visual</i> , <i>R_ATdensity</i> and <i>R_Adverse</i> . Finally, <i>CL_QQ</i> is defined as the sum of <i>R_Quantity</i> and <i>R_quality</i> , which is a comprehensive index for the information quantity and quality of IPO comment letter response
<i>CL_rounds</i>	IPO comment letter rounds
<i>CL_questions</i>	Natural logarithm of the total number of questions in an IPO comment letter
<i>IPOofferfee</i>	The ratio of underwriting fees to total funds raised in an IPO
<i>Sentiment</i>	The cumulative market return in 30 trading days before IPO
<i>Size</i>	The mean of the natural logarithm of total assets over the three years preceding the IPO
<i>ROA</i>	The mean of net profit divided by total assets over the three years prior to IPO
<i>Lev</i>	The mean of total liabilities to total assets over the three years prior to IPO
<i>RD</i>	The mean of R&D expenditure to operating income over the three years prior to IPO
<i>Underwriter</i>	An indicator that equals 1 if the underwriter is one of the top 5 security firms, and 0 otherwise
<i>Audit</i>	An indicator that equals 1 if the auditor is one of the Big10, 0 otherwise

This table provides detailed definition of all the variables in this paper.

3.4. Model

We employ the following model to test our hypothesis H1:

$$\text{Volatility} = \beta_0 + \beta_1 CL + \beta_2 \text{Controls} + \text{Year} + \text{Indu} + \varepsilon \quad (1)$$

Where *CL* denotes *CLquantity*, *Visualization*, *ATdensity*, *Adverse*, and the comprehensive index of response quality (*CL_QQ*). According to our hypothesis, if the quality of response information is higher, we anticipate a reduction in stock price volatility. Consequently, we expect β_1 to be significantly negative.

To test hypotheses H2 and H3, we divide the entire sample into two subsamples based on the median values of companies' R&D investment and business risk, respectively. We then proceed to examine the differences between each pair of groups.

4. Empirical results

4.1. Descriptive statistics

Table 2 presents the descriptive statistics of the main variables. The mean of stock price volatility (*Volatility*) is 1.634 with a standard deviation of 1.142, indicating a significant variability in stock price volatility among different companies. The mean of *CLquantity* is 18.40, suggesting that, on average, companies reply 18.40 characters to each character of questions in IPO comment letters. *Visualization*, *ATdensity*, and *Adverse* have a mean of 0.232, 5.529 and 0.083, respectively, suggesting that in comment letter responses, 23.2% are covered by pictures and tables, and there are 5.529 accounting terms and 0.083 adversative conjunctions in every 100 words. On average, the IPO companies will be asked 48 questions (mean of *CL_questions* is 3.877) and will suffer from 2.5 rounds of IPO review (mean of *CL_rounds* is 2.536). The mean of *RD*, *ROA* and *Lev* is 0.101, 0.146, and 0.381, respectively.

Table 2. Descriptive statistics.

Variables	Observations	Mean	S.D.	Min.	Medium	Max.
<i>Volatility</i>	351	1.634	1.142	0.289	1.272	5.320
<i>CLquantity</i>	351	18.40	3.620	11.78	18.25	27.28
<i>Visualization</i>	351	0.232	0.044	0.147	0.228	0.334
<i>ATdensity</i>	351	-5.529	0.603	-7.032	-5.456	-4.476
<i>Adverse</i>	351	-0.083	0.021	-0.139	-0.081	-0.045
<i>CL_QQ</i>	351	4.000	1.127	2.000	4.000	6.000
<i>CL_rounds</i>	351	2.536	0.820	1.000	2.000	6.000
<i>CL_questions</i>	351	3.877	0.324	3.367	3.784	4.575
<i>IPOofferfee</i>	351	0.106	0.040	0.029	0.101	0.210
<i>Sentiment</i>	351	0.012	0.042	-0.068	0.009	0.137
<i>Size</i>	351	20.39	0.841	19.05	20.29	22.80
<i>ROA</i>	351	0.146	0.087	-0.006	0.127	0.369
<i>Lev</i>	351	0.381	0.173	0.108	0.355	0.781
<i>RD</i>	351	0.101	0.071	0.032	0.076	0.333
<i>Underwriter</i>	351	0.419	0.494	0.000	0.000	1.000
<i>Audit</i>	351	0.652	0.477	0.000	1.000	1.000

This table presents the summary statistics of the variables used in the main tests. All variables are defined in the Table 1. This table reports the impact of the information quantity and quality of IPO comment letter responses on stock price volatility of the first 180 days after IPO. All variables are defined in the Table 1. The t-statistics reported in parentheses are based on standard errors adjusted for heteroskedasticity. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

4.2. Regression results

4.2.1. IPO comment letter responses and post-IPO stock price volatility

Hypothesis 1 predicts a negative correlation between the quantity and quality of information in the IPO comment letter responses and post-IPO stock price volatility. Table 3 reports the impact of information quantity and quality of responses on stock price volatility. Column (1) shows that the coefficient of *CLquantity* is negatively significant at the 1% level, indicating that the larger the quantity of comment letter responses, the lower the post-IPO stock price volatility. Columns (2)-(4) present the effect of information quality of the responses on the post-IPO stock price volatility (*Volatility*). The regression results in columns (2) to (4) represent the impact of *Visualization*, *ATdensity*, and *Adverse* on stock price volatility (*Volatility*), with coefficients of -2.9675 , -0.1742 , and -6.8172 , respectively. These coefficients are significantly negative at least at 10% level, indicating that as the level of visualisation in comment letter responses increases and the density of accounting terms and adversative expressions decreases, post-IPO stock price volatility

Table 3. The information quantity and quality of IPO comment letter responses and post-IPO stock price volatility.

	(1) <i>Volatility</i>	(2) <i>Volatility</i>	(3) <i>Volatility</i>	(4) <i>Volatility</i>	(5) <i>Volatility</i>
<i>CLquantity</i>	-0.0689*** (-4.08)				
<i>Visualization</i>		-2.9675** (-2.02)			
<i>Atdensity</i>			-0.1742* (-1.89)		
<i>Adverse</i>				-6.8172** (-2.50)	
<i>CL_QQ</i>					-0.2487*** (-5.05)
<i>CL_rounds</i>	0.1550 (1.56)	0.1019 (1.02)	0.1046 (1.01)	0.0947 (0.93)	0.1365 (1.40)
<i>CL_questions</i>	-0.0728 (-0.26)	0.0845 (0.30)	0.1074 (0.37)	0.1484 (0.53)	-0.0449 (-0.17)
<i>IPOofferfee</i>	11.5696*** (6.20)	11.7899*** (6.11)	11.6785*** (6.07)	11.8599*** (6.21)	11.9712*** (6.45)
<i>Sentiment</i>	2.6093* (1.72)	3.3465** (2.11)	3.1791** (1.99)	3.1482** (1.98)	2.7559* (1.82)
<i>Size</i>	0.3215*** (3.30)	0.3138*** (3.06)	0.2829*** (2.74)	0.3024*** (2.97)	0.3130*** (3.24)
<i>ROA</i>	-0.6063 (-0.78)	-0.7274 (-0.89)	-0.7244 (-0.89)	-0.7144 (-0.88)	-0.6197 (-0.79)
<i>Lev</i>	-0.7644** (-2.02)	-0.8717** (-2.25)	-0.7966** (-2.05)	-0.7579* (-1.97)	-0.7810** (-2.06)
<i>RD</i>	3.4544*** (3.62)	3.4552*** (3.37)	3.3334*** (3.29)	3.3389*** (3.33)	3.2634*** (3.36)
<i>Underwriter</i>	-0.0824 (-0.72)	-0.0635 (-0.55)	-0.0855 (-0.71)	-0.0258 (-0.23)	-0.0892 (-0.78)
<i>Audit</i>	0.0383 (0.34)	0.0054 (0.05)	0.0018 (0.02)	0.0013 (0.01)	0.0103 (0.09)
<i>_cons</i>	-4.0529* (-1.93)	-4.5359** (-2.07)	-5.8397*** (-2.60)	-6.3028*** (-2.90)	-4.2930** (-2.07)
<i>Indu</i>	Yes	Yes	Yes	Yes	Yes
<i>Year</i>	Yes	Yes	Yes	Yes	Yes
<i>Observation</i>	351	351	351	351	351
<i>Adj.R²</i>	0.2629	0.2279	0.2240	0.2320	0.2719

tends to decrease as well. Column (5) is the regression results of the comprehensive index (*CL_QQ*). The coefficient of *CL_QQ* is -0.2487 and is significantly negative at the 1% level, indicating that the higher the quantity and quality of responses, the lower the stock price volatility. All these findings align with our hypothesis, suggesting that greater quality and quantity of information within comment letter responses enhance outside investors' comprehension of the IPO candidates. As investors gain a deeper understanding of the company's core technology, corporate governance, business model, firm risk, and other pertinent aspects, both information asymmetry and stock price volatility are diminished. In terms of control variables, the coefficients of *IPOofferfee*, *Sentiment*, and *RD* are significantly positive, indicating that the issuance expenses, market sentiment, and the R&D investment will increase the post-IPO short-term stock price volatility.

4.2.2. R&D investment, IPO comment letter responses and post-IPO stock price volatility

Table 4 illustrates the impact of R&D intensity on the relationship between IPO comment letter response quality and post-IPO stock price volatility. We divide the

Table 4. R&D investment, IPO comment letter responses and stock price volatility.

	(1) Low R&D investment	(2) High R&D investment
	<i>Volatility</i>	<i>Volatility</i>
<i>CL_QQ</i>	-0.1815** (-2.27)	-0.3248*** (-5.30)
<i>CL_rounds</i>	0.0975 (0.66)	0.1671 (1.21)
<i>CL_questions</i>	-0.0042 (-0.01)	-0.1228 (-0.32)
<i>IPOofferfee</i>	11.5936*** (4.13)	11.5140*** (4.74)
<i>Sentiment</i>	0.9950 (0.44)	4.7087** (2.29)
<i>Size</i>	0.3054** (2.01)	0.3682*** (2.74)
<i>ROA</i>	-0.7378 (-0.64)	-0.4636 (-0.44)
<i>Lev</i>	-0.4578 (-0.84)	-0.9590* (-1.75)
<i>RD</i>	12.0935** (2.10)	3.5086** (2.60)
<i>Underwriter</i>	0.1121 (0.67)	-0.1958 (-1.15)
<i>Audit</i>	0.1623 (1.00)	-0.1420 (-0.86)
<i>_cons</i>	-5.5134* (-1.71)	-5.9506** (-2.06)
<i>Indu</i>	Yes	Yes
<i>Year</i>	Yes	Yes
<i>Observation</i>	175	176
<i>Adj.R²</i>	0.2277	0.3079
Difference between (1) vs. (2)		-0.143*(P = 0.070)

We divide the total sample into 2 groups according to the median of *RD*. The column (1) and (2) of Table 4 report the impact of IPO comment letter responses on stock price volatility in the companies with lower and higher R&D investment, respectively. All variables are defined in the Table 1. The t-statistics reported in parentheses are based on standard errors adjusted for heteroskedasticity. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

sample into two groups based on the median R&D investment and then rerun model (1) respectively. In Column (1) of Table 4, we present the regression results for sample with relatively lower R&D investment. Notably, the coefficient of CL_QQ is -0.1815 and is statistically significant at the 5%. Conversely, in Column (2) of Table 4, for the sample with relatively higher R&D investment, the coefficient of CL_QQ is -0.3248 , signifying statistical significance at the 1% level. Furthermore, the intergroup difference test reveals a significant difference in coefficients at the 10% level. These findings support hypothesis H2, which postulates that the impact of IPO comment letter responses on stock price volatility is more pronounced in companies with higher R&D investment.

4.2.3. Operational risk, IPO comment letter responses and stock price volatility

This study employs the standard deviation of Return on Assets (SD_ROA) in the three years before IPO to measure its operational risk. A larger SD_ROA indicates greater earnings fluctuations and higher operational risk before IPO. We classify the companies into two subsamples according to the median of SD_ROA to investigate impact of operational risk on the relationship between IPO comment letter responses and post-IPO stock price volatility.

Table 5 presents how operational risk will influence the relationship between IPO comment letter responses and stock price volatility. Column (1) in Table 5 presents the results for companies with lower business risk. The coefficient of CL_QQ is statistically insignificant. On the contrary, column (2) shows the regression results for companies with higher business risk and the coefficient of CL_QQ is significantly negative at 1% level. The coefficients of CL_QQ in two groups are significantly different at the 1% level. These results support hypothesis H3, which anticipates that when companies have higher operational risk, the level of information asymmetry between investors and issuers is greater, making the incremental information provided in IPO comment letter responses more valuable and exerting a stronger influence on stock price volatility.

The findings in Tables 4 and 5 collectively demonstrate that the mechanism by which IPO comment letter responses influence post-IPO stock price volatility is by reducing information asymmetry between companies and investors, as well as among investors themselves.

5. Further tests

In previous section, we investigate the impact of information quantity and quality of IPO comment letter responses on stock price volatility. In this section, we first make some cross-sectional tests based on the characteristics of IPO comment letters, such as the intensity of technology-related questions and timeliness of comment letters. Then, we explore how comment letter responses affect the information quantity and quality between the first and the final versions of prospectus. We also use informed trading probability and bid-ask spread to validate the channel of information mechanism. Finally, we explore whether the impact of IPO comment letter responses on stock price volatility diminishes over time.

Table 5. Operating risk, IPO comment letter responses, and stock price volatility.

	(1) Low operating risk	(2) High operating risk
	<i>Volatility</i>	<i>Volatility</i>
<i>CL_QQ</i>	-0.0976 (-1.52)	-0.3841*** (-5.45)
<i>CL_rounds</i>	0.1235 (0.90)	0.2374* (1.84)
<i>CL_questions</i>	0.1343 (0.37)	-0.5795 (-1.48)
<i>IPOofferfee</i>	9.2057*** (3.99)	16.4417*** (5.25)
<i>Sentiment</i>	1.2675 (0.61)	4.2325* (1.94)
<i>Size</i>	0.2158* (1.68)	0.5391*** (4.19)
<i>ROA</i>	-3.6536** (-2.16)	0.2791 (0.32)
<i>Lev</i>	-1.0976* (-1.91)	-0.5575 (-1.05)
<i>RD</i>	4.7534*** (3.29)	2.0512* (1.70)
<i>Underwriter</i>	-0.1278 (-0.79)	-0.0269 (-0.16)
<i>Audit</i>	0.2299 (1.48)	-0.0738 (-0.43)
<i>_cons</i>	-4.2577 (-1.35)	-7.1427** (-2.58)
<i>Indu</i>	Yes	Yes
<i>Year</i>	Yes	Yes
<i>Observation</i>	175	176
<i>Adj.R²</i>	0.2572	0.3381
Difference between (1) vs. (2)		0.286*** (P = 0.000)

We measure the operating risk as the volatility of ROA over the three years prior to IPO and divide the total sample into 2 groups according to the median of operating risk. The column (1) and (2) of Table 5 report the impact of IPO comment letter responses on their stock price volatility in companies with lower and higher operating risk, respectively. All variables are defined in the Table 1. The t-statistics reported in parentheses are based on standard errors adjusted for heteroskedasticity. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

5.1. The characteristics of IPO comment letters

The STAR Market primarily supports in high-tech companies seeking to raise funds through IPOs, including those involved in new-generation information technology, advanced equipment, new materials, renewable energy, energy efficiency, environmental protection, and biomedicine. Consequently, technological issues take centre stage in IPO review process.

When a IPO comment letter contains many technology-related questions, it indicates that the disclosure of core technology information in prospectus is insufficient, or the core technology is challenging to comprehend. After inquired by the exchanges, the IPO company needs to explain their core technology in detail in its response letter, mitigating the information asymmetry between issuers and investors. Furthermore, unlike short-term information such as accounting numbers, core technology remains relatively stable in the short run. In essence, core technology information disclosed before an IPO can aid investors in pricing IPO companies. Consequently, we anticipate that when the proportion of technology-related issues in IPO comment

letters is high, the impact of comment letter responses on stock price volatility becomes more pronounced.

We use the proportion of technological questions over the total number of questions in a comment letter to proxy the intensity of technology issues. We divide the sample into two subsamples based on the median of the intensity of technology issues and rerun model (1). Column (1) in Table 6 presents the results for companies with lower intensity of technology issues and the coefficient of *CL_QQ* is statistically insignificant. Column (2) shows the results for companies with higher intensity of technology issues and the coefficient of *CL_QQ* is significantly negative at the 1% level. Furthermore, these coefficients are significantly different at the 1% level, which indicates that the higher the proportion of technological issues in the IPO comment letters, the stronger the impact of the information quality of the IPO comment letter responses on post-IPO stock price volatility.

After undergoing multiple rounds of review and responses, companies seeking IPO on the STAR Market need to go through additional procedures such as the listing committee review, registration approval by CSRC, and roadshow before they can successfully go public. It's worth noting that there are significant variations in the time taken for different companies to navigate through this process. Most of the IPO candidates on the STAR Market are innovative technology enterprises with fluctuating revenue, and they face significant risks of having their core technologies imitated or surpassed. The longer the period between the end of the review process and the actual listing date, the less useful of the information in IPO comment letter response becomes.

We investigate whether the time gap between the final review and the listing date (referred to as the 'time gap' hereafter) influences the relationship between IPO comment letter responses and post-IPO stock price volatility. To explore this, we divide the samples based on the median time gap. Columns (1) and (2) in Table 7 present the regression results for shorter and longer time gaps, respectively. The coefficients of *CL_QQ* are -0.3220 and -0.1738 , respectively. The former is statistically significant at the 1% level, while the latter is significant at the 5% level. Moreover, the coefficient difference between

Table 6. The proportion of technology-related questions and the impact of IPO comment letter responses.

	(1)	(2)
	Lower proportion of technology-related questions	High proportion of technology-related questions
<i>CL_QQ</i>	<i>Volatility</i> -0.1243 (-1.63)	<i>Volatility</i> -0.3559*** (-5.67)
<i>Controls</i>	Yes	Yes
<i>Indu</i>	Yes	Yes
<i>Year</i>	Yes	Yes
<i>Observation</i>	175	176
<i>Adj.R²</i>	0.2488	0.2870
Difference between (1) vs. (2)		0.232***(P = 0.005)

We divide the total sample into 2 groups according to the median of the proportion of technology-related questions in an IPO comment letter. The column (1) and (2) of Table 6 report the impact of IPO comment letter responses on their stock price volatility in the companies with lower and higher proportion of technology-related questions, respectively. All variables are defined in the Table 1. The t-statistics reported in parentheses are based on standard errors adjusted for heteroskedasticity. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table 7. The time gap between the final review to the date of IPO and the impact of comment letter responses.

	(1)	(2)
	Short gap	Long gap
	Volatility	Volatility
<i>CL_QQ</i>	-0.3220*** (-4.75)	-0.1738** (-2.17)
<i>Controls</i>	Yes	Yes
<i>Indu</i>	Yes	Yes
<i>Year</i>	Yes	Yes
<i>Observation</i>	175	176
<i>Adj.R²</i>	0.2488	0.2870
Difference between (1) vs. (2)	-0.148*(P = 0.065)	

Note: We divide the total sample into 2 groups according to the median of the time gap between the final review to the date of IPO. The column (1) and (2) of Table 7 report the impact of IPO comment letter responses on their stock price volatility in the companies with shorter and longer gap, respectively. All variables are defined in the Table 1. The t-statistics reported in parentheses are based on standard errors adjusted for heteroskedasticity. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

these two groups is significant at the 10% level. These findings indicate that when the final review date is closer to the listing date, the impact of information quantity and quality of IPO comment letter responses on stock price volatility becomes more pronounced.

5.2. Mechanism test

Although our previous findings have shown that the information quantity and quality of comment letter responses has a negative impact on post-IPO stock price volatility, there is an alternative explanation that companies with a favourable information environment inherently exhibit lower price volatility. To address this alternative explanation, we employ the IPO process of the STAR Market as our research framework. Within this context, we delve deeper into the mechanisms through which IPO comment letter responses influence stock price volatility. That is, we explore whether the companies' responses offer incremental information throughout the entire IPO process, which encompasses stages from the initial application version of the prospectus to review process with multiple rounds of inquiry and response, and finally to the final version of prospectus. The application version of the prospectus is released prior to the review process, while the final version is produced subsequent to this stage. Consequently, if the IPO comment letter responses indeed prove effective and informative, we would anticipate significant revisions in the final version of the prospectus when compared to the initial version.

We employ changes in character count and page count as metrics to quantify the incremental information conveyed through comment letter responses. The calculation for these two measurements is as follows: $\Delta Prospectus_Quantity = (\text{Character count in issuer's final version of prospectus} - \text{character count in the application version of prospectus}) / 10000$; $\Delta Prospectus_Page = (\text{page count of the issuer's final version of prospectus} - \text{page number of the application version of prospectus}) / 100$. The greater the changes, the more

incremental information is conveyed. In addition, concerning the assessment of the information quality of IPO comment letter responses, we define the visualisation change between the two versions of prospectus as $D_Visualization = \text{visualisation degree of final version of prospectus} - \text{visualisation degree of application version of prospectus}$. Similarly, we define change of accounting term density and change of adversative conjunctions as $D_ATdensity$ and $D_Adverse$, respectively.

Panel A of Table 8 illustrates how comment letter responses impact the prospectus in terms of information quantity. The coefficients of $CL_quantity$ are all positively correlated with $\Delta Prospectus_Quantity$ and $\Delta Prospectus_Page$, respectively, suggesting that the greater the quantity of information in the comment letter responses, the more incremental information is incorporated into the final version of the prospectus compared to its application version. In Panel B, we examine how comment letter responses influence the prospectus in terms of information quality. Our empirical findings indicate that higher-quality comment letter responses correspond to greater improvements in the information quality of the final version of prospectus.

As previously discussed, when the information quality of IPO comment letter responses is higher, the cost for all investors to obtain and interpret firm-specific information decreases. Consequently, sophisticated investors with professional backgrounds and access to private information sources will have a reduced information advantage. This, in turn, leads to a decrease in opinion divergence among investors, resulting in lower stock price volatility.

To measure the information asymmetry among investors, we utilise $VPIN$ and $Bid\text{-}ask\ Spread$. A higher value of $VPIN$ and $Bid\text{-}ask\ Spread$ indicates a higher level of information

Table 8. The impact of IPO comment letter responses on the revision of prospectus.

	(1) $\Delta Prospectus_Quantity$	(2)	(3) $\Delta Prospectus_Page$
Panel A: The change of the information quantity of final-version prospectus			
$CLquantity$	0.2282*** (4.02)		0.0236*** (3.51)
<i>Controls</i>	Yes		Yes
<i>Indu/Year</i>	Yes		Yes
<i>Observation</i>	351		351
<i>Adj.R²</i>	0.3363		0.2539
	(1) $D_Visualization$	(2) $D_Atdensity$	(3) $D_Adverse$
Panel B: The changes of the information quality of final-version prospectus			
<i>Visualization</i>	0.1203*** (3.20)		
<i>Atdensity</i>		0.0680*** (4.15)	
<i>Adverse</i>			0.1158*** (5.71)
<i>Controls</i>	Yes	Yes	Yes
<i>Indu/Year</i>	Yes	Yes	Yes
<i>Observation</i>	351	351	351
<i>Adj.R²</i>	0.0250	0.1139	0.1357

Panel A (B) of Table 8 reports the impact of comment letter responses on the change of information quantity (quality) from initial-version to final-version prospectus. All variables are defined in the Table 1. The t-statistics reported in parentheses are based on standard errors adjusted for heteroskedasticity. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table 9. The impact of IPO comment letter responses on the probability of informed trading and bid-ask spread.

	(1) <i>Probability of Informed Trading</i>	(2) <i>Bid-ask Spread</i>
<i>CL_QQ</i>	-0.0011** (-2.21)	-0.0048* (-1.71)
<i>Controls</i>	Yes	Yes
<i>Indu</i>	Yes	Yes
<i>Year</i>	Yes	Yes
<i>Observation</i>	351	351
<i>Adj.R²</i>	0.0940	0.2665

This table reports the impact of IPO comment letter responses on probability of informed trading and bid-ask spread. All variables are defined in the Table 1. The t-statistics reported in parentheses are based on standard errors adjusted for heteroskedasticity. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

asymmetry among investors. We adopt the methodology outlined in previous studies (Chen et al., 2019; Easley et al., 2012) to calculate VPIN, as shown in Equation (2).

$$VPIN = \frac{\sum_{\tau=1}^n |V_{\tau}^B - V_{\tau}^S|}{nV} \quad (2)$$

Where V_{τ}^B and V_{τ}^S denote the buy and sell volume at time τ , respectively. n represents the number of buckets in the time interval, and V represents the equalised trading volume of each bucket.

We calculate the Bid-ask Spread following the methodologies outlined in Blankespoor et al. (2014) and Zhang et al. (2014). To compute the daily *Bid-ask Spread*, we begin by subtracting the bid price from the ask price and then divide this difference by the midpoint of the bid and ask price. Subsequently, we calculate the average daily *Bid-ask Spread* over a 180-day period following the IPO. We then regress *CL_QQ* on *VPIN* and *Bid-ask Spread*, respectively. The regression results, as displayed in Table 9, demonstrate that the higher the information quality of IPO comment letter responses, the lower the probability of informed trading and bid-ask spread within the 180 days following the IPO. The findings in Table 9 validate the pathways we outlined in the development of our hypotheses.

5.3. IPO comment letter response and stock price volatility in different windows

In this part, we are interested in whether the impact of IPO comment letter responses on stock price volatility diminishes over time. In theory, as time since listing increases, the information, particularly financial information, will undergo significant changes, leading to a decrease in impact IPO comment letter responses on stock price volatility. We investigate the stock price volatility from 30 to 360 days after IPO, and the results are presented in Table 10. The findings in Table 10 reveal that the regression coefficient for *CL_QQ* gradually decreases from 0.5879 to 0.1730, which is consistent with our expectation that the incremental information provided by IPO comment letter responses diminishes over time after IPO.

Table 10. The impact of comment letter responses on the stock price volatility in different windows.

	(1) <i>Volatility_30</i>	(2) <i>Volatility_60</i>	(3) <i>Volatility_90</i>	(4) <i>Volatility_180</i>	(5) <i>Volatility_360</i>
<i>CL_QQ</i>	-0.5879*** (-4.89)	-0.4288*** (-5.02)	-0.3551*** (-5.01)	-0.2487*** (-5.05)	-0.1730*** (-5.01)
<i>Controls</i>	Yes	Yes	Yes	Yes	Yes
<i>Indu</i>	Yes	Yes	Yes	Yes	Yes
<i>Year</i>	Yes	Yes	Yes	Yes	Yes
<i>Observation</i>	351	351	351	351	351
<i>Adj.R²</i>	0.2766	0.2700	0.2691	0.2719	0.2644

This table reports the impact of comment letter responses on the stock price volatility in different windows. All variables are defined in the Table 1. The t-statistics reported in parentheses are based on standard errors adjusted for heteroskedasticity. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

6. Robustness tests

6.1. Excluding the alternative explanation of time trend

There exists a potential alternative explanation for the results in the main tests. It suggests that during the early stages of the STAR Market, investor sentiment was high, resulting in significant stock price volatility. At the same time, issuers and underwriters may have had limited experience in responding to IPO comment letters, leading to lower-quality response information. However, as time passes and investors gradually become more rational, stock price volatility decreases. Simultaneously, issuers and underwriters gain more experience in responding to comment letters, which improve the quality of comment letter responses. In this scenario, we might still observe a negative correlation between information quantity and quality of IPO comment letter responses and stock price volatility. In other words, it's possible that there is no causality between responses and price volatility, and the negative relationship may be solely influenced by the time trend.

To address this alternative explanation, we followed the approach of Xue and Wang (2022a) and constructed a variable to represent the time since listing (*IPOmonth*). Specifically, we assigned 1 to July 2019, 2 to August 2019, and so on until December 2021 (30 months in total). After controlling for this time trend, the results, as shown in Table 11, remain robust, thereby mitigating concerns related to this alternative explanation.

6.2. Alternative definition of dependent variable

In Section 4.2, we employ the standard deviation of individual stock returns as a measure of stock price volatility. In our robustness test, we adopt the approach of Wei et al. (2019) and O. Z. Li et al. (2021), using the standard deviation of market-adjusted stock returns (*Volatility_Adj*) as an alternative measure of stock price volatility. The results are consistent with our main tests and are presented in Table 12.

6.3. Controlling for characteristics of prospectus information

We further control for the information quality of the initial version of the prospectus, including information quantity, degree of information visualisation,

Table 11. The impact of comment letter responses when time trend is controlled.

	(1) <i>Volatility</i>	(2) <i>Volatility</i>	(3) <i>Volatility</i>	(4) <i>Volatility</i>	(5) <i>Volatility</i>
<i>CLquantity</i>	-0.0707*** (-4.22)				
<i>Visualization</i>		-2.6874* (-1.84)			
<i>Atdensity</i>			-0.1554* (-1.67)		
<i>Adverse</i>				-7.5230*** (-2.85)	
<i>CL_QQ</i>					-0.2478*** (-4.99)
<i>IPOmonth</i>	0.0176* (1.96)	0.0202** (2.12)	0.0188** (1.98)	0.0193** (2.04)	0.0217** (2.38)
<i>Controls</i>	Yes	Yes	Yes	Yes	Yes
<i>Indu</i>	Yes	Yes	Yes	Yes	Yes
<i>Year</i>	No	No	No	No	No
<i>Observation</i>	351	351	351	351	351
<i>Adj.R²</i>	0.2467	0.2076	0.2040	0.2175	0.2530

IPOmonth equals to 1 for July of 2019, 2 for August of 2019 and so on. Table 11 reports the impact of IPO comment letter responses on their stock price volatility when time trend (*IPOmonth*) is controlled. All variables are defined in the Table 1. The t-statistics reported in parentheses are based on standard errors adjusted for heteroskedasticity. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table 12. Alternative dependent variable: market-adjusted stock return volatility.

	(1) <i>Volatility_Adj</i>	(2) <i>Volatility_Adj</i>	(3) <i>Volatility_Adj</i>	(4) <i>Volatility_Adj</i>	(5) <i>Volatility_Adj</i>
<i>CLquantity</i>	-0.0698*** (-4.15)				
<i>Visualization</i>		-2.9432** (-2.00)			
<i>Atdensity</i>			-0.1729* (-1.86)		
<i>Adverse</i>				-6.9400** (-2.55)	
<i>CL_QQ</i>					-0.2506*** (-5.10)
<i>Controls</i>	Yes	Yes	Yes	Yes	Yes
<i>Indu</i>	Yes	Yes	Yes	Yes	Yes
<i>Year</i>	Yes	Yes	Yes	Yes	Yes
<i>Observation</i>	351	351	351	351	351
<i>Adj.R²</i>	0.2660	0.2295	0.2257	0.2345	0.2745

In Table 12, we use market-adjusted stock return volatility as dependent variable. All variables are defined in the Table 1. The t-statistics reported in parentheses are based on standard errors adjusted for heteroskedasticity. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

terminology density and adversative conjunction density. We posit that if the quality of the initial version of the prospectus is high, it signifies a favourable information environment for the issuer. In this way, we can control the original information environment of issuers and then capture the net information effect caused by comment letter responses. As illustrated in Table 13, even after controlling for these company-specific information environment, our conclusions remain robust.

Table 13. The impact of comment letter responses when characteristics of prospectus are controlled.

	(1) <i>Volatility</i>	(2) <i>Volatility</i>	(3) <i>Volatility</i>	(4) <i>Volatility</i>	(5) <i>Volatility</i>
<i>CLquantity</i>	-0.0751*** (-4.22)				
<i>Visualization</i>		-3.4251** (-2.17)			
<i>Atdensity</i>			-0.2271** (-2.08)		
<i>Adverse</i>				-8.4313*** (-2.90)	
<i>CL_QQ</i>					-0.2780*** (-5.30)
<i>Pro_quantity</i>	0.4652 (1.29)	0.2220 (0.62)	0.1214 (0.33)	0.1438 (0.40)	0.4651 (1.33)
<i>Pro_Visualization</i>	0.0856 (0.09)	0.9420 (0.95)	0.0510 (0.05)	-0.1171 (-0.12)	0.1653 (0.18)
<i>Pro_Atdensity</i>	0.1288 (0.85)	0.0510 (0.33)	0.1891 (1.06)	0.0049 (0.03)	0.1786 (1.16)
<i>Pro_Adverse</i>	-0.1869 (-0.04)	0.5824 (0.12)	-0.8723 (-0.19)	5.9102 (1.19)	1.5984 (0.34)
<i>Controls</i>	Yes	Yes	Yes	Yes	Yes
<i>Indu</i>	Yes	Yes	Yes	Yes	Yes
<i>Year</i>	Yes	Yes	Yes	Yes	Yes
<i>Observation</i>	351	351	351	351	351
<i>Adj.R²</i>	0.2595	0.2211	0.2172	0.2273	0.2713

We define the information quantity and quality for prospectus using the same methods as for comment letter responses. Specifically, *Pro_quantity*, *Pro_Visualization*, *Pro_Atdensity* and *Pro_Adverse* proxy the information quantity, information visualisation, density of accounting terms and density of adversatives of prospectus, respectively. Table 13 reports the results when information quantity and quality of prospectus are controlled. All other variables are defined in the Table 1. The t-statistics reported in parentheses are based on standard errors adjusted for heteroskedasticity. *, **, and ***denote significance at the 10%, 5%, and 1% levels, respectively.

6.4. Full sample test

In our baseline analysis, we excluded 26 companies that are listed according to the unprofitable IPO criterion. These 26 issuers exhibit lower ROA, leverage, and R&D compared to other IPO candidates with positive earnings. To enhance the external validity of our research, we have included these 26 companies and utilise the entire sample of 377 companies to re-estimate the regression model. The results for the full sample are presented in Table 14, and they align with our main findings.

7. Conclusion

Using Chinese IPO firms listed on the STAR Market from 22 July 2019, to 31 December 2021, we explore the relationship between the information quantity and quality of IPO comment letter response and post-IPO stock price volatility. Our findings indicate a negative correlation between the information quantity and quality of responses and stock price volatility. Specifically, more detailed responses, higher visualisation degrees, lower accounting terminology density, and fewer inverse connectives are associated with lower post-IPO stock price volatility in the short period. Furthermore, when IPO companies allocate more resources to R&D or face greater operational risks, this negative correlation becomes more pronounced. Additionally, we observe that when comment letters contain more technology-related questions or the time gap between the final review and the listing date is shorter, the impact of IPO

Table 14. Full sample test.

	(1)	(2)	(3)	(4)	(5)
	Volatility	Volatility	Volatility	Volatility	Volatility
<i>CLquantity</i>	-0.0733*** (-4.58)				
<i>Visualization</i>		-2.8431** (-2.02)			
<i>Atdensity</i>			-0.1492* (-1.69)		
<i>Adverse</i>				-6.9274*** (-2.62)	
<i>CL_QQ</i>					-0.2637*** (-5.56)
<i>Controls</i>	Yes	Yes	Yes	Yes	Yes
<i>Indu</i>	Yes	Yes	Yes	Yes	Yes
<i>Year</i>	Yes	Yes	Yes	Yes	Yes
<i>Observation</i>	377	377	377	377	377
<i>Adj.R²</i>	0.2652	0.2217	0.2166	0.2272	0.2723

In the main tests we exclude the issuer with losses. In Table 14 we add 26 IPO firms with losses back and rerun the regressions. All variables are defined in the Table 1. The t-statistics reported in parentheses are based on standard errors adjusted for heteroskedasticity. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

comment letter responses on stock price volatility is more significant. Mechanism tests reveal that IPO comment letter responses contribute to improving prospectus quality while reducing the likelihood of informed trading and bid-ask spread. Finally, we find that the impact of IPO comment letter responses on stock price volatility diminishes over time after IPO,

Taking the registration-based IPO system reform in China as the research setting, our findings hold important implications for both theoretical understanding and practical applications. From a theoretical perspective, our study enriches the existing research on IPO comment letter responses. Regarding stock price volatility, we highlight the crucial role of IPO comment letter responses in enhancing the information environment and reducing information asymmetry in the capital market. In practice, as information disclosure is a key aspect of the registration-based IPO system reform, we emphasise the significance of IPO comment letter responses as a channel for issuer to disclosure information. Regulatory bodies should consider mandating detailed and comprehensible responses to improve pricing efficiency of IPO, drive technological innovation, and promote the high-quality development of capital market.

It is worth noting that our study, conducted before the full implementation of the registration-based IPO system by the CSRC on 17 February 2023, offers valuable insights not only for the STAR Market but also for the broader application of the registration-based IPO system across the entire stock market.

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