Shadow banking activities of non-financial companies and the information content of stock prices

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A R T I C L E   I N F O

A B S T R A C T

In recent years, corporate investment rate has been declining, and they have been allocating financial capital to the shadow credit market, which lead to accumulation of financial risks. Based on the annual data of non-financial listed companies from 2007 to 2019, this paper explores the impact of non-financial companies' shadow banking on the information content of stock prices. Results show that shadow banking of non-financial enterprises reduce the information content of stock price, and the above effects are more significant in regions with lower social trust and higher policy uncertainty, private enterprises, and enterprises without political connection. Enterprises engage in shadow banking can impact idiosyncratic information content of stock price through channels of earning management, irrational investor behavior, creditor risk concerns and informed trading; Analysts over-optimism and insider trading can also have an impact on the relationship between shadow banking activities and synchronization of stock price. This paper analyzes economic consequences of non-financial enterprises' shadow banking activities, thus providing important theoretical support and policy guidance for enhancing signal mechanism of securities market, improving capital market efficiency of resource allocation, deepening financial market-oriented reforms.

1. Introduction

For a long time, there has been serious credit discrimination in the financial capital allocation. Interest rate regulation and high entry barriers to financial sector have led to resource mismatch problems. Inefficient credit allocation has led to a mismatch between financial support and real economic development, so that financial leakage among enterprises exists. Currently, many non-financial enterprises gain excess funds from bank or financial market and then lend funds to other enterprises act as credit intermediaries. As of the first quarter of 2021, the scale of broad shadow banking in China rose to 5.87 billion yuan, and in 2019, the scale of entrusted loans, entrusted wealth management, and private lending of non-financial enterprises in Shanghai Stock Exchange and Shenzhen Stock Exchange reached 3.65733 billion yuan. Financial resources leakage from state-owned sector to private sector can correct the imbalance of initial credit resources allocation to a certain extent. However, the use of over-raising funds by enterprises to engage in shadow banking activities can also further cause problems such as lower operating performance and stock price crash risk, thus have negative impacts on the development of real economy and capital market.

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Under the background of " Economy De-Financialization", investment opportunities and profitability of real sector have been reduced. Enterprises tend to invest their capital to financial sector in order to improve operating performance. The massive capital influx into financial system pushes up financial sector returns. As an important sector for absorbing employment and increasing R&D investment, the real economy plays a key role in promoting high-quality economic development. However, excessive enterprises resources devote to high-risk shadow banking activities will have a negative impact on stock price performance and capital market stability. On one hand, real sector engages in high-risk shadow banking can exacerbate systemic financial risks (Du et al., 2015). On the other hand, enterprises use limited credit resources to participate in shadow banking business will inevitably crowd out real sector investment and weaken the efficiency of monetary policy (Han et al., 2019). It is of great theoretical and practical importance to reveal the impact of non-financial enterprises' shadow banking activities on capital market performance.

The efficient operation of capital markets plays an important role in achieving optimal resources allocation. Ability of stock prices to reflect information is an important indicator of a country's capital market efficient operation. However, existing studies show that Chinese stock market prices are observed isotropic changes, indicating that firm-specific information is not fully integrated into stock prices, and the capital market is operating inefficiently (Morck et al., 2000). Most of literatures have used synchronization of stock price to reflect information content of stock prices and operations efficiency of capital market. Studies on synchronization of stock price have found that firm-specific earnings are significantly correlated with future information of individual stocks earnings, and low synchronization of stock price is mainly due to incorporation of firm-level idiosyncratic information (Durnev et al., 2003). Nevertheless, some studies also suggest that synchronization of stock price is reflected as noise, and synchronization of stock price is not entirely derived from information.

In terms of factors influencing, studies have put forward that institutional investors, analyst characteristics and investor sentiment may impact synchronization of stock price. Specifically, new audit report system, information disclosure and SEO discount all help to play a role in strengthening capital market supervision, which can improve transparency of market information and enhance idiosyncratic information reflected by individual stock prices, thus reducing synchronization of stock price (Fernandes & Ferreira, 2009). With respect to internal factors such as information transparency, hiring of Big Four auditors, and accounting quality are all related to synchronization of stock price (Jin & Myers, 2006; Hutton et al., 2009; Dasgupta et al., 2010). Throughout the existing literature, there have been abundant researches on synchronization of stock price. However, little literatures have explored the role of corporate shadow banking activities on capital market efficiency. In view of this, this paper will explore the impact of capital market efficiency of resource allocation from the perspective of corporate shadow banking activities.

The paper analyzes the impact of non-financial enterprises' shadow banking activities on information content of stock prices at theoretical level and proposes corresponding research hypotheses. Using data of non-financial listed enterprises in Shanghai Exchange Stock and Shenzhen Exchange Stock from 2007 to 2019, to do empirical test and explore heterogeneous effects in different regions and firms. Then use the mediating effect model to explore influence mechanism of non-financial enterprises' shadow banking activities on information content of stock prices. Finally, concludes the research.

This paper shows that non-financial enterprises engage in shadow banking activities promotes synchronization of stock prices, and the above effects are more significant in private firms, non-political connection firms, and regions with lower social trust and higher policy uncertainty. Mechanism tests show that enterprises engage in shadow banking business can reduce idiosyncratic information content of stock price through channels of surplus management, irrational investor behavior, creditor risk concerns and informed trading. Results of extended analysis suggest that analyst optimism bias and lower insider transactions also positively moderate the relationship between corporate shadow banking scale and stock prices information content.

Compared with the existing literature, main contributions of the research conclude, firstly, this study explores factors that influencing the information content of stock prices from the perspective of non-financial enterprises' shadow banking business. The article provides a new perspective on influencing factors that contribute to capital market efficiency. Second, the paper analyzes influence mechanism of non-financial enterprises' shadow banking activities on information content of stock prices, which helps to clarify theoretical influence channels.

The rest of this article is organized as follows. Section 2 is theoretical analysis and research hypothesis. Section 3 elaborates the details of sample and empirical models. Next, the summary statistics, baseline findings, robustness tests, mechanism analyses, and heterogeneity analyses are reported in Section 3. Section 4 elaborates the moderating effects. Section 5 summarizes the research.

2. Literature review and research hypothesis

The Efficient Market Hypothesis (EMH) states that stock prices in a strong efficient market will reflect all public and non-public information. Roll (1988) found that goodness-of-fit of Capital Asset Pricing Model is not high in practice and argued that stock returns should be divided into market common returns and firm-specific returns. Goodness-of-fit (R^2) of CAPM model regression reflects market information, and firm-specific information is measured by 1- R^2. Morck et al. (2000) then defined 1- R^2 as synchronization of stock price and explicated its rationality for reflecting fundamental information of enterprises. The larger the 1- R^2, the stronger the synchronization of stock price, the higher the degree of convergence between individual stock movements and broad market price movements, and the less company-specific information.

Some state-owned enterprises use its advantageous financing ability to obtain funds from financial markets at a financing cost which is lower than the market equilibrium interest rate, and then engage in shadow banking business by means of entrusted loans, entrusted wealth management and private lending (Du et al., 2015). Corporate shadow banking scale will affect information content of stock price. Non-financial enterprises engage in shadow banking business will send a negative signal to investors that they are "not doing their job", which is not conducive to price performance and financing capacity. As a result, corporate will disclose less

information to public, which negatively affects information content of stocks price. Second, high-risk shadow banking business can also make investors more sensitive to the release of negative news, leading to herding effects caused by "voting with their feet" and collective selling. Noises, bubbles and irrational behavior caused by investors' psychological biases can also reduce information content of stock price. Third, enterprises that have poor performance and do not have good investment opportunities are more willing to engage in shadow banking business, which tend to hide true corporate operating conditions through surplus management, thus it reduce information content of individual stock prices and improve synchronization of stock price. In view of this, we propose the first research hypothesis.

H1. : Non-financial enterprises' shadow banking activities will reduce information content of stock price.

As a complement to legal system, informal system can reduce transaction costs and information communication costs, promote enterprise technological innovation, and achieve long-term economic growth. Social trust, as an informal institution, influences corporate behavior through self-regulation, external monitoring, and collective punishment. On the one hand, management is less likely to deceive consumers and investors in a trustworthy environment, and more willing to proactively disclose relevant matters that affect business decisions. The purpose is to reduce negative impact of enterprises' shadow banking business on information content of stock price idiosyncrasies caused by hiding negative news. On the other hand, public punishment for breach of trust will increase in an environment with high human trust level. Once management's behavior of hiding unfavorable news based on self-interest motive is detected by external investors, they will be subject to severe social sanctions and economic strikes. As a result, in regions with higher social trust level, management will be more proactive in disclosing more truthful and valid information in order to avoid negative shocks on the corporate operations, investment and financing activities. In addition, sufficient social trust promotes frequent corporate information exchange, reduce information asymmetry between management and external investors, which serves to restrain the impact of corporate shadow banking activities on the information content of stock prices.

Local governments play a decisive role in the resources allocation and policies formulation. They have a greater impact on corporate development within their jurisdiction. Investors are more sensitive to the release of corporate negative news in regions with high policy uncertainty. They will be more inclined to vote with their feet in response to future business risks. Thus, in regions with high policy instability, corporate sector is more inclined to actively disclose some non-public information in order to signal to public that business conditions are good and stock price performance is stable, which helps to reduce negative impact of corporate shadow banking scale on stock price information content. The paper proposes the second hypothesis.

H2. : The impact of non-financial enterprises' shadow banking activities on information content of stock prices is weaker in regions with higher social trust and higher policy uncertainty.

State-owned enterprises are closely monitored by external investors and government department, which leads them to disclose more related information on their business activities actively or passively. The authenticity, timeliness and transparency of information is higher. Compared to private firms, SOEs have less performance pressure, weaker industry competition, greater risk aversion, and less information opacity. The negative impact of non-financial enterprises' shadow banking business on information content of stock prices is weaker. In addition, political connection companies have more timely access to information about macro policy changes, industry policy adjustments and market environment, which tend to have more resources and policy preferences. Banks are more inclined to allocate credit resources to corporate with political connections, and thus require higher information level. Banks require corporate to report their financial and operating conditions truthfully, which leads to higher stock price transparency in political connection enterprises. This paper proposes the third hypothesis.

H3. : The impact of non-financial enterprises' shadow banking activities on information content of stock prices is weaker in state-owned enterprises and political connection enterprises.

3. Research data and research design

3.1. Sample selection and data processing

This study used 2007–2020 data from Chinese A-share non-financial listed companies. For data analysis, we excluded companies from the financial industry, special treatment (ST) companies, and companies with missing data, and winsorize all continuous variables at the 1% level to reduce the influence of extreme values. The data were drawn from the China Stock Market & Accounting Research (CSMAR) database, China Statistical Yearbook or manually calculated.

3.2. Variable setting

3.2.1. Information content of stock price

This paper uses synchronization of stock price to measure information content of stock price referred to Durnev et al. (2003). The calculation model is as the followings.

$$RER_{i,t} = \delta_0 + \delta_1 MARET_t + \delta_2 INDRET_{j,t} + \varepsilon_{i,t} \tag{1}$$

$$SYN_i = \ln\left(\frac{R_i^2}{1 - R_i^2}\right) \tag{2}$$

where i indexes firm and t is a week time index, $RER_{i,t}$ is corporate stock return, $MARET_t$ represents market return, and $INDRET_{j,t}$ represents industry return. R_i^2 is the goodness-of-fit of model (1), and the goodness-of-fit is logarithmized by using model (2) to obtain the proxy for synchronization of stock price. The higher the synchronization of stock price, the lower the information content of stock price.

3.2.2. Shadow banking of non-financial companies

We referred to Han et al. (2019), use the ratio of entrusted loans, entrusted financial products, private lending, and shadow banking products to total asset, as the measurement of corporate shadow banking scale. Entrusted loans data are obtained by manually collecting according to the entrusted loans announcements of listed companies in Shanghai Exchange and Shenzhen Exchange. Private lending data are based on Jiang et al. (2010), and use "other receivables" as a proxy indicator. Shadow banking products, such as trust products and structured deposits are obtained from the listed companies detailed account of "other current assets".

3.2.3. Control variables

Referred to the existing literature (Piotroski & Roulstone, 2004; Gul et al., 2004), we control corporate size (*Size*), profitability *(ROE)*, turnover rate (*Turnover*), investor ownership (*INS*), book-to-market ratio (*BM*), financial leverage (*Lev*), shareholder equity ratio (*SH*), and dual listing (*Crosslist*). The variable definitions and descriptive statistics are shown in Table 1.

3.3. Model setting and variable definition

In order to explore the impact of non-financial enterprises' shadow banking business on synchronization of stock price, the paper constructs the model as the following.

$$SYN_{i,t} = \alpha_0 + \alpha_1 Sb\_Scale_{i,t} + \alpha_2 Control_{i,t} + \mu_i + \theta_t + \varepsilon_{i,t} \tag{3}$$

where $SYN_{i,t}$ is synchronization of stock price of firm i in year t, $Sb\_Scale_{i,t}$ is shadow banking scale of firm i in year t, and $Control_{i,t}$ denotes other control variables affecting synchronization of stock price. μ_i and θ_t capture the individual fixed and year effects, respectively, and $\varepsilon_{i,t}$ is the random disturbance. If the coefficient of α_1 is larger than 0, it indicates that non-financial enterprises' shadow banking scale will increases synchronization of stock price and decreases stock price information content, H1 holds.

To further analyze the influence mechanism of non-financial enterprises' shadow banking business on idiosyncratic information content of stock prices, this paper constructs model (4) and (5) referred to Baron & Kenny (1986) and Wen et al. (2004).

$$MV_{i,t} = \gamma_0 + \gamma_1 Sb\_Scale_{i,t} + \gamma_2 Control_{i,t} + \mu_i + \theta_t + \varepsilon_{i,t} \tag{4}$$

$$SYN_{i,t} = \rho_0 + \rho_1 Sb\_Scale_{i,t} + \rho_2 MV_{i,t} + \rho_3 Control_{i,t} + \mu_i + \theta_t + \varepsilon_{i,t} \tag{5}$$

$MV_{i,t}$ is the mediating variable. The test procedure is as follows, first, test if the coefficient of α_1 is significant in the benchmark regression model (3). Then, test whether coefficient of γ_1 in model (4) and coefficient of ρ_2 in model (5) are significant, and if both are significant, it indicates the mediating effect exist. In the above case, if coefficient of ρ_1 is not significant, complete mediating effect holds; if coefficient of ρ_1 is significant, it indicates partial mediating effect exists. Conversely, if at least one of coefficients of γ_1 and ρ_2 is not significant, bootstrap test is required to further determine whether a mediating effect exists.

Table 1
Variable Definitions and Descriptive Statistics.

Symbol	Variable Definitions	Variable Measurement	Sample	SD	Median	Mean
Sb_Scale	Shadow banking scale	Ratio of shadow banking scale to total assets	16,629	0.2391	0.0178	0.1065
SYN	Synchronization of stock price	Calculation method is detailed in the paper	16,629	0.1952	0.4793	0.4748
Size	Corporate Size	Natural logarithm of total assets	16,629	1.3121	22.1532	22.3256
ROE	Profitability	Ratio of net profit to equity	16,629	0.1056	0.0783	0.0755
Turnover	Turnover rate	Annual average turnover rate	16,629	5.0997	4.9134	6.3979
BM	Book-to-Market ratio	Ratio of shareholders equity to book market value	16,629	0.2403	0.6215	0.6630
INS	Institutional investor share	Institutional investor share ratio	16,629	0.2483	0.4989	0.4691
SH	Shareholder equity	Largest shareholder equity ratio	16,629	0.1511	0.3360	0.3537
Lev	Leverage	Ratio of total liabilities to total assets	16,629	0.2019	0.4385	0.4402
Crosslist	Dual listing	If corporate issues B/H shares is 1, else is 0	16,629	0.2521	0.0000	0.6825

4. Empirical results analysis

4.1. Basic results

Table 2 reports the impact of non-financial enterprises' shadow banking activities on synchronization of stock price. Columns (1) and (2) add core explanatory variables only, and respectively not control and control for year fixed effects. Columns (3) and (4) control for full information set. The results show that the coefficient of corporate shadow banking scale (*Sb_Scale*) is significantly positive at the 1% statistical level. It can be shown that non-financial enterprises engage in shadow banking activities increases synchronization of stock price and reduces information content of stock prices, and hypothesis one holds.

Table 3 examines the impact of shadow banking business on synchronization of stock price in different regions and enterprises. We divide the sample into high social trust and low social trust, and high policy uncertainty and low policy uncertainty regions. For the measurement of regional trust, using China Urban Business Credit Environment Index from 2015 to 2019 compiled by China Academy of Management Sciences to indicate social trust level in the region referred to Han et al. (2019). Specifically, enterprises are divided into a high social trust region, if located in a region with a social trust score higher than the median of all regions, and vice versa. The results in columns (1) and (2) show that the coefficient of corporate shadow banking (*Sb_Scale*) is significantly positive at 10% level in low social trust regions, while it is not significant in high social trust regions. Thus, non-financial enterprises' shadow banking has a more significant positive impact on synchronization of stock prices in low social trust regions.

The paper measured policy uncertainty according to whether governor in the enterprises' registered location has been changed referred to Chen and Chen (2018). The measurement method is as follows, when there is governors' allopatry change in the enterprises registered location, the value is set to 2, if there is a local governor change, the value is set to 1, if there is no official change, the value is set to 0. Columns (3) and (4) in Table 3 show that the coefficient of non-financial corporate shadow banking (*Sb_Scale*) is significant at 1% level in high policy uncertainty areas. In contrast, the coefficient is only significant at 5% level in low local policy uncertainty regions. Both in terms of coefficient size and significance level, it is smaller than that of regions with high policy uncertainty. Thus, the positive impact of non-financial enterprises' shadow banking on synchronization of stock price is more significant in high policy uncertainty regions, and hypothesis two exists.

Column (1) and Column (2) in table4 report the heterogeneous effect of shadow banking on synchronization of stock price. The results show that the coefficient (*Sb_Scale)* is only significant at 1% statistical level in non-state-owned enterprises. The possible explanation is that SOEs have higher information transparency due to the stringent external regulation, which lead to a weaker impact of enterprises' shadow banking business on information content of stock prices. We used if senior management has a government background to measure political connections according to Dai et al. (2014) and Xu et al. (2013). Column (3) and column (4) in Table 4 show that the coefficient (*Sb_Scale)* is significantly positive at 1% statistical level in non-political connection enterprises, but not significant in enterprises with political connections, hypothesis three exists.

Table 2
Baseline Regression.

Explained Variable	(1) SYN	(2) SYN	(3) SYN	(4) SYN
Sb_Scale	0.0149 * *	0.0200 * **	0.0356 * **	0.0313 * **
	(0.006)	(0.006)	(0.008)	(0.007)
Size			-0.0196 * **	0.0262 * **
			(0.003)	(0.004)
ROE			-0.0040	0.0023
			(0.016)	(0.015)
Turnover			-0.0000	-0.0001 * **
			(0.000)	(0.000)
BM			0.1472 * **	0.1620 * **
			(0.010)	(0.013)
INS			-0.0007 * **	-0.0019 * **
			(0.000)	(0.000)
SH			0.0001	0.0007 * *
			(0.000)	(0.000)
Lev			-0.0610 * **	-0.1254 * **
			(0.016)	(0.015)
Crosslist			-0.0152	-0.0136
			(0.027)	(0.022)
N	27,259	27,259	16,633	16,633
adj-R2	0.000	0.228	0.025	0.291
Year FE	N	Y	N	Y
Firm FE	Y	Y	Y	Y

Table 3
Heterogeneity Analysis: Social Trust and Policy Uncertainty.

Explained Variable: SYN	Higher Social Trust (1)	Low Social Trust (2)	High Policy uncertainty (3)	Low Policy Uncertainty (4)
Sb_Scale	0.0261	0.0316 *	0.0352 * **	0.0233 * *
	(0.019)	(0.018)	(0.012)	(0.011)
Controls	Y	Y	Y	Y
N	2314	2954	6726	9907
adj-R2	0.323	0.023	0.250	0.327
Year FE	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y

Table 4
Heterogeneity Analysis: Ownership and Political Connection.

Explained Variable: SYN	Non-state-owned Enterprises (1)	State-owned Enterprises (2)	Political connectionEnterprises (3)	Non-political connection Enterprises (4)
Sb_Scale	0.0327 * **	0.0103	0.0021	0.0348 * **
	(0.008)	(0.021)	(0.023)	(0.011)
Controls	Y	Y	Y	Y
N	10,630	5898	2144	10,255
adj-R2	0.297	0.035	0.323	0.332
Year FE	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y

4.2. Robustness test

4.2.1. Endogenous problems

Considering the endogenous problems caused by omitting variables or reverse causality, we respectively use the first-order lagged of corporate shadow banking and shadow banking scale of other enterprises in the same-year and same-industry as instrumental variables. The choice criteria are that the above two instrumental variables have impact on corporate shadow banking scale, but are not directly related to information content of stock prices. The regression results are shown in Table 5.

Column (1) in Table 5 reports the regression results using shadow banking scale of other enterprises in the same-year and same-industry as instrumental variable. The results show that after efficiently tackling the problem of endogeneity in the regression, the coefficient of corporate shadow banking scale remains significantly positive at 1% statistical level, indicating that non-financial enterprises' shadow banking activities will increase stock price synchronicity, and reduce the information content of stock prices. The results of Anderson LM test and Cragg-Donald Wald tests indicate that there are no under-identified and weak instrumental variables problems. Column (2) uses the first-order lag of corporate shadow bank scale as instrumental variable. Results show the coefficient of core variable (Sb_Scale) is significantly positive at 10% statistical level after replacing instrumental variable. Column (3) in Table 5 reports regression results of Systematic GMM. Sargan test and Hansen test indicate that the model does not exist over-identification, which suggests that the choose of instrumental variables are valid. The results of GMM show that coefficient of corporate shadow banking scale (Sb_Scale) is significantly positive at 1% statistical level, which indicates that negative effect of corporate shadow banking on information content of stock prices remains valid after considering endogeneity.

Table 5
Robustness Test: IV Regression and Systematic GMM.

Explained Variable: SYN	(1) IV_SBI	(2) IV_LSB	(3) GMM
Sb_Scale	0.1025 * **	0.0448 *	0.2618 * **
	(0.020)	(0.027)	(0.088)
Controls	Y	Y	Y
N	16,560	15,411	14,496
adj-R2	0.020	0.026	
Anderson LM statistic	2057.936	1164.439	
Cragg-Donald Wald F statistic	2402.201	1276.237	
Sargan statistic			0.365
Hansen statistic			0.494
AR (1)			0.034
AR (2)			0.343
Year FE	Y	Y	Y
Firm FE	Y	Y	Y

4.2.2. Control other possible influencing factors

To alleviate the impact of omitting variables on the empirical results, we also include other possible influencing factors in baseline regression model. Exist Studies found that securities analyst activity and research reports numbers may affect the information content of stock prices (Piotroski & Roulstone, 2004; Chan & Hameed, 2006; Jiang, 2013). Therefore, Column (1) and Column (2) in Table 6 consider the possible impact of analyst activities and research report numbers respectively. Results show that coefficient of corporate shadow banking (*Sb_Scale*) is significantly positive at 1% level. Exist literatures also proposed that information disclosure can affect capital market transparency and the auditors source increases information veracity, which may have an impact on synchronization of stock prices (Gul et al., 2010; Hutton et al., 2009). Colum (3) includes auditor sources which is measured by whether the auditor come from one of big four accounting firms respectively. Column (4) includes information disclosure dummy variable into the baseline model. The results show that coefficients of corporate shadow banking (*Sb_Scale*) are significant at 1% statistical level respectively, which indicates that empirical result are still robust after controlling other influencing factors.

4.2.3. Change clustering level

This paper also changes clustering level by clustering standard errors to industry level. Table 7 show that coefficient of corporate shadow banking (*Sb_Scale*) is significantly positive at 1% statistical level, regardless of controlling for year fixed effects and entire information sets, which suggests that the previous findings remain valid.

4.2.4. Consider the impact of Financial Crisis

After the global financial crisis in 2008, economy plunged into a very steep downturn. In order to eliminate possible influence of financial crisis on empirical results, the paper excluded the data before 2008. Table 8 show that coefficient of corporate shadow banking scale (*Sb_Scale*) is significantly positive at 1% statistical level, regardless of whether full information set is included and controlling for year fixed effects. The empirical results are still valid after excluding the impact of financial crisis.

4.3. Influence mechanism analysis

4.3.1. Earning management mechanism

Different from financial asset allocation such as stocks and bonds, shadow banking business have the characteristics of high risk and high leverage. Corporate engage in shadow banking business can exacerbate risk financial risk and stock price crash risk, and send negative signals about "bad business" and "poor management" to the market. For enterprises that engage in shadow banking business may cover-up the real information through surplus management, in order to avoid external investors' negative expectations on operations and financial conditions, which will make it more difficult for external investors and analysts to analyze the enterprises' actual operating conditions and thus reduce the information content of stock price.

To verify surplus management mechanism, we measure earning management by constructing a modified Jones model to calculate sum of discretionary accruals over three years. It has been found that the larger the sum of absolute value of discretionary accruals, the stronger the surplus management, and the lower the information opacity (Hutton et al., 2009). Table 9 reports the results of mediating effect tests, we can see that in column (2), the coefficient of corporate shadow banking (*Sb_Scale*) is 0.0253 at 5% significant level, indicating that corporate engage in shadow banking activities will increase degree of surplus management and reduces information transparency. Column (3) shows that the coefficients of shadow banking (*Sb_Scale*) and surplus management (*Opaque*) are 0.0380 and 0.0337, respectively, both of which are significant at 1% statistical level. Combined with results in column (2), the results suggest the existence of partial mediating effect. Therefore, enterprises engage in shadow banking activities can increase information opacity by promoting surplus management, which lead to an increase in synchronization of stock price and a decrease in information content of stock price, and earning management mechanism is validated.

4.3.2. Irrational investor behavior

Behavioral finance suggests that irrational behavior caused by investors' mood fluctuation can affect stock prices and even deviate from real values (Baker & Wurgler, 2004). Specifically, external investors are more sensitive to release of negative news in enterprises engaged in shadow banking business. They may "vote with their feet" and rush out en masse, thus reduce information content of stock price and even cause the collapse in the share price. In addition, irrational behavior unrelated to corporate fundamentals caused by noise, bubbles and investor psychological biases may also lead to herd effect, thus reducing information content of stock price.

Table 6
Robustness Test: Control Other Possible Influencing Factors.

	Analyst activities	Research reports	Auditor Sources	Information Disclosure
Explained variable	*SYN*	*SYN*	*SYN*	*SYN*
Sb_Scale	0.0288 * **	0.0284 * **	0.0310 * **	0.0333 * **
	(0.009)	(0.009)	(0.008)	(0.008)
Controls	Y	Y	Y	Y
N	13,933	14,079	16,387	12,192
adj-R2	0.292	0.292	0.291	0.282
Year FE	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y

Table 7
Robustness Test: Changing Clustering Level.

Explained variable	(1) SYN	(2) SYN	(3) SYN	(4) SYN
Sb_Scale	0.0149 *	0.0200 * **	0.0356 * **	0.0313 * **
	(0.008)	(0.006)	(0.009)	(0.007)
Controls	N	N	Y	Y
N	27,258	27,258	16,633	16,633
adj-R2	0.000	0.228	0.025	0.291
Year FE	N	Y	N	Y
Firm FE	Y	Y	Y	Y

Table 8
Robustness Test: Eliminating the Impact of Financial Crisis.

Explained variable	(1) SYN	(2) SYN	(3) SYN	(4) SYN
Sb_Scale	0.0255 * **	0.0217 * **	0.0352 * **	0.0325 * **
	(0.006)	(0.006)	(0.008)	(0.008)
Controls	N	Y	N	Y
N	24,785	24,785	15,293	15,293
adj-R2	0.001	0.198	0.011	0.264
Year FE	N	Y	N	Y
Firm FE	Y	Y	Y	Y

Table 9
Earnings Management Mechanism.

Explained variable	(1) SYN	(2) OPAQUE	(3) SYN
Sb_Scale	0.0313 * **	0.0253 * *	0.0380 * **
	(0.007)	(0.012)	(0.010)
Opaque			0.0337 * **
			(0.012)
Controls	Y	Y	Y
N	16,633	11,193	12,493
adj-R2	0.291	0.077	0.309
Year FE	Y	Y	Y
Firm FE	Y	Y	Y

In order to further verify investors' irrational behavior mechanism, we referred to Hua et al. (2011), and used a half-year momentum indicator to measure investor sentiment. We measure investors' irrational behavior by calculating cumulative monthly stock returns for previous six-month period. When investors' sentiment tends to be pessimistic, they are more sensitive to the release of negative news, and negative effect of investors' irrational behavior on the relationship between corporate shadow banking scale and information content of stock prices is stronger. In view of this, we empirically analyze the above mechanism using mediating effects model.

Table 10 shows that coefficient of shadow banking (*Sb_Scale*) is − 0.0574, which is significantly negative at 1% statistical level, which indicates that enterprises engage in shadow banking activities can be accompanied by accumulation of negative sentiment and irrational sentiment, which will reinforce investors' pessimistic expectations about future stock price movements and affect capital

Table 10
Investor Irrational Behavior.

Explained variable	(1) SYN	(2) SENT	(3) SYN
Sb_Scale	0.0313 * **	-0.0574 * **	0.0291 * **
	(0.007)	(0.015)	(0.007)
Sent			-0.0463 * **
			(0.005)
Controls	Y	Y	Y
N	16,633	17,667	16,633
adj-R2	0.291	0.315	0.296
Year FE	Y	Y	Y
Firm FE	Y	Y	Y

market pricing efficiency. Column (3) shows that coefficient of shadow banking (*Sb_Scale*) and investor sentiment (*Sent*) are 0.0291 and − 0.0463, respectively, both of which are significant at 1% level. The results show that enterprises engage in shadow banking business intensify investors' negative expectations of corporate market performance and tends to be pessimistic about future share prices, which lead to a greater possibility of irrational behavior such as en masse, thus reduce information content of share price.

4.3.3. Creditor risk concern mechanism

Capital sources of non-financial enterprises' shadow banking activities mainly include the following two channels. First, enterprises' undistributed profits and retained earnings are forced to idle because of no good investment opportunities. Second, state-owned enterprises and large-scale enterprises can obtain funds from capital market and financial intermediaries by means of sufficient guarantees. Dominance of traditional financial institutions such as banks in China's financial system means that financial intermediaries are still the enterprises' main funds source. Different from capital market, banks have stronger ability in credit approval, loan tracking and risk management, and higher qualification requirements for a loan enterprise. Thus, banks are more sensitive and concerned about loan enterprises' risks. Non-financial enterprises engage in high-risk, information-asymmetric shadow banking will intensify operating risk. Banks as external creditors are bound to bear the uncollectible loans risk, which will eventually lead to corporate hiding some private information, reducing information transparency and increasing synchronization of stock price.

In order to test creditors risk concern mechanism, the paper used long-term borrowing as a proxy variable for corporate to obtain loans from banks. According to quantile levels of bank loans in the same-industry and same-year, corporate located at the 0–33%, 34%− 66%, and 67%− 100% quantile levels are correspondingly divided into three subsamples of weak, medium, and strong bank loan intensity, which are assigned values of 1, 2, and 3, respectively. In general, the higher bank loans intensity, the higher the degree of creditors risk concern. Column (2) in Table 11 shows that the coefficient of corporate shadow banking (*Sb_Scale*) is significantly negative at 1% statistical level, which indicates that enterprises engage in shadow banking business will reduce bank credit intensity. Column (3) reports that coefficient of corporate shadow banking (*Sb_Scale*) and bank credit intensity (*Loan*) are 0.0376 and 0.0054, respectively, which are significant at 1% and 10% statistical levels. The empirical results indicate that corporate engage in shadow banking business reduces corporate loans from bank. Banks, as the ultimate credit risk takers, are more concerned about corporate risk taking, which makes enterprises hiding some unfavorable information, and thus lead to a reduction in information content of stock price.

4.3.4. Informed trading mechanism

Investors participate in stock market through buying and selling arbitrage based on publicly available macroeconomic and fundamental information, which eventually leads to a gradual approximation of stock price to actual valuation (Morck et al., 2000). When the probability of market-informed trading increases, it leads to adverse selection against liquidity traders who do not have information advantage. Enterprises engage in risky shadow banking business exacerbate the crash risk of stock price and operational risk, which lead to a lower probability of informed traders participating in securities trading and gaining profit by using their information advantage, and reducing probability of informed trading. Reduced informed trading will prevent non-informed traders from accessing corporate private information, which in turn reduces the information content of stock prices. This paper used informed trading probability (*Vpin*) referred to Chen et al. (2019) to measure information trading. Specifically, informed trading probability is the ratio of order arrival rate to all order arrival rates under informed trading.

Column (2) reports regression results of corporate shadow banking on the probability of informed trading. Results show that coefficient of corporate shadow banking (*Sb_Scale*) is significant at 5% statistical level, which indicate that enterprises engage in shadow banking business will reduce informed trading. Column (3) shows that coefficient of corporate shadow banking (*Sb_Scale*) and informed trading probability (*Vpin*) are 0.0303 and − 1.6385, respectively, and both are statistically significant at 1% level, which show that non-financial enterprises engage in high-risk shadow banking will reduce information content of stock prices by reducing informed trading. Informed trading mechanism is validated.

4.4. Cross-sectional analysis

Analysts are important information intermediaries in capital market, and the information interpretation of listed enterprises will transmit more news to the public market, alleviate information asymmetry between corporate and investors, and improve pricing efficiency of capital market (Cheng et al., 2016). Non-financial enterprises engage in shadow banking are faced with a higher probability that their hiding high-risk behaviors will be detected by acute analysts. Analysts will convey information to market through analytical reports, reducing the synchronization of share prices and increasing content of idiosyncratic information. However, analysts' judgment can also be affected by some factors such as subjective lack of knowledge and objective long-term business dealing with enterprises, and lead to analysts are overly optimistic. In contrast, executives and shareholders have a better understanding of enterprises' actual development situation. When corporate engage in risky shadow banking business, executives and shareholders are quicker to learn about it and take actions on the capital markets. Although investors do not have direct access to first-hand information, they can also detect adverse information from insider behavior and spontaneously imitate their behavior, and thus cause the fluctuation of stock price. The above process drives a more realistic stock price performance, prompting stock price to contain more information and making it less synchronized with market. In view of this, this paper will explore heterogeneity of corporate shadow banking on information content of stock prices from two dimensions of analyst optimism bias and insider trading.

Table 11

Creditor Risk Concern Mechanism.

Explained variable	(1) SYN	(2) LOAN	(3) SYN
Sb_Scale	0.0313 * **	-0.0664 * **	0.0376 * **
	(0.007)	(0.025)	(0.011)
Loan			0.0054 *
			(0.003)
Controls	Y	Y	Y
N	16,633	18,437	10,774
adj-R2	0.291	0.221	0.320
Year FE	Y	Y	Y
Firm FE	Y	Y	Y

Table 12

Informed Trading Mechanism.

Explained variable	(1) SYN	(2) VPIN	(3) SYN
Sb_Scale	0.0313 * **	-0.0012 * *	0.0303 * **
	(0.007)	(0.001)	(0.007)
Vpin			-1.6385 * **
			(0.136)
Controls	Y	Y	Y
N	16,633	19,466	16,387
adj-R2	0.291	0.466	0.300
Year FE	Y	Y	Y
Firm FE	Y	Y	Y

4.4.1. Analyst optimism bias

Analysts act as information intermediaries in capital market decisions. Analysts have an advantage in information acquisition and information mining compared to external investors who are more fragmented and have less financial knowledge. However, analysts limited by their own business capabilities, are not able to provide or interpret private information objectively and accurately in many cases. In general, most analysts are tended to be optimistic. Over-optimism among analysts means that they will ignore the negative impact of adverse news on business operations and financial conditions , and become less sensitive to information changes in the capital markets. If external analysts are over-optimistic, it will inevitably lead to a decrease in their risk sensitivity to corporate shadow banking. Some of negative information cannot be objectively conveyed by analysts to external investors, which lead to lower information content of stock prices and higher synchronization of stock price.

To test the heterogeneity effect of shadow banking on information content of stock prices among enterprises with different levels of analyst over-optimism. We refer to Jackson (2005) to construct an analyst optimism bias index. The paper used the ratio of analysts forecast EPS minus actual EPS and forecasted closing price in the previous trading day as a measurement. Full sample is divided according to the level of analyst optimism deviation above and below median level in the same year and industry. Results are shown in Table 13. Column (1) and (2) illustrate that among enterprises with higher levels of analyst optimism bias, coefficient of corporate shadow banking (*Sb_Scale*) is 0.0468, which is significant at 5% statistical level. However, it is not significant among enterprises with a lower level of analyst optimism bias. Results suggest that the negative effect of non-financial enterprises' shadow banking scale on information content of stock prices is only significant among enterprises with a high degree of analyst optimism bias.

4.4.2. Insider trading

Executives and major shareholders possess a large amount of insider information, and will look for the right time to trade and gain profit in the stock market taking advantage of information, which greatly caused losses in outside investors interests. Insider trading

Table 13

Further Analysis: Analyst Optimism Bias and Insider Trading.

Explained variable SYN	High Analysts optimistic (1)	Low Analysts optimistic (2)	Insider Trading (3)	No Insider Trading (4)
Sb_Scale	0.0468 * *	0.0338	0.0467 * *	0.0552 * **
	(0.020)	(0.023)	(0.020)	(0.019)
Controls	Y	Y	Y	Y
N	3547	3731	3713	2347
adj-R2	0.318	0.296	0.298	0.349
Year FE	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y

will be able to release signals about corporate future development. Institutional investors, securities analysts and individual investors will also imitate the corresponding trading strategies and follow executives' and major shareholders' self-interested behavior in the capital market. Insider trading behavior of executives and major shareholders can signal corporate actual valuation and performance prospects to the market, which helps to increase information content of stock price.

To test the heterogeneous effect of relationship between shadow banking and synchronization of stock price in non-financial enterprises with different degree of insider trading. This paper constructs a dummy variable as a proxy variable for insider trading. Specifically, dummy variable is assigned 1 if the enterprises have insider trading in the current year; conversely, it is assigned 0. In this paper, full sample are divided into two subsamples according the existence of insider trading. Table 13 shows that among firms without insider transactions, the coefficient of corporate shadow banking (*Sb_Scale*) is 0.0552, which is significant at 1% level. In the enterprises exist insider transactions, coefficient of corporate shadow banking (*Sb_Scale*) is 0.0467, which is significant only at 5% level, suggesting that positive impact between corporate shadow banking and synchronization of stock price is more significant in enterprises without insider trading. The reason lies that insider trading can release information related to the corporate future operating conditions, and thus increase information content of stock price.

5. Conclusions

At this stage, non-financial enterprises are gradually involved in shadow banking business, and the trend of "Economic Divorce from Entity to Virtual" is increasing. In this paper, we explore the influence mechanism of corporate shadow banking on information content of stock price. The study finds that, first, corporate shadow banking business increases synchronization of stock price and decreases stock price information content, and the above effect are more significant in regions with lower social trust and higher policy uncertainty, as well as in non-state-owned and non-political connection enterprises. Non-financial enterprises engage in shadow banking activities can influence information content of stock price through channels of earning management, irrational investor behavior, creditor risk concerns, and informed trading. The effect of corporate shadow banking activities on information content of stock prices is more significant in enterprises with a higher degree of analyst optimism bias and without insider trading.

Finally, our research also exists certain limitations. The paper analyzes the impact of non-financial enterprises' shadow banking on capital market efficiency, but fails to deeply discuss the factors that affect corporate shadow banking behavior. In the future, we will try to do more exploration from this perspective.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this article.

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