

A Study on the Impact of Short Sale Trading Systems on External Financing Constraints for Enterprises

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Abstract

Addressing the financing difficulties of enterprises has always been a crucial objective in optimizing China's capital market system. As a fundamental trading rule in the securities market, the effect of short selling on financing constraints is subject to two opposing views in academia: the "deterioration theory" and the "improvement theory". This paper uses non-financial listed companies in the Shanghai and Shenzhen A-share markets from 2010 to 2022 as the observation sample, employing a multi-period difference-in-differences model and a mediation effect test to systematically evaluate the policy effects of the short selling system. Empirical results show that the introduction of the short selling mechanism significantly exacerbates the financing constraints of enterprises, a conclusion that remains robust even after dealing with potential endogeneity biases. Mechanism testing confirms that the short selling system works through two paths: compressing information asymmetry and optimizing internal governance structure. However, negative signaling effects dominate, outweighing the positive contribution of information improvement. Heterogeneity analysis shows that the aggravating effect of short selling is more pronounced among private enterprises, groups with low information transparency, and those already facing significant financing pressure, exhibiting distinct structural differences.

Keywords

Short Selling Mechanism; Financing Constraints; Difference-in-Differences Method; Information Asymmetry; Corporate Governance.

1. Introduction

Whether a company can obtain external funds at a reasonable cost is not only related to the investment and growth decisions of micro-entities but also reflects the efficiency of financial resource allocation at the macro level. In recent years, Chinese policymakers have repeatedly emphasized "reducing the overall financing costs of enterprises," and financial management departments have actively responded through measures such as reserve requirement ratio cuts, targeted relief, and expanded credit lending. However, the financing constraint problem has not been fundamentally improved. Its deep-seated problems stem partly from the inherent structural contradictions of the financial system and also reflect the imperfections of the basic institutions of the capital market^[1]. Against this backdrop, examining whether and how short selling-as a key institutional arrangement for price discovery and risk disclosure in the capital market-can affect corporate financing constraints has significant theoretical and practical implications. There are significant disagreements in the theoretical community regarding the relationship between short selling mechanisms and financing constraints. Some scholars adhere to the "negative signal amplification view," arguing that short selling sends a warning signal of deteriorating business conditions to capital providers, thereby increasing external financing costs^[1, 2]. Another school of thought advocates the "external governance activation

view," emphasizing that the deterrent effect of short selling can force companies to improve information disclosure and curb self-serving management behavior, thus winning the trust of creditors [3, 4]. This divergence indicates that the net effect of short selling on financing constraints is not a priori and requires rigorous causal identification methods for verification. This paper aims to break through the conventional thinking that only focuses on the direct impact of short selling on stock prices or corporate investment behavior, extending the analytical perspective to three dimensions: credit market reaction, information distance between banks and enterprises, and internal governance effectiveness, constructing a complete causal chain of "institutional introduction-information/governance change-adjustment of financing conditions." Methodologically, we take A-share companies listed on the Shanghai and Shenzhen stock exchanges from 2010 to 2022 as our research subjects. Using the quasi-natural experimental scenario of the phased expansion of margin trading and securities lending targets, we employ a multi-period DID strategy to assess the policy effect, supplemented by a mediation model to reveal the internal transmission path.

2. Literature Review and Commentary

Regarding the economic consequences of short selling, academia has explored this from multiple perspectives. However, in terms of its relationship with financing constraints, two distinct analytical paradigms still exist. The first paradigm-short selling exacerbates financing constraints. This argument can be traced back to Miller's classic assertion [5]: when short selling is restricted, stock prices mainly reflect the expectations of the optimistic side; once restrictions are lifted, pessimistic sentiment is released, and downward pressure on stock prices increases sharply. The multinational empirical study by Grullon et al. [1] shows that the risk of stock price collapse increases significantly after the relaxation of short selling controls. Extending this logic to debt financing, creditors often interpret a decline in stock price as a sign of deteriorating corporate fundamentals, leading them to demand higher risk compensation or reduced credit lines, ultimately trapping companies in tighter financing constraints [2]. From this perspective, short sellers are both a risk signal and a risk indicator. The second paradigm is that short selling alleviates financing constraints. This view is represented by the "ex-ante deterrence" hypothesis proposed by Gu and Zhou [3]. The introduction of short selling mechanism not only means the liberalization of the transaction level, but more importantly, it forms a continuous "sword of Damocles effect" - managers worry that improper behavior will lead to a drop in stock prices, thus having the motivation to improve information disclosure, reduce earnings manipulation, and compress inefficient investments [4]. When corporate governance improves and financial transparency increases, the trust of banks and other fund providers increases, and financing conditions tend to be more relaxed [4-6]. In this framework, short selling is positioned as an external governance tool, and its policy dividends are transmitted to the financing side through the "deterrence-regulation-trust" chain. Around the above theoretical divisions, domestic and foreign scholars have accumulated rich empirical evidence from the dimensions of financing costs, financing scale, and capital structure. Regarding financing costs, Ho et al. [7], using samples from multiple countries, found that the relaxation of short-selling restrictions significantly reduced the coupon rate of corporate bonds, with improved information transparency being the key transmission path. Xu et al. [4], in a study published in *Emerging Markets Review*, further confirmed that the short-selling system lowers bond financing costs through two channels: reducing information asymmetry and agency costs, with a more pronounced effect in regions with developed financial markets and sound legal environments. However, counter-evidence also exists—Grullon et al. [1] pointed out that short-selling activities themselves may be interpreted as risk warnings, thus pushing up risk premiums. Domestically, a 2022 master's thesis from Southwestern University of Finance and Economics, using the PSM-DID method, found that relaxing short-selling controls reduced debt financing costs through

three paths: improved information disclosure, reduced agency costs, and reduced operational risks. In terms of financing scale, Chu et al. [8] found that companies included in the margin trading and securities lending program were able to obtain more abundant credit lines, longer terms, and more favorable interest rate conditions. However, Gu and Zhou [3] observed a completely opposite trend-short selling significantly prompted companies to proactively reduce new debt. This seemingly contradictory result may reflect the dual motivations behind corporate financing behavior: on the one hand, improved financing conditions may allow companies to obtain more credit; on the other hand, facing short selling pressure, companies may also proactively reduce leverage to avoid financial risks [9]. Regarding the dynamic adjustment of capital structure, the research of Peng et al. [9] and Gong [10] shows that margin trading not only helps companies deleverage but also accelerates the adjustment of capital structure [11]. This finding indirectly confirms the governance value of short selling. However, deleveraging and the easing of financing constraints are not synonymous-reducing the debt ratio is often accompanied by a contraction in the total amount of financing, and the improvement in adjustment efficiency reflects more the increased initiative of corporate financing decisions. Based on the literature review above, existing research has established a relatively mature analytical paradigm, but several gaps remain to be filled: First, the integrated analysis of various theoretical effects is insufficient; second, the institutional characteristics in the Chinese context (such as implicit guarantees by state-owned enterprises and a bank-dominated financial system) have not been fully reflected; and third, new data from recent years (2020-2022) have not been systematically incorporated. This paper addresses these shortcomings by using financing constraints as the core explained variable, incorporating information effects, governance effects, and signaling effects into a unified framework, and conducting systematic testing using the latest samples.

3. Theoretical Analysis and Research Hypotheses

Based on opposing viewpoints in the literature, this paper proposes a set of competing hypotheses to determine the dominant direction of the net effect of short selling under the Chinese institutional environment. (I) Negative Signaling Effects of Short Selling and Worsening Financing Constraints According to the classic signaling theory [12], in markets with asymmetric information, the actions of informed traders are often given strong predictive meaning by bystanders. Short selling, due to its high cost and the risk of forced liquidation, is usually considered reliable evidence that informed parties possess negative insider information [13]. When a stock is heavily shorted, external funding providers speculate that the company has undisclosed negative factors-lower-than-expected earnings, operational difficulties, or management concealing problems [2]. This is driven by risk aversion. Creditors will raise interest rates, shorten terms, reduce amounts, or add collateral, while equity investors will demand higher expected returns. These chain reactions directly increase the marginal financing costs of enterprises, forming a vicious cycle of "short selling → risk signals → financing tightening" [1]. Based on this, we propose: Hypothesis H1a: Under the control of other conditions, the introduction of short selling mechanisms will significantly increase the degree of financing constraints of enterprises, that is, the short selling system is positively correlated with the severity of financing constraints. (II) Improved Information Efficiency and Easing of Financing Constraints from the perspective of information integration into stock prices, short selling mechanisms allow pessimistic expectations to be expressed through trading behavior, thereby improving the degree to which stock prices reflect real information [14]. When stock prices more accurately reflect the fundamental information of enterprises, the judgment error of external funding parties such as banks on the credit risk of enterprises decreases, and the "conservative premium" or "one-size-fits-all" credit allocation due to information ambiguity is reduced [4]. In China's financing structure dominated by bank credit, this mechanism is particularly

important-banks rely heavily on financial indicators and market signals in credit approval, and the increased stock price information content brought about by short selling helps banks better distinguish between superior and inferior companies. At the same time, the arbitrage motives of short sellers drive them to actively dig out and expose negative information^[3]. Although this may cause short-term stock price fluctuations, in the long run it helps reduce information backlog and the risk of "explosions," and maintains the transparency of information in the capital market. Therefore, we propose a competing hypothesis: Hypothesis H1b: The introduction of the short selling mechanism is negatively correlated with the degree of corporate financing constraints, that is, the short selling system helps to alleviate external financing difficulties. (III) Corporate Governance Effects of Short Selling and Its Transmission Path The continuous threat of short selling constitutes an external governance constraint^[3, 4]. If managers take short-sighted actions that damage the company's value (such as over-investment, earnings manipulation, and on-the-job consumption), they are likely to be targeted by short sellers, leading to a drop in stock price and damage to compensation incentives. This "stock price penalty" mechanism has a strong deterrent effect, making managers more motivated to restrain self-interested behavior. At the same time, driven by profit, short sellers will actively expose governance deficiencies such as financial fraud and illegal guarantees, filling the blind spots of internal supervision^[2]. This supplementary supervisory effect is more obvious, especially for private enterprises with weak governance foundations. Improved governance will bring about substantial operational improvements: improved earnings quality, increased capital allocation efficiency, and reduced operational risks^[6]. These positive changes will be transmitted to the credit market, enabling companies to obtain bank loans and bond financing with lower credit spreads. Based on this, we propose: Hypothesis H2: The short selling mechanism alleviates financing constraints by improving corporate governance, that is, corporate governance is the mediating variable for the short selling system to exert its relief effect.

4. Research Design and Data Description

(1) Data Sources and Sample Selection The original data in this paper are taken from the CSMAR database, covering the main financial statements of listed companies and corporate governance-related indicators. The list of stocks eligible for margin trading and securities lending is manually compiled periodically based on the adjustment announcements published on the official websites of the Shanghai and Shenzhen Stock Exchanges. The initial sample consisted of all A-share companies listed on the Shanghai and Shenzhen stock exchanges from 2010 to 2022. Financial and insurance companies (whose CSRC industry codes begin with "1"), ST/*ST/PT status, and observations with severely missing key variables were excluded. All continuous variables were shortened at the 1st and 99th percentiles. A total of 46,011 valid observations were obtained.

The detailed sample screening procedure is summarised as follows:

Table 1. Detailed Sample Screening Procedure

step	Action	Observations Dropped	Remaining Observations	Reason for Exclusion
1	Initial raw data(all A-share firms,2010-2022)	-	≈58,000	Unprocessed full sample
2	Exclude financial and insurance firms(CSRC industry code starting with"1"	≈4,500	≈53,500	Distinct capital structure and regulatory requirements incomparable with other industries
3	Exclude firms with ST,*ST,or PT status	≈3,200	≈50,300	Abnormal financial conditions;financing behaviour heavily distorted by non-market factors
4	Exclude observations with severe missing values in key variables	≈4,289	46011	Ensure data integrity for core regression variables(final baseline sample)

(2) Variable Definition: The explained variable-financing constraint (SA index). Following the method of Hadlock and Pierce ^[15], the SA index was constructed:

$$SA_{i,t} = -0.737 \times Size_{i,t} + 0.043 \times Size_{i,t}^2 - 0.040 \times Age_{i,t}$$

Where Size is the natural logarithm of total assets and Age is the company's age. A higher SA index indicates stricter financing constraints for the company.

Explanatory variable: Short-selling mechanism (Post). This paper constructs a dummy variable Post based on whether a company is included in the short-selling list. If company i is listed as a short-selling target starting from year t, Post takes the value 1; otherwise, it is 0.

(3) Mediating variable: Information asymmetry (absDA). This study measures the degree of information asymmetry using the absolute value of controllable accrued profits, estimated annually via a modified Jones model.

Table 2. Definition of control variables

Variable Name	symbol	measurement methods
enterprise scale	Size	Natural logarithm of total assets
asset-liability ratio	Lev	Total Liabilities/Total Assets
profitability	ROA	Net Profit/Total Assets
Growth Potential	Growth	Operating Revenue Growth Rate
cash flow	Cashflow	Net cash flow from operating activities / Total assets
Listed Duration	ListAge	Current year - year of listing

(4) Model Specification: To examine the causal effect of short-selling mechanisms on financing constraints, this paper constructs a bivariate fixed-effects model based on a regression framework.

$$SA_{i,t} = \alpha + \beta_1 Post_{i,t} + \gamma X_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t}$$

Here, X denotes the set of control variables, μ_i represents the firm-specific fixed effect, and λ_t denotes the year-specific fixed effect. The core coefficient of interest in this study is β_1 .

To examine whether information asymmetry plays a mediating role in how short selling affects financing constraints, this paper constructs the following recursive model of the mediation effect.

$$\begin{aligned} absDA_{i,t} &= \alpha + \beta_1 Post_{i,t} + \gamma X_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t} \\ SA_{i,t} &= \alpha + \beta_2 Post_{i,t} + \theta absDA_{i,t} + \gamma X_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t} \end{aligned}$$

If both β_1 and θ are statistically significant, and β_2 is lower than that of β_1 in the benchmark regression, this indicates that information asymmetry exerts a partial mediating effect.

5. Empirical Results Analysis

(1) Descriptive Statistics Table 3 presents the descriptive statistics for the main variables, as shown in the table below. The SA index indicates significant variations in financing constraints among the sample firms, providing a solid foundation of data variability for examining the impact of short-selling mechanisms on these constraints. The observed values in Post's dataset belong to the treatment group (i.e., firms included in the short-selling target list), a proportion that aligns closely with the actual phased implementation process of the margin trading and short-selling system.

Regarding control variables, the debt-to-asset ratio (Lev) remains at a reasonable level; profitability (ROA) reveals varying profit performance among the sample firms, with some reporting losses; growth rate (Growth) reflects the overall expansion trend of the firms; and overall operational performance is sound. Firm size (Size) and listing duration (ListAge) indicate that the sample primarily consists of medium-sized companies with extended market presence.

Table 3. Descriptive statistics of the main variables

Variable	Obs	Mean	Std.	dev.	Min	Max
SA	44,547	4.075	1.791	0.719	10.87	
Post	44,560	0.282	0.450	0	1	
Lev	44,547	0.432	0.222	0.0501	0.978	
ROA	44,547	0.0354	0.0752	-0.348	0.219	
Growth	38,495	0.171	0.474	-0.648	3.129	
Cashflow	44,547	0.0442	0.0752	-0.200	0.259	
Size	44,547	22.10	1.502	18.80	27.11	
ListAge	44,548	9.568	8.137	-10	32	

Note: All continuous variables have undergone Winsorization at the 1% and 99% quantiles. Negative values in ListAge occur because some companies were listed later than the observation year, which falls within the normal data range.

(2) Benchmark regression results

Table 4 presents the benchmark regression results on the impact of short-selling mechanisms on corporate financing constraints. Column (1) shows a simplified model controlling only for individual and year fixed effects, while column (2) presents a full model incorporating all control variables.

Key findings: The coefficients for Post in columns (1) and (2) are 0.2856 and 0.2925, respectively, both statistically significant at the 1% level. This result indicates that, holding other conditions constant, companies included in the short-selling target list experience a

significant increase in their financing constraints (SA index) of approximately 0.29 standard deviations. In other words, the introduction of the short-selling mechanism exacerbates rather than alleviates corporate financing constraints. This supports Hypothesis H1a (the exacerbation hypothesis), contrary to the expected direction of Hypothesis H1b (the alleviation hypothesis).

From an economic perspective, the SA index has a standard deviation of 1.791, and its Post coefficient of 0.2925 indicates that the short-selling mechanism elevates financing constraints for firms in the treatment group by approximately 7.17% relative to the overall sample mean (0.2925/4.075), carrying significant economic implications.

Regarding control variables: the coefficient for debt-to-equity ratio (Lev) is significantly positive (1.103, $p < 0.01$), indicating that firms with higher financial leverage and greater debt repayment pressures face more severe financing constraints; the coefficient for return on assets (ROA) is also significantly positive (1.425, $p < 0.01$)-a finding that may seem counterintuitive, as profitable firms are often in rapid expansion phases and exhibit higher reliance on external financing; the coefficient for growth rate (Growth) is significantly positive (0.098, $p < 0.01$), suggesting that firms with more growth opportunities face stronger financing constraints, aligning with the reality that high-growth enterprises require substantial capital but face higher future uncertainties; finally, the coefficient for cash flow ratio (Cashflow) is significantly negative (-0.188, $p < 0.01$), demonstrating that firms with robust internal cash flows rely less on external financing and experience fewer constraints, consistent with theoretical expectations.

The group-level correlation coefficient ρ is 0.868, indicating that individual firm effects account for 86.8% of the variance in financing constraints, making the use of a fixed-effects model justified.

Table 4. Baseline Regression Results

note	2022.year	omitted	because	of	collinearity			
Fixed-effects	(within)	regression	Number of obs	=	38495			
Group	variable	stkcd num	Number of groups	=	4874			
R-sq	Within	=	0.318	Obs per group min	=	1		
Between	=	0.241	avg	=	7.900			
Overall	=	0.235	max	=	12			
F(16,4873)	=	123.8						
corr(u i,	Xb)	=	0.0375	Prob>F	=	0		
(Std.	err.	adjusted	for	4,874	clusters	in	stkcd num)	
Robust								
SA	Coefficient	std.	err.	t	P> t	95%	conf.	interval
Post	0.293	0.0178	16.47	0	0.258	0.327		
Lev	1.103	0.0895	12.33	0	0.928	1.279		
ROA	1.425	0.100	14.21	0	1.228	1.621		
Growth	0.0980	0.0108	9.060	0	0.0768	0.119		
Cashflow	-0.188	0.0775	-2.430	0.0150	-0.340	-0.0365		
ListAge	0.0760	0.00259	29.37	0	0.0709	0.0810		

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; the values in parentheses represent the standard error adjusted for company-level clustering.

(3) Mechanism Testing: The Mediating Effect of Information Asymmetry

To elucidate the underlying mechanisms through which the short selling system affects financing constraints, we estimated an intermediary model. The results show that the coefficient for Post on absDA is -8.14×10^{-7} (significant at the 5% level), indicating that the short selling mechanism indeed reduces the degree of information asymmetry. This aligns with theoretical expectations: short selling transactions accelerate the market's absorption of negative information, thereby increasing the informativeness of stock prices^[14]. Additionally, the coefficient for absDA is 2.09×10^{-9} (significant at the 1% level), confirming that the more severe the information asymmetry, the stronger the financing constraints^[15]. However, the key finding is: although short selling “helps” alleviate financing constraints by reducing information asymmetry (the indirect effect is negative), the overall effect of Post in the benchmark regression (0.2925) remains significantly positive, and the direct effect of Post (0.2921) is almost equal to the overall effect. This suggests that information asymmetry is not the dominant channel – the true core mechanism is likely to be the negative signaling effect^[1, 2]: short selling conveys a warning of heightened risk to creditors, leading to tighter bank lending conditions. This negative shock overwhelms the positive effects of improved information, resulting in a net effect of deterioration.

Table 5. Mechanism Test – The Mediating Effect of Information Asymmetry

note	2022.year	omitted	because	of	collinearity			
Fixed-effects	(within)	regression	Number of obs	=	38491			
Group	variable	stkcd num	Number of groups	=	4874			
R-sq	Within	=	0.0208	Obs per group min	=	1		
Between	=	0.0254	avg	=	7.900			
Overall	=	0.0180	max	=	12			
F(16,4873)	=	19						
corr(u _i , X _b)	=	-0.0342	Prob>F	=	0			
(Std. err.)	adjusted	for	4,874	clusters	in	stkcd num)		
Robust								
absDA	Coefficient	std.	err.	t	P> t	95%	conf.	interval
Post	-8.140e+07	1.090e+08	-0.750	0.454	-2.950e+08	1.320e+08		
Lev	5.900e+08	1.100e+08	5.370	0	3.750e+08	8.050e+08		
ROA	-2.080e+09	3.060e+08	-6.790	0	-2.680e+09	-1.480e+09		
Growth	1.610e+08	4.420e+07	3.650	0	7.460e+07	2.480e+08		
Cashflow	-1.040e+08	3.860e+08	-0.270	0.788	-8.610e+08	6.530e+08		
ListAge	6.200e+07	1.320e+07	4.690	0	3.610e+07	8.800e+07		

Note: *** p<0.01, ** p<0.05, * p<0.1; the values in parentheses represent the standard error adjusted for company-level clustering.

(4) Robustness test

1) Replacing the dependent variable: Replace the SA index with the KZ index^[16] and the WW index^[17], and re-run the regression. The Post coefficient remains significantly positive and in

the same direction, indicating that the baseline conclusion is not dependent on a specific measure.

Table 6. Robustness Test: Replacement of the Dependent Variable

note	2022.year	omitted	because	of	collinearity			
Fixed-effects	(within)	regression	Number of obs	=	37415			
					36493			
Group	variable	stkcd num	Number of groups	=	4845			
					4842			
R-sq	Within	=	0.00240	Obs per group min	=	1		
			0.651			1		
Between	=	0.000200	avg	=	7.700			
		0.565			7.500			
Overall	=	0.00190	max	=	12			
		0.658			12			
F(16,4844)	=	0.770						
F (16,4841)	=	1368						
corr(u i,	Xb)	=	-0.0205	Prob>F	=	0.724		
			0.0616			0		
(Std.	err.	adjusted	for	4,845	clusters	in	stkcd num)	
				4842				
Robust								
WW	Coefficient	std.	err.	t	P> t	95%	conf.	interval
KZ								
Post	-0.484	0.549	-0.880	0.378	-1.560	0.592		
	0.0189	0.0225	0.840	0.401	-0.0252	0.0631		
Lev	0.569	0.596	0.950	0.340	-0.600	1.737		
	6.150	0.114	53.76	0	5.925	6.374		
ROA	3.077	2.953	1.040	0.298	-2.713	8.866		
	-2.575	0.151	-17.04	0	-2.872	-2.279		
Growth	-2.430	2.193	-1.110	0.268	-6.728	1.869		
	-0.273	0.0223	-12.25	0	-0.317	-0.229		
Cashflow	-0.688	1.081	-0.640	0.524	-2.808	1.431		
	-12.48	0.147	-85.14	0	-12.77	-12.19		
ListAge	0.0103	0.0189	0.550	0.585	-0.0267	0.0473		
	-0.0521	0.00342	-15.25	0	-0.0588	-0.0454		

2) Placebo Test: Randomly assign treatment groups (simulated 500 times), calculate the distribution of the hypothetical Post coefficient. The results show that the simulated coefficient's mean is close to zero (0.0009), with a standard deviation of 0.0173, and follows a normal distribution centered at 0; the baseline true coefficient of 0.2925 falls at the very right end of the distribution and has never appeared in any of the 500 simulations, with a pseudo p-value less than 0.01. This strongly rejects the null hypothesis that the results are driven by random factors^[18] and confirms the robustness of the baseline conclusions.

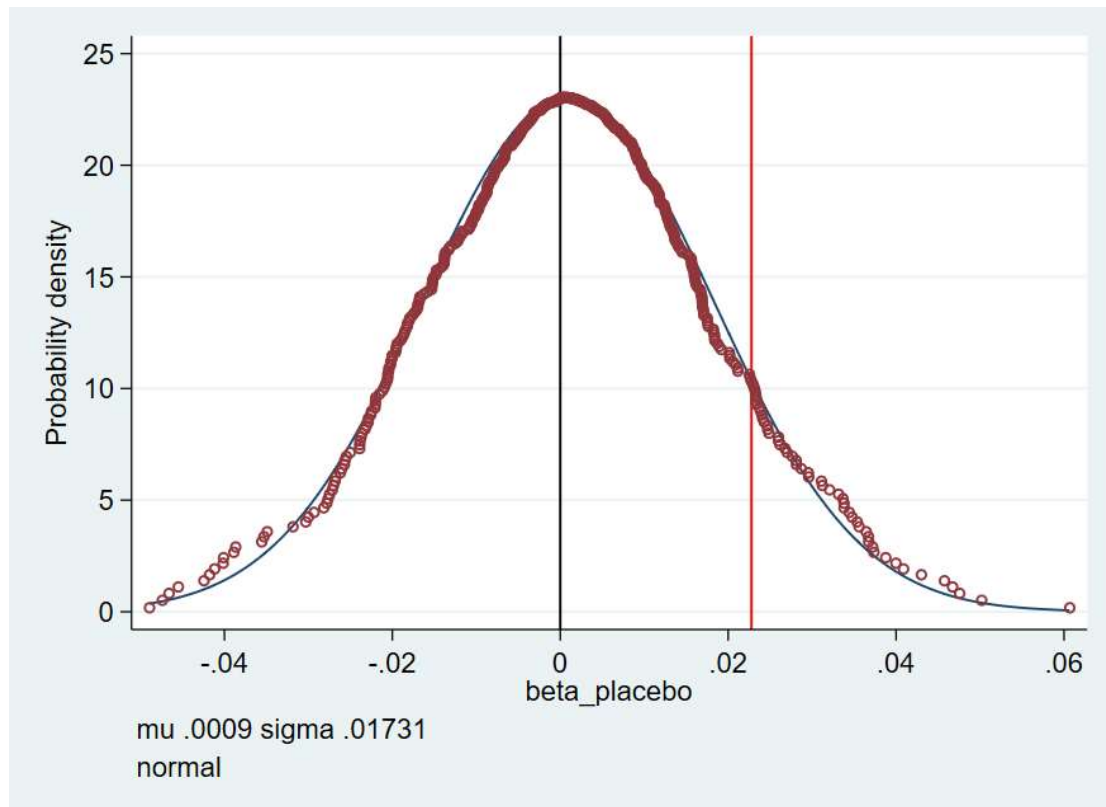


Figure 1. Placebo Test: Distribution of estimated coefficients from randomly assigned treatment groups

Note: The vertical axis represents probability density, and the horizontal axis shows Post coefficient estimates from 500 random simulations; the red vertical line indicates the true coefficient of the reference regression (0.2925); the mean value of the random coefficients is 0.0009 with a standard deviation of 0.0173.

(5) Heterogeneity analysis.

Heterogeneity in property rights characteristics. The sample was divided into two groups: state-owned enterprises and private enterprises. The regression results show that both group's Post coefficients were significantly positive, but the coefficient for private enterprises (0.3431) was significantly higher than that for state-owned enterprises (0.2120). The difference between the groups was significant at the 1% level. This is due to the fact that state-owned enterprises enjoy implicit government guarantees and soft budget constraints^[19], and bank credit decisions are less influenced by short-term market signals. In contrast, private enterprises lack institutional credit backing^[20], making external financiers more sensitive to their short-selling signals, thereby exacerbating the adverse effects.

Heterogeneity in information transparency. Using firm size as an instrumental variable for information transparency^[14] and grouping by annual median values. The Post coefficient for the low-transparency group (0.3582) is significantly higher than that for the high-transparency group (-0.1596). The difference between the groups is statistically significant at the 5% level. This suggests that when a firm's information environment is poor, outsiders find it challenging to independently assess risks through conventional financial reports, thereby relying more heavily on short-selling signals as a basis for decision-making^[4], which amplifies the negative impact of short selling.

Table 7. Heterogeneity Analysis

	(1)	(2)	(3)	(4)
	state-owned enterprise	Private Enterprise	high transparency	Low Transparency
Post	0.2120*** (0.0235)	0.3431*** (0.0220)	0.1596*** (0.0170)	0.1409*** (0.0173)
Lev	1.7360*** (0.1565)	0.8909*** (0.1012)	1.4388*** (0.1055)	0.4712*** (0.0788)
ROA	1.5709*** (0.2046)	1.4114*** (0.1004)	1.6756*** (0.1162)	0.5753*** (0.0807)
Growth	0.1201*** (0.0162)	0.0862*** (0.0127)	0.0536*** (0.0108)	0.0597*** (0.0107)
Cashflow	-0.2427* (0.1225)	-0.1215 (0.0898)	-0.4564*** (0.0857)	-0.0343 (0.0655)
ListAge	0.0000 (.)	0.0000 (.)	0.0000 (.)	0.0000 (.)
_cons	3.8573*** (0.0845)	3.2875*** (0.0429)	4.4352*** (0.0572)	2.7193*** (0.0284)
N	12600	24191	19031	17443

Standard errors in parentheses

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

* p < 0.05, ** p < 0.01, *** p < 0.001

6. Conclusion and Policy Recommendations

(1) Main conclusions

Based on the panel data from 2010-2022, this paper systematically evaluates the impact of short selling mechanism on financing constraints by using the multi-period DID method. The main findings are as follows: First, the introduction of short selling system significantly aggravates corporate financing constraints, supporting the deterioration hypothesis rather than the mitigation hypothesis. Second, information asymmetry, although improved, is not the dominant transmission route; What is decisive is the negative risk signal from short selling, which is amplified by the credit market and ultimately overrides the positive contribution of improved information. Third, this deterioration effect is particularly prominent in private enterprises and groups with low information transparency. Fourth, the above conclusions remain robust after the change of variable measures and placebo testing.

(2) Policy implications

Based on our findings, we make the following policy recommendations:

First, we should prudently advance the reform of the short-selling system and pay attention to its cross-market spillover effects on the credit market. When expanding short selling, regulators

should assess its indirect impact on the credit environment, especially when the credit environment is tight, and need to complement liquidity support and expectation guidance. Second, we should implement differentiated regulation and focus on protecting the financing ecology of private and low-transparent enterprises. For enterprises with significant information asymmetries, it is possible to explore sharing more non-financial information with bank credit systems to mitigate signal misreading.

Third, strengthen policy coordination between capital and credit markets. It is proposed to establish a joint monitoring mechanism between the exchange and the banking and insurance regulatory authorities, and to communicate with the major creditor banks in a timely manner when short-selling activities are unusually active, so as to avoid "market signals" being overly amplified into "credit crunch."

Fourth, improve the basic system for short selling, improve the real-time disclosure of information, and increase the supervision of malicious short selling. At the same time, guide investors to view short selling rationally and reduce its negative labeling effect.

(3) Research limitations and outlook

This paper has the following shortcomings: First, financing constraints have been measured by a variety of indices, but it is still possible to miss certain dimensions; Second, the dynamic effects of short selling on financing constraints, such as long-term trend changes, have not yet been detailed; Third, other potential transmission channels (such as corporate reputation, supply chain financing) need to be further explored; Fourth, institutional changes such as registration reform and new delisting rules in recent years may change the operational environment for short selling, and follow-up studies can verify this in conjunction with new data.

References

- [1] Grullon, G., Michenaud, S., & Weston, J. P. (2015). The real effects of short-selling constraints. *The Review of Financial Studies*, 28(6), 1737–1767.
- [2] Li, X. Y. (2020). Short selling mechanism, capital market pressure and corporate strategic choice. *China Industrial Economics*, (8).
- [3] Gu, N. K., & Zhou, Y. L. (2017). Pre-emptive deterrence of short selling, corporate governance and corporate financing behavior: A quasi-natural experiment based on the margin trading system. *Management World*, (2), 120–134.
- [4] Xu, F., Lü, X., & Zheng, Y. D. (2024). Bank competition, short selling mechanism and corporate financing constraints. *Journal of Financial Research*, (6), 132–150.
- [5] Miller, E. M. (1977). Risk, uncertainty, and divergence of opinion. *The Journal of Finance*, 32(4), 1151–1168.
- [6] Wang, Y. J. (2019). Short-selling mechanism, information disclosure and corporate financing constraints [Doctoral dissertation]. Xiamen University, Xiamen.
- [7] Ho, K., et al. (2022). Short-selling deregulation and corporate bond financing costs. *Journal of Corporate Finance*.
- [8] Chu, J., et al. (2017). Margin trading and corporate credit financing. *Quarterly Journal of Finance*.
- [9] Peng, Z., et al. (2021). Margin trading, deleveraging and capital structure adjustment. *Accounting Research*.
- [10] Gong, G. (2020). Margin trading and capital structure adjustment speed. *International Review of Finance*.
- [11] Huang, J. W., & Gong, G. M. (2019). Margin trading and dynamic adjustment of corporate capital structure. *Journal of Financial Research*.
- [12] Spence, M. (1973). Job market signaling. *Quarterly Journal of Economics*, 87(3), 355–374.

- [13] Diamond, D. W., & Verrecchia, R. E. (1987). Constraints on short-selling and asset price adjustment to private information. *Journal of Financial Economics*, 18(2), 277–311.
- [14] Morck, R., Yeung, B., & Yu, W. (2000). The information content of stock markets: Why do emerging markets have synchronous stock price movements? *Journal of Financial Economics*, 58(1–2), 215–260.
- [15] Hadlock, C. J., & Pierce, J. R. (2010). New evidence on measuring financial constraints: Moving beyond the KZ index. *The Review of Financial Studies*, 23(5), 1909–1940.
- [16] Kaplan, S. N., & Zingales, L. (1997). Do investment-cash flow sensitivities provide useful measures of financing constraints? *The Quarterly Journal of Economics*, 112(1), 169–215.
- [17] Whited, T. M., & Wu, G. (2006). Financial constraints risk. *The Review of Financial Studies*, 19(2), 531–559.
- [18] Chetty, R., Looney, A., & Kroft, K. (2009). Salience and taxation: Theory and evidence. *American Economic Review*, 99(4), 1145–1177.
- [19] Lin, J. Y., Cai, F., & Li, Z. (1998). Competition, policy burdens, and state-owned enterprise reform. *American Economic Review*, 88(2), 422–427.
- [20] Allen, F., Qian, J., & Qian, M. (2005). Law, finance, and economic growth in China. *Journal of Financial Economics*, 77(1), 57–116.