

Exploring the Influence of Short-Selling Mechanisms on Stock Price Fluctuations: An Empirical Study of China's A-Share Market

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ABSTRACT

Leveraging A-share market data spanning from 2016 to 2023, this research employs a difference-in-differences (DID) methodology to investigate how the short-selling mechanism affects stock price volatility. The findings indicate that the short-selling mechanism generally exerts a significant stabilizing influence on stock price volatility across the A-share market. However, this effect is relatively weaker among smaller firms. The conclusions of this study provide references for improving China's securities market trading system and legal framework.

KEYWORDS

Short-selling mechanism; Stock price volatility; A-share market

1 Introduction

1.1 Research Background

Despite the implementation and gradual expansion of the margin trading and short-selling system in China since 2010, the issue of excessive stock price volatility persists and has not been effectively resolved^[1]. The volatility of China's A-share market has become even more severe under the triple impact of the COVID-19 pandemic, the Russia-Ukraine war, and the interest rate hikes by the Federal Reserve^[2]. This study focuses on examining the influence of the short-selling mechanism on stock price volatility, with A-share market data serving as the basis for a comprehensive analysis.

1.2 Research Significance

The short-selling mechanism is crucial to the capital market. However, China's short-selling mechanism has been introduced for a relatively short period, and related research is insufficient. Meanwhile, overseas studies have limited reference value for China.

Drawing on A-share market data, this paper examines the influence of the short-selling mechanism on stock price volatility, thereby contributing to both theoretical and empirical research in this area. Although the short-selling mechanism has ended the "one-way" pattern of China's securities market, the problem of high volatility remains unresolved. Through empirical analysis, this paper proposes suggestions for improving the short-selling mechanism for regulatory authorities' reference.

1.3 Research Methods

Literature Analysis: This paper reviews existing domestic and international research on the short-selling mechanism and its effects on stock price volatility, thereby establishing a foundation for subsequent analysis.

Empirical Analysis: This research employs A-share market data from 2016 to 2023 and applies a difference-in-differences (DID) methodology to explore the impact of the short-selling mechanism on stock price volatility. To ensure the reliability of the results, placebo tests and alternative variable analyses are conducted to verify the robustness of the findings.

Difference-in-Differences (DID) Method: To address the varying timing of policy shocks across different entities, a multi-period difference-in-differences (DID) model is employed. Additionally, parallel trend assessments and placebo analyses are carried out to rigorously evaluate the impact of the policy.

1.4 Research Innovations

This paper selects data from the entire Chinese stock market from a macro perspective, enriching the research on factors influencing A-share market price volatility.

Employing the difference-in-differences (DID) model to examine the influence of the short-selling mechanism on stock price volatility significantly strengthens the robustness of the findings.

2 Literature Review

2.1 The Relationship Between Short-Selling Mechanisms and Stock Price Volatility

2.1.1 Short-Selling Mechanism Reduces Stock Price Volatility

Drawing on data from the Taiwan stock market, Liao Shiguang and Yang Chaogjun utilized Granger causality tests and additional methods to show that the implementation of the short-selling mechanism can significantly reduce stock price volatility^[3]. Hu Songming and Deng Qu discovered a stable long-term relationship between market volatility and the short-selling mechanism, indicating that China's short-selling mechanism has the potential to mitigate stock market volatility^[4]. Using data from ChiNext-listed companies between 2010 and 2021, Li Xiangning identified a significant negative correlation between the short-selling mechanism and the price volatility of ChiNext target stocks^[5]. Pan Wenfu and Tang Jiying investigated the impact of margin trading and short-selling on stock price volatility in a particular industry within the ChiNext market. Their findings revealed that the short-selling mechanism exerts a significant long-term dampening effect on volatility. However, this effect can be mitigated by corporate risk^[6]. Tian Jiamin found that while margin trading and short-selling business has a significant inhibitory effect on stock market volatility, this effect is relatively minor^[7].

2.1.2 Short-Selling Mechanism Exacerbates Stock Price Volatility

Li Shan found that margin trading and short-selling do not significantly affect stock price volatility during periods of market stability or upward trends. However, during market downturns, these mechanisms tend to have a negative impact on stock price volatility. Moreover, stock price volatility can also exert a modest negative influence on the development of margin trading and short-selling^[8]. Wang Lingrui explored the impact of the margin trading and short-selling system on stock price volatility under different market conditions. The study revealed that during stable and volatile market periods, the system does not have a significant effect on stock price volatility^[9]. Xu Huiyuan and Gao Guofang discovered that margin trading and short-selling have divergent effects on the returns of the Shanghai and Shenzhen markets. Specifically, the impact of the short-selling business on the market is relatively modest, indicating that the short-selling mechanism has not yet achieved full effectiveness in China^[10].

3 Research Hypotheses

Hypothesis 1: In the short term, the short-selling mechanism will exacerbate stock price volatility.

Hypothesis 2: In the long term, the short-selling mechanism will suppress stock price volatility.

Hypothesis 3: The short-selling mechanism exerts a less pronounced dampening effect on the stock prices of smaller companies.

4 Methodological Framework

4.1 Data Collection and Sample Determination

This research utilizes data spanning from 2016 to 2023, focusing on A-share listed companies that are neither in the ST category nor part of the financial industry as the study samples. Furthermore, any samples with incomplete data or extreme outliers are removed. The data are obtained from the CSMAR database.

4.2 Variable Specification

4.2.1 Outcome Variable

Referring to the research of Tian Liang^[11], this paper uses the standard deviation as a tool to measure the risk of securities to gauge the level of stock price volatility. Let P_t represent the closing price of the stock at period t , and P_{t-1} represent the closing price at period $t-1$. The stock return R_t at period t is calculated using Equation (4.2). Here, R_t denotes the stock return at period t , and R_e denotes the average return at period t . The formula for measuring stock price volatility is given in Equation (4.3).

$$R_t = \frac{P_t - P_{t-1}}{P_{t-1}} \quad (4.2)$$

$$vola_t = \sqrt{\frac{1}{n-1} \sum_{t=1}^n (R_t - R_e)^2} \quad (4.3)$$

4.2.2 Independent Variable

Referring to the research of Li Xiangning^[5], this paper sets the proxy variable for the short-selling mechanism as DID. If a stock is eligible for short-selling within the research period, DID is set to 1; otherwise, it is set to 0. This variable indicates whether a stock is available for short-selling.

4.2.3 Control Variables

Referring to the studies of Yao Jiajun^[2] and Ling Hao^[12], Table 4-1 lists the main variables and their definitions.

Table 4-1 Variables and Definitions

Variable Category	Variable Label	Symbol for Variable	Variable Description
Dependent Variable	Stock Price Volatility	<u>Vola</u>	Standard deviation of annual stock returns
Independent Variable	Short-Selling Mechanism	DID	Proxy variable for short-selling mechanism; 1 if short-selling is allowed, 0 otherwise
Control Variables	Company Size	size	The logarithmic value of total assets measured at the end of the fiscal year, using the natural logarithm base.
	Debt-to-Asset Ratio	LEV	Ratio of year-end total liabilities to total assets
	Turnover Rate	Turn	Stock trading volume / Total shares outstanding
	Return on Total Assets	ROA	(Net profit of the enterprise / Total assets of the enterprise) × 100%
	Cash Flow Ratio	<u>Cashflow</u>	Net cash flow / Total assets of the enterprise
	Book-to-Market Ratio	BM	Total market value of stocks / Total book value of assets
	Beta Value	<u>Betaval</u>	Annual market Beta value

This paper employs the difference-in-differences (DID) model to assess the effectiveness of the short-selling mechanism in reducing stock price volatility while controlling for factors that may influence volatility. The model is specified as follows:

$$Vola_{it} = \beta_0 + \beta_1 Control_{it} + \beta_2 DID_{it} + Stock_i + Year_t + \varepsilon_{it}$$

The model uses DID_{it} as the dependent variable to denote the fluctuation in stock price of stock i during year t . The primary independent variable, DID_{it} , determines if stock i qualifies for short-selling in year t if DID_{it} equals 1. Conversely, when DID_{it} equals 0, it signifies that stock i is not included in the short-selling target list for year t . Here, $stock_i$ represents the firm-specific fixed effects, while $year_t$ denotes the year-specific fixed effects. The term $\varepsilon_{i,j}$ represents the stochastic fluctuation factor influencing the instability of stock prices, while β stands for the difference-in-differences (DID) estimator, assessing the short-selling mechanism's effect on stock price instability. $Control_{it}$ symbolizes additional factors that could influence fluctuations in stock prices.

5 Empirical Results Analysis

5.1 Regression Results and Analysis

The research utilizes the difference-in-differences (DID) approach to examine the relationship between short-selling strategies and the volatility of target stocks, aiming to test Hypothesis 1. The regression analysis results are presented in Table 5-2. Specifically, Column (1) reports the regression outcomes without control variables and without fixed effects, while Column (2) illustrates the benchmark regression results for this study. In Table 5-2, the primary focus is on the coefficient of the key independent variable, DID. The results in Column (2) demonstrate that the coefficient of DID is negative and statistically significant at the 1% level. This suggests that following the inclusion of stocks in the short-selling pilot program, the volatility of these stocks in the A-share market is significantly reduced. Consequently, Hypothesis 1 posited in this study is supported.

Table 5-2 Differences in Stock Price Volatility Between Short-Selling Target and Non-Target Stocks

	(1)	(2)
	Vola	Vola
DID	0.008 (1.28)	0.011* (1.81)
size		-0.028*** (-2.95)
LEV		0.016*** (4.48)
Turn		29.579*** (6.20)
ROA		0.035*** (2.95)
Cashflow		0.578*** (12.11)
Betavals		0.012** (2.36)
Observations	28718	28718
R^2	0.303	0.343
adj. R^2	0.169	0.217

***, **, and * Specify the significance thresholds as 1%, 5%, and 10%, in that order. The figures within brackets represent t-values. This is also true for the subsequent tables.

5.2 Robustness Test

The annual fluctuation (Swing) in the stock prices of listed companies is employed as an alternative measure of stock price volatility. Given that stock price volatility is influenced not only by the companies' operational conditions but also by the trading status of individual stocks, columns (2) and (3) in Table 5-3 replace the control variables related to the basic trading status of individual stocks to conduct robustness tests. The floating market value of individual stocks (smvosd) is used to replace the company size (size) and the debt-to-asset ratio (LEV) for the tests.

Table 5-3 Variable Substitution Test

Variable Names	(1) (replace Vola)	(2) (replace Size)	(3) (replace LEV)
	Swing	Vola	Vola
DID	-0.041 (-1.62)	0.042*** (6.67)	0.039*** (6.22)
size	-0.080** (-2.57)		0.040*** (3.63)
LEV	0.005 (1.23)	0.014*** (5.34)	
Turn	204.051*** (8.61)	37.557*** (8.91)	42.999*** (8.23)
ROA	0.273*** (2.78)	0.050*** (2.70)	0.055*** (2.71)
Cashflow	0.977*** (12.77)	0.549*** (13.70)	0.549*** (13.27)
Betavals	0.071*** (5.59)	0.012** (2.36)	0.012** (2.38)
smvosd		-0.100*** (-13.79)	-0.119*** (-13.25)
Observations	28,718	28,718	28,718
R-squared	0.332	0.354	0.351
Stkcd FE	Yes	Yes	Yes
Year EF	Yes	Yes	Yes

5.3 Subgroup Analysis

5.3.1 Heterogeneity in Firm Size

This study divides the sample into two categories—large firms and small firms—based on their year-end total assets. The corresponding regression results are shown in Table 5-4. As depicted in Table 5-4, the regression coefficients of the

Swing variable for both large and small firms are statistically significant at the 1% level. This finding indicates that the impact of the short-selling mechanism on stock price volatility is consistent across different firm sizes.

Table 5-4 The Impact of Firm Size on the Differential Short-Selling Mechanism and Stock Price Volatility

Variable Names	(1)Small enterprises	(2)Big enterprises
	Vola	Vola
DID	0.023* (1.88)	-0.010* (-1.65)
size	-0.087*** (-5.35)	-0.014 (-1.22)
LEV	0.012*** (4.62)	0.028*** (2.67)
Turn	22.486*** (5.15)	34.498*** (6.47)
ROA	0.034** (2.43)	-0.046 (-0.77)
Cashflow	0.626*** (12.93)	0.454*** (5.31)
Betavals	0.010** (2.01)	0.007 (0.45)
Observations	14,047	14,286
R-squared	0.401	0.398
Stkcd FE	Yes	Yes
Year EF	Yes	Yes

5.3.2 Heterogeneity in Ownership Nature

The analysis divides the sample into two groups: state-owned enterprises (SOEs) and non-state-owned enterprises (non-SOEs), with the regression results presented in Table 5-5. As illustrated in Table 5-5, the regression coefficients for the Swing variable are statistically significant at the 1% level for both SOEs and non-SOEs. This suggests that the influence of the short-selling mechanism on stock price volatility is consistent, irrespective of whether the firm is state-owned or privately owned.

Table 5-5 The Impact of Ownership Nature on the Short-Selling Mechanism and Stock Price Volatility

Variable Names	(1)SOEs	(2)non-SOEs
	Vola	Vola
DID	-0.020** (-2.20)	0.033*** (4.00)
size	-0.001 (-0.09)	-0.047*** (-4.06)
LEV	0.000 (0.11)	0.017*** (5.46)
Turn	30.496*** (4.69)	27.819*** (6.46)
ROA	-0.007 (-0.53)	0.036** (2.27)
Cashflow	0.350*** (7.03)	0.620*** (13.00)
Betavals	0.046*** (3.12)	0.008 (1.59)
Observations	8,773	19,899
R-squared	0.411	.334
Stkcd FE	Yes	Yes
Year EF	Yes	Yes

6 Research Findings and Policy Suggestions

6.1 Research Findings

The short-selling mechanism significantly suppresses the volatility of A-share stock prices overall, but its effect is weaker for small companies.

6.2 Policy Recommendations

For Regulatory Authorities:(1)Optimize the short-selling mechanism.(2)Strengthen market regulation.(3)Improve laws and regulations.(4)Enhance investor education and protection.

For Market Participants:(1)Institutional investors should use the short-selling mechanism to optimize their investment portfolios.(2)Listed companies should strengthen corporate governance and information disclosure.(3)Securities firms should enhance risk management in short-selling operations.

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