

Short selling and corporate earnings management

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Abstract:

This article empirically tests the impact of short selling mechanism on corporate earnings management level using data from companies other than the financial and real estate industries and ST companies from 2003 to 2023. This article constructs a model and also set multiple control variables. The results of the research show that between short selling and the level of earnings management of enterprises there is a negative correlation, that is, the stronger the short selling mechanism, the lower the level of earnings management of enterprises. At the same time, this study also shows that compared with other regions, in areas with a good legal environment, the negative correlation between short selling mechanism and corporate earnings management level is stronger. The innovation of this article lies in the use of data samples with longer time spans and the addition of annual dummy variables, providing new perspectives and directions for future research. Through this study, we hope to promote the development and improvement of short selling mechanisms, effectively prevent financial fraud caused by excessive earnings management levels of enterprises, and promote the development of the capital market.

Keywords: short selling mechanism, earnings management, double difference model, legal environment

1. Introduction

1.1 Research background

Short selling is a very frequent operation in the capital market, and its impact is not limited to the returns of individual investors, but may also have an impact on the entire market and the operational strategies of enterprises. The existence of short selling mechanism

means that there is uncertainty in the market about the future performance of enterprises, which may put pressure on them to adjust or optimize their external financial reporting through earnings management. At the same time, companies may also use earnings management to cope with potential risks or negative impacts brought by short selling.

Currently, many literature have studied the factors that affect the level of earnings management in com-

panies from various perspectives. However, due to the fact that China's short selling system was only officially implemented in 2010, there is relatively little literature on how short selling affects the level of earnings management of enterprises. Existing scholarship has indeed explored the connection between short selling mechanisms and earnings management behaviors in corporations, there are still many gaps in research that need to be filled. The dynamic relationship between short selling mechanism and corporate earnings management has not been fully studied. Current research mostly focuses on static or short-term effects, lacking exploration of long-term dynamic relationships. Over time, the interactive relationship between short selling mechanisms and corporate earnings management may change, which requires the use of longer time span data and research methods to reveal.

1.2 Research Conclusion and Contribution

This article confirms through empirical research that short selling mechanism is an important factor affecting corporate earnings management. From the perspective of improving the short selling mechanism, it is suggested that by further improving the short selling system, excessive earnings management behavior of enterprises can be effectively suppressed, thereby reducing the risk of financial fraud and promoting the healthy development of the capital market. At the same time, this study can fill the gap in the literature on how short selling affects the level of corporate earnings management, and use a longer time span data sample (2003-2023) to demonstrate the relationship between short selling mechanisms and corporate earnings management over time.

1.3 Research Structure

In terms of research structure, this article first proposes research hypotheses. Secondly, to verify the hypotheses, samples are selected and the sample data is filtered and cleaned. Then, descriptive statistical analysis is conducted on the characteristics of the data. A regression model was subsequently constructed to quantify the association between predictors and outcome variables. Finally, robustness tests are conducted on the regression analysis to draw research conclusions.

2. Literature review and research hypotheses

2.1 Literature review on short selling mechanism

The current situation in China's short selling mechanism is that domestic regulatory penalties are weak, and the short selling mechanism has been gradually implemented since 2007, officially implemented in 2010. In 2023, restrictions on short selling will be further increased, making the short selling mechanism difficult to implement.

This article mainly refers to the literature of short selling and information disclosure: evidence from quasi natural experiments of securities lending, and summarizes and learns from multiple literature. Li Chuntao empirically tested the impact of short selling mechanism on the quality of information disclosure using data from A-share listed companies on the Shenzhen Stock Exchange from 2006 to 2015.^[1]

2.2 Literature Review on Earnings Management

Earnings management is human intervention in financial statement figures, and exceeding the GAAP threshold can be considered as financial fraud. The main motivations for companies to engage in earnings management are as follows: ① Capital market motivation: for listing, issuing shares and rights issues. ② Contract motivation: executives pursue personal interests, positions, and debts. ③ Political motivation: State owned enterprises such as China Railway Construction's sky high hospitality expenses are aimed at appearing less profitable. ④ Tax motivation: Enterprises plan for tax purposes.

The basic theory and research review of earnings management explains what earnings management is and provides direction for subsequent empirical research on earnings management.^[2] I also read relevant literature on factors that affect the level of earnings management in enterprises, such as whether high-quality internal control can inhibit earnings management? —Based on the empirical study of voluntary internal control assurance reports, the article concludes that high-quality internal control can suppress a enterprise's accounting choices of earnings management and real activity earnings management.^[3]

Through reading the literature, it can be seen that scholars are increasingly paying attention to earnings management

research and have diverse perspectives.

2.3 Literature Review on Short Selling Mechanism and Earnings Management

The “survival of the fittest” mechanism in financial markets - a study based on short selling mechanism and earnings management suggests that after the introduction of margin trading and securities lending, companies with high earnings management will become the main targets of short selling, and short selling mechanism will have external governance effects on companies.^[4]

2.4 Research hypothesis

This study refers to the above literature and uses multi time point double difference model to measure short selling. We select company data from the time span of 2003 to 2023 and propose two hypotheses: H1a: the short selling mechanism exacerbates the level of earnings management in enterprises. H1b: The short selling mechanism suppresses the level of earnings management in enterprises. H2a: Compared with other regions, in areas with better legal environment, the negative correlation between short selling mechanism and corporate earnings management level is stronger. H2b: Compared with other regions, in areas with better legal environment, the negative correlation between short selling mechanism and corporate earnings management level is weaker.

This article has a relatively large sample size. At the same time, control variables were selected from the reference literature on earnings management level, and an annual dummy variable was added to better measure the relation-

ship between short selling mechanism and earnings management level, filling the existing literature gap.

3. Research design

3.1 Sampling

This article takes all companies in the stock market from 2003 to 2023 as the research object, and uses company related information from the Guotai An database. This article processed the sample as follows: ① Enterprises in the financial and real estate industries were deleted. ② Enterprises with incomplete financial data were deleted. ③ Enterprises in St were deleted. In addition, this article also performed a 5% Winsor treatment on all continuous variables. Finally, a total of 42354 observations were obtained for the company’s annual data.

3.2 Research model

3.2.1 Measurement of short selling

This article refers to the research methods of Bertrand and Mullainathan, Chu Jian, Fang Junxiong, and Li Chuntao to construct a multi time point double difference model (DID). Define the dummy variables Treat and PostShort as follows: If the company has been included in the securities lending list before, Treat is 1, otherwise it is 0; If the observed year is the year after the company is included in securities lending, the value of PostShort is 1, otherwise it is 0.^[1,5]

3.2.2 Measurement of Earnings Management Level

Refer to the Jones model revised by Dechow (1995).

参考 Dechow (1995) 修正的 Jones 模型。

$$\frac{TA_{i,t}}{A_{i,t-1}} = \beta_0 \frac{1}{A_{i,t-1}} + \beta_1 \frac{\Delta REV_{i,t} - \Delta REC_{i,t}}{A_{i,t-1}} + \beta_2 \left(\frac{PPE_{i,t}}{A_{i,t-1}} \right) + \varepsilon_{i,t} \quad (1)$$

$$\frac{NDA_{i,t}}{A_{i,t-1}} = \hat{\beta}_0 \frac{1}{A_{i,t-1}} + \hat{\beta}_1 \frac{\Delta REV_{i,t} - \Delta REC_{i,t}}{A_{i,t-1}} + \hat{\beta}_2 \left(\frac{PPE_{i,t}}{A_{i,t-1}} \right) \quad (2)$$

$$DA_{i,t} = TA_{i,t} - NDA_{i,t} \quad (3)$$

The operational accrued profit of the company is represented by DA, and the larger its absolute value, the greater the company’s earnings management space and the lower the quality of accounting information.

3.2.3 Modeling

Due to the different establishment dates and listing times of different companies, this article designs to use a multi time point double difference model to empirically test the hypothesis. The model is as follows:

$$DA_{i,t} = \alpha + \beta_1 Treat_{i,t} + \beta_2 PostShort_{i,t} + \beta_3 \sum Year + \delta X_{i,t} + X\epsilon_{i,t}$$

Among them, DA represents manipulative accruals and represents the level of earnings management of the enterprise as the dependent variable; Treat and PostShort are virtual variables generated according to the method described above, serving as explanatory variables and generating the interaction term did (did=Treat * PostShort).

3.3 Variable Explanation

In order to eliminate random errors, multiple control variables were designed in this paper. Can high-quality internal controls suppress earnings management in this article? —An empirical study based on voluntary internal control assurance reports on the selection of control variables, and the addition of relevant control variables on this basis, while removing controls with collinearity or other influences.^[3]

Table 1 Variables and Explanations

Variable type	variable	Variable Declaration
Explained Variable	Earnings Management Level (DA)	Using the Modified Jones Model for Metrology
explanatory variable	Double difference model Treat	dummy variable
	Double difference model PostShort	
control variable	LEV	Asset liability ratio: total liabilities/total assets
	ROE	Roe
	Shrcr1	Equity concentration indicator 1 (%)
	Shrcr4	Equity concentration indicator 4 (%)
	Boardsize	The natural logarithm of the size of the board of directors
	TOP3SumSalary	Total compensation for the top three management positions
	BM	Book to value ratio: the ratio of a company's year-end market value to its book value
	InsInvestorProp	Shareholding ratio of institutional investors (relative to total share capital)
	Age	Listing period

3.4 Descriptive statistics

Table 2 presents descriptive statistics of variables, including mean and maximum/minimum values. The average absolute value of operational accrual profit DA is 0.067, and the maximum value reaches 3.36, indicating that most listed companies have operational accrual profit and a large absolute value. Therefore, most listed companies have surplus management space, further indicating that the low accounting information quality problem caused by

earnings management in listed companies is worth paying attention to. In addition, the mean value of the dummy variable Treat is 0.67, indicating that more than half of the 42354 annual sample data of companies have been included in the short selling pilot program, which is influenced by the short selling mechanism. This also indicates that the proportion of the experimental group and the control group in the sample is relatively consistent, and the conclusions drawn will be more scientifically credible.

Table 2 Descriptive statistics of major variables (sample size: 42354)

Variable	Mean	p50	SD	Min	Max
DA	0.0670	0.0440	0.0840	0	3.360
Treat	0.673	1	0.469	0	1
PostShort	0.347	0	0.476	0	1
did	0.347	0	0.476	0	1

LEV	0.428	0.424	0.201	0.00700	0.998
ROE	0.0160	0.0650	1.250	-186.6	2.324
Shrcr1	34.26	31.94	15.09	0.286	89.99
Shrcr4	57.52	58.18	15.36	1.310	101.2
Boardsize	8.607	9	1.759	0	19
TOP3SumSal~y	14.47	14.49	0.820	9.385	18.58
BM	0.628	0.626	0.252	0.00400	1.636
InsInvesto~p	45.02	47.03	24.51	0	132.6
Age	10.20	9	7.307	1	33

4. Empirical testing

4.1 Correlation analysis

Table 3 Correlation Analysis of Major Variables

	DA	LEV	ROE	Shrcr1	Shrcr4	Boards~e	TOP3Su~y
DA	1						
LEV	0.071***	1					
ROE	-0.069***	-0.097***	1				
Shrcr1	-0.027***	0.040***	0.028***	1			
Shrcr4	-0.020***	-0.090***	0.036***	0.653***	1		
Boardsize	-0.037***	0.158***	0.00400	0.042***	0.041***	1	
TOP3SumSal~y	-0.066***	-0.040***	0.035***	-0.092***	0.061***	-0.027***	1
BM	-0.112***	0.328***	0.00400	0.163***	0.105***	0.173***	-0.014***
InsInvesto~p	-0.00600	0.183***	0.009*	0.302***	0.267***	0.219***	0.028***
Age	-0.011**	0.280***	-0.022***	-0.057***	-0.283***	0.126***	0.130***
	BM	InsInv~p	Age				
BM	1						
InsInvesto~p	0.084***	1					
Age	0.180***	0.230***	1				

Table 3 shows the correlation between each control variable and the dependent variable. From the table, it can be seen that almost all control variables and the dependent variable DA are significantly correlated at the 0.01 level, which proves the reliability and necessity of the control variable selection in this article.

4.2 Parallel trend test

In order to test whether the implementation of short selling mechanism will really affect the earnings management level of enterprises, this article divides the sample into a

treatment group and a control group. The treatment group is a company that has been included in the short selling pilot program, i.e. Treat=1, while the control group is the opposite. At the same time, in terms of graphical representation, due to the different times when different companies began to be affected by the short selling system, this article takes the year when each company was first affected by short selling as the t-th period, with the first n years being the t-n period and the last n years being the t+n period. The test results are shown in Figure 1, and the data passed the parallel trend test. At the same time, draw a parallel

trend test chart (Figure 2) according to the above rules. The confidence interval before the policy starts contains the 0 axis, and from period t+1 onwards, the confidence interval moves away from the 0 axis. The model design is reasonable.

***** Test for 'parallel trend' using the 'time-trend' *****

Test for the null hypothesis 'Ho: d=0' in the following fixed-effect regression

$$y_{it} = a + b*t + c*D + d*(D*t) + f*x + g_t + h_i + \text{error}$$
 where D*t is the interaction between the treatment D and the time variable t

(1) _DT = 0

F(1, 4636) = 0.74
 Prob > F = 0.3909

RESULT: 'Parallel-trend' passed

Figure 1 Parallel Trend Test Results

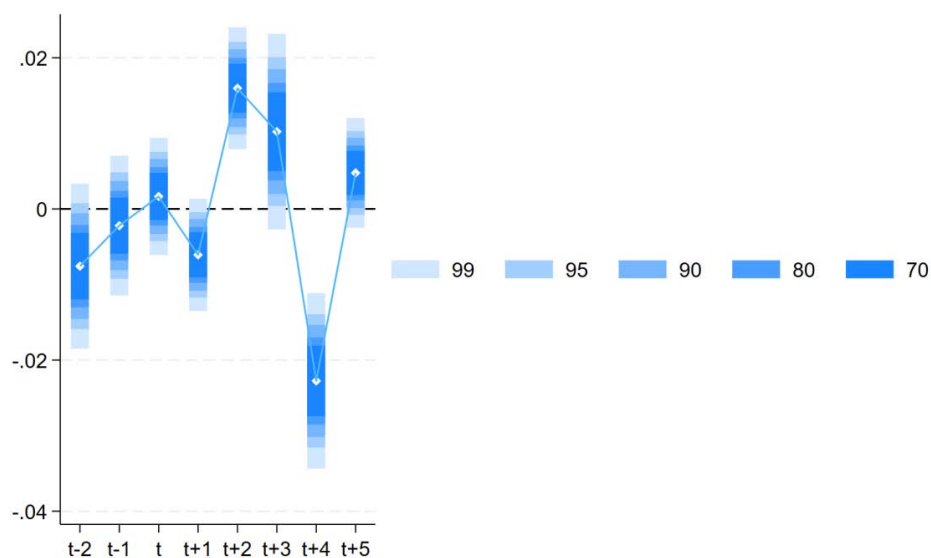


Figure 2 Parallel Trend Test Chart

4.3 Regression analysis

Table 4 Regression analysis of short selling mechanism and earnings management level

	(1)	(2)
	DA	DA
did	-0.004**	-0.003**
	(-2.40)	(-2.13)
LEV		0.060***
		(10.56)
ROE		-0.003***

		(-2.79)
BM		-0.030***
		(-8.07)
Age		-0.004***
		(-3.25)
Shrcr1		-0.012***
		(-4.48)
Shrcr4		0.020***
		(4.99)
Boardsize		-0.005
		(-1.04)
TOP3SumSalary		0.003
		(0.12)
InsInvestorProp		0.001
		(0.80)
_cons	0.068***	0.066
	(103.39)	(1.14)
N	42003	42003
R ²	0.201	0.212
adj. R ²	0.110	0.122

t statistics in parentheses

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

To verify the relationship between short selling mechanism and earnings management level, regression analysis was conducted on the interaction term did of the dummy variables Treat and PostShort, as well as the dependent variable manipulated accrual profit DA. Table 4 shows the regression analysis results, which indicate a negative

correlation between DID and DA, proving that the earnings management level of enterprises is lower under the influence of short selling mechanism. This validates the hypothesis H1b: short selling mechanism suppresses the earnings management level of enterprises.

4.4 Multicollinearity test

Table 5 VIF Variance Inflation Factor

Variable	VIF	1/VIF
Shrcr4	2.170	0.461
Shrcr1	1.930	0.518
Age	1.380	0.726
InsInvesto~p	1.300	0.771
LEV	1.240	0.803
BM	1.200	0.834
Boardsize	1.090	0.917
TOP3SumSal~y	1.080	0.924
Mean	VIF	1.380

From the data in the table above, it can be seen that the VIFs of each variable are all less than 3, indicating no

multicollinearity, and the tolerance (1/VIF) is greater than 0.1, which also proves that there is no obvious collinearity

and the variable selection is reasonable.

5. Robust Test

This article uses the method of replacing the dependent variable to conduct robustness tests on the research conclusions. Replace the original dependent variable manipulated accrual profit DA with Resid, referring to the Patricia M. Dechow and Ilia D. Dichev model, and use working capital accrual to linearly regress the cash flows

from operating activities for the lagged, current, and future periods. If the absolute value of the residual is larger, it indicates that the company has more room for earnings management and a higher level of earnings management.

Figure 3 shows the regression results, which indicate a negative and significant correlation between the interaction term did of the dummy variable and the dependent variable. The conclusion drawn from the above empirical test has passed the robustness test.

Source	SS	df	MS	Number of obs	=	36,722
Model	2.07931868	1	2.07931868	F(1, 36720)	=	45.89
Residual	1663.92008	36,720	.045313728	Prob > F	=	0.0000
				R-squared	=	0.0012
				Adj R-squared	=	0.0012
Total	1665.9994	36,721	.045369119	Root MSE	=	.21287

Resid	Coefficient	Std. err.	t	P> t	[95% conf. interval]	
did	-.0161995	.0023914	-6.77	0.000	-.0208867	-.0115122
_cons	.0855725	.0013422	63.76	0.000	.0829418	.0882031

Figure 3 Regression analysis results with Resid as the dependent variable

6. Research conclusion

This article uses a multi-point double difference model and uses parallel trend testing in order to test the robustness of the model, verifying the hypothesis that the short selling mechanism will inhibit the level of earnings management in enterprises. The conclusion is that selling short will inhibit the enterprise's earnings management. Compared with existing research, this article has made improvements at the time level by selecting a longer time span to obtain a larger sample size, making the research conclusions more universal and reliable.

At the same time, this article also verifies the hypothesis that short selling mechanisms in provinces with good rule of law have a greater impact on corporate earnings management. This article grouped the samples and regressed them separately based on whether the company is located in the developed provinces of Beijing, Shanghai, and Guangdong. The results are shown in Figures 4 and 5. The regression results R^2 of both groups are significant, but the values of the "Beijing, Shanghai, Guangdong" group are larger, indicating better goodness of fit, which is more in line with the conclusion that the short selling mechanism suppresses the level of corporate earnings management.

Source	SS	df	MS	Number of obs	=	7,604
Model	.339525881	1	.339525881	F(1, 7602)	=	48.15
Residual	53.6097421	7,602	.007052058	Prob > F	=	0.0000
				R-squared	=	0.0063
				Adj R-squared	=	0.0062
Total	53.949268	7,603	.007095787	Root MSE	=	.08398

da	Coefficient	Std. err.	t	P> t	[95% conf. interval]	
did	-.0141359	.0020373	-6.94	0.000	-.0181295	-.0101424
_cons	.0757794	.0011828	64.07	0.000	.0734609	.0780998

Figure 4 Regression analysis of companies in Beijing, Shanghai, and Guangdong

Source	SS	df	MS	Number of obs	=	16,077
Model	.425580106	1	.425580106	F(1, 16075)	=	52.24
Residual	130.957248	16,075	.008146641	Prob > F	=	0.0000
				R-squared	=	0.0032
				Adj R-squared	=	0.0032
Total	131.382828	16,076	.008172607	Root MSE	=	.09026

da	Coefficient	Std. err.	t	P> t	[95% conf. interval]	
did	-.0111843	.0015474	-7.23	0.000	-.0142173	-.0081512
_cons	.0729057	.0008533	85.44	0.000	.0712331	.0745783

Figure 5 Regression analysis of companies in other regions

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