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Does Short Selling Increase Speculation? Evidence from the Chinese Stock Market

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Abstract

Using difference-in-differences method, this paper examines the effect of the introduction of short selling in the Chinese stock market on the speculative trading of underlying stocks and makes a further exploration of the cause from the perspective of the changes in shareholder structure. It is found that speculative trading of underlying stocks is significantly decreased after short selling is introduced, and the speculation of stocks with low market value and low idiosyncratic volatility is increased more than those with high market value and high idiosyncratic volatility. Leaving the short selling markets of some small and institutional investors, who prefer to speculative trading, are able to partially and well explain these study results.

Keywords

Short Selling, Speculation, Investor Structure, DID Model

1. Introduction

Financing purchase and securities short-selling are two forms of securities credit transaction. In China, the two transaction forms are also called by a joint name of securities margin trading. Short selling is an indispensable part of the stock markets. In the security markets of western developed countries, short selling mechanism has existed for a long time. However, there had been no short selling mechanism in Chinese security market until the year 2010. Chinese security markets began to develop at the beginning of 1990s[1], it was full of variously speculative trading behaviors and lack of value investments and there was no right

[1]The establishment of Shanghai Security Exchange on November 19th, 1990 and Shenzhen Security Exchange on December 1st, 1990 marks the beginning of the development of Chinese stock market.

timing to launch short selling business in such immature and unsteady markets from the year 1990 to 2009. After the development of 20 years and adequate preparations for security margin trading, on March 31st, 2010, China Securities Regulatory Commission (CSRC) finally launched securities margin trading. It then successively expanded the number of underlying stocks of securities margin trading on December 5th, 2011, January 31st, 2013 and September 16th, 2013, which means short selling mechanism have been formally established.

During the world financial crisis from 2007-2009, western governments banned a series of related policies to prohibit or restrict short-selling due to fear that short selling would increase speculative trading behaviors and cause stock markets shock. Affected by the world financial crisis, Chinese stock market also experienced a long down market lasting for more than four years from August 4th, 2009 to March 12th, 2014[2]. During the period, both Shanghai and Shenzhen Security Exchange simultaneously announced new lists of underlying stocks that are eligible for short selling three times. Generally speaking, the goal of a new financial policy taken by government is to stabilize and prosper financial market. So, curiously, against the tide, does Chinese government's behavior of launching short selling business in the down market increase stock market volatility and speculation? In this paper, we attempt to test the effect of the introduction of short selling on speculative trading. Our goal is to examine whether short selling business increases speculative trading at the individual firm level and make a further effort to explore the cause from the perspective of changes in shareholder structure.

The effect of short selling on stock volatility has been studied extensively. Miller [1] and Diamond and Verrecchia [2] theoretically point out that short selling constraints reduce liquidity and increase volatility. Hong and Stain's [3] theoretical model also demonstrates that short selling constraints will cause stock price crash and aggravates market volatility when the market is in a down trend. Some authors confirm these theoretical results by empirical analysis [4] [5]. It's well-known that the more volatile the market is, the more speculative trading there is. Since short selling reduces market volatility and promotes market stability according to the existing literature, then, does short selling reduce speculative trading of the stock markets? Jarrow [6] claims indirectly that short selling reduces the bubble probability and decreases speculative trading in the mean-variance model. And some literature claim a completely opposite view that short selling is a kind of speculative trading [7] [8], of course, it increases speculative trading. Above all, there is no consistent conclusion. It's necessary to empirically and directly study the relationship between short selling and speculative trading using new data or method.

Luckily, Chinese government launched short selling business, which is a good opportunity for us to research the effect of the introduction of short selling on speculation. In this paper, taking the underlying stocks eligible for short selling

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[2]In this period, the Shanghai A-share index fell from 3478 to 1974. Although it experienced two short rebounds, the overall market returns continued to decline.

in the three expansions of underlying stocks[3] as samples, we use the difference-in-differences (DID) method to directly examine whether the speculative trading of the underlying stocks is increased after short selling is introduced compared to non-underlying stocks. Then, we conduct a further empirical analysis on the changes of shareholding ratio of institutional investors and growth rate of shareholding ratio of per household to explore the cause of the obtained link between short selling and speculation.

There may be two contributions in this paper. At first, we are the first time to directly examine the effect of short selling on the speculation using the natural experiment of gradually expanding the number of margin-trading underlying stocks in China. Second, the endogenous problem is well solved because the difference-in-differences method can better separate the influence of margin-trading on speculation from other systemic economic forces.

The rest of this paper is arranged as follows. Section 2 describes the data and sample and introduces the model used in this paper. Section 3 analyzes the empirical results and makes a further exploration and analysis. At last, we draw a simple conclusion and make a research perspective in Section 4.

2. Model and Sample

2.1. The DID Model

The DID estimator can avoid the endogenous problem caused by taking policy as an explanatory variable and control the heterogeneity of individual stock in the sample and the influence of unobservable systemic factors that change over time. It is popular to evaluate policy effectiveness. In this paper, we employ it to measure the difference of the average change of the speculative trading before and after the expansion of underlying stocks between the underlying stock group (treatment group) and non-underlying stock group (control group). The specific estimation model is defined as follows:

$$Turnover_{i,t} = \beta_0 + \beta_1 D_t + \beta_2 G_i + \beta_3 G_i * D_t + \omega X_{i,t} + \varepsilon_{i,t} \quad (i = 1, \cdots, n; t = 1, 2) \quad (1)$$

where $Turnover_{i,t}$ is a speculation index, which is always used to measure speculation but not liquidity of stocks in Chinese financial literature [9] [10] and represents the turnover rate of stock i at time t. The bigger the turnover rate is, the more the speculative trading is. G_i is a grouping dummy variable, and it equals to 1 if stock i belongs to treatment group and it equal to 0 if stock i belongs to control group. t is a time variable, and $t = 1$ represents the time before the date when short selling business started while $t = 2$ represents the time after the date. D_t is an experimental period dummy variable, $D_t = 0$ if $t = 1$ while $D_t = 1$ if $t = 2$. $X_{i,t}$ is a serious of control variables such as market

[3]On December 5th, 2011, Shanghai and Shenzhen Security Exchange respectively announced two new lists of underlying stocks which are eligible for short selling. Because it increased the number of underlying stocks of short selling, the government called it as an expansion of underlying stocks. Then, on January 31st and September 16th, 2013, the two Exchanges successively announced another new underlying stock lists. So, we call the three announcement events as three expansions of underlying stocks or three expansions in this paper.

value of company in circulation, idiosyncratic volatility and stock exchange and so on.

The coefficient β_2 on the D_t measures the difference on speculative trading between treatment and control stock groups before introduction of short selling. And $\beta_2 + \beta_3$ measure the speculative trading difference between the two groups after introduction, including difference before the introduction and policy effect. So the coefficient β_3 is the real DID estimator, which measures the disposal or policy effect of short selling business. If the sign of β_3 is significant and negative, it shows that short selling business reduces the speculative trading of underlying stocks compared to non-underlying stocks. If it is not significantly negative, it shows that the speculative trading isn't obviously decreased or even increased.

2.2. Data and Sample

The daily data about turnover rate and Fama-French three factors (including market factor, size factor and book-market ratio factor) used in calculating idiosyncratic volatility are from the Chinese Stock Market and Accounting Research (CSMAR) database, and quarterly data on institutional investor shareholding ratio and growth rate of shareholding ratio of per household are from WIND database. In order to get the final sample, we use the following filters. First, we exclude the stocks which belong to the component stocks of index options and futures. Because Chinese government successively launched options and futures after the year 2010[4], which also have impact on the speculative trading of the underlying stocks. In particular, 90 stocks which are eligible for short selling on March 31th, 2010 are excluded. All 90 stocks are the component stocks of Shanghai-Shenzhen 300 Index Futures that were launched on April 16th, 2010. Second, we drop these stocks, which are excluded by Shanghai or Shenzhen Security Exchange from the underlying stock lists because of withdrawal warning, listing termination or asset size without reaching requirements during the sample period. Finally, these stocks are excluded whose observations are less than half of the number of trading days during the sample period.

In this paper, we apply the DID method to empirically test the impact of the introduction of short selling on the speculative trading of stocks. In DID estimation, the samples of treatment group and control group should be homogeneous. According to the rules of selecting underlying stocks, the stocks successively appearing in the lists of underlying stocks are closest to homogeneity. So we choose the successively published underlying stocks of lists respectively as treatment and control stocks. For example, if we choose the stocks eligible for short selling in December 2011 as treatment group stocks, then the stocks of lists announced in January 2013 are naturally chosen as the control group stocks. The samples of the three expansions of underlying stocks are shown in Table 1.

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[4]For example, Shanghai-Shenzhen 300 Index Futures were listed and traded in the market on April 16th, 2010.

Table 1. Samples of the three expansions of underlying stocks.

	Expansion Date	Stock Number in Treatment Group	Stock Number in Control Group	Sample Period
First Expansion	Dec. 5, 2011	192	240	Dec. 4, 2010-Dec. 4, 2012
Second Expansion	Jan. 31, 2013	261	172	Jul. 4, 2012-Aug. 31, 2013
Third Expansion	Sep. 16, 2013	172	180	Feb. 1, 2013-Apr. 30, 2014

3. Empirical Analysis

In this section, we conduct a deep and comprehensive analysis on the influence of the introduction of short selling on the speculative trading based on the DID method. We analyze the three expansions of underlying stocks respectively because the sample of DID estimation should own simultaneous nature[5].

3.1. Analysis on the Statistical Results of Average Turnover Rates

Table 2 shows the statistical results of average turnover rates in treatment and control groups before and after the three expansions of underlying stocks. From the distribution of the average turnover rates in the first expansion of underlying stocks, we can see that the average turnover rate before expansion is bigger than that after expansion in both treatment and control group, and the difference of average turnover rates between before and after the first expansion in treatment group is much bigger than that in control group. The average turnover rate in treatment group is 1.49 before expansion and 0.95 after expansion. It is decreased by 36.2%. But the average turnover rate in control group is only decreased by 9.1%, which is obviously smaller than 36.2%. This means that speculative trading in treatment group is decreased more than that in control group. In the second and third expansions of underlying stocks, it is easy to see that the magnitude of the average turnover rate is decreased in treatment group but increased in control group after expansions, which means the speculative trading in the treatment is decreased but increased in control group. All of these initially indicate that short selling business reduces the speculation of treatment group compared to control group.

3.2. Analysis on the Results of DID Test for Average Turnover Rates

In this subsection, we conduct DID tests for the samples of the three expansions of underlying stocks respectively to examine the influence of short selling business on the speculative trading of underlying stocks. Table 3 reports the results of DID test for average turnover rates. As Table 3 shows, the β_3 coefficients are −0.49, −1.88 and −0.93, respectively for the first, second and third expansion samples, all of which are negative at significant level of 1%. This indicates that the average turnover rates for the treatment groups are decreased significantly compared to the control groups after the short selling mechanism is introduced.

[5]Simultaneous nature means the stocks in treatment group should be eligible for short selling at the same time in a DID estimation.

Table 2. Statistics results of average turnover rates. T means the treatment group, and C means the control group. Before means the time before the expansion date of underlying stocks, and after means the time after the expansion date.

		First Expansion		Second Expansion		Third Expansion	
		Before	After	Before	After	Before	After
	Mean	1.49	0.95	2.25	2.06	2.86	2.28
	Median	1.19	0.79	1.57	1.63	2.23	1.84
T	Max	7.88	4.13	16.34	9.17	15.33	10.24
	Min	0.08	0.05	0.09	0.13	0.12	0.20
	Std. Error	1.07	0.67	2.29	1.61	2.22	1.55
	Mean	1.93	1.75	1.55	2.83	1.69	1.90
	Median	1.61	1.43	1.04	2.24	1.29	1.47
C	Max	6.82	9.41	21.73	15.20	12.45	13.01
	Min	0.12	0.06	0.03	0.06	0.07	0.09
	Std. Error	1.36	1.39	2.11	2.23	1.53	1.82

Table 3. Results of DID tests for average turnover rates. ***, ** and * represent 1%, 5% and 10% significant level respectively. T means the treatment group, and C means the control group. Before means the period before the expansion date of underlying stocks, and after means the period after the expansion date.

		First Expansion	Second Expansion	Third Expansion
	C	21.88	43.43	42.32
	T	22.09	44.94	43.91
Before	β_2	0.20*	1.52***	1.59***
	Std. Error	(0.11)	(0.17)	(0.17)
	C	21.28	44.71	42.81
	T	21.00	44.35	43.47
After	$\beta_2 + \beta_3$	−0.28***	−0.36**	0.66***
	Std. Error	(0.09)	(0.17)	(0.15)
	β_3	−0.49***	−1.88***	−0.93***
	Std. Error	(0.14)	(0.25)	(0.22)
	R^2	0.28	0.34	0.39

That's to say, the introduction of short selling business reduces the speculative trading of underlying stocks.

We then conduct DID tests for low and high market value portfolios respectively. First we put all the treatment group stocks into two portfolios of high and low market value. We obtain the median of the market values of all the treatment group stocks before they are eligible for short selling. If the market value of the stock in treatment group is smaller than median, it is classified into the low market value portfolio, otherwise classified into the high portfolio. Then we

conduct a DID test using low (high) portfolio and the corresponding control group. Table 4 reports the results of DID tests for low and high market value portfolios for three expansions of underlying stocks.

From Table 4, it's not hard to see that the absolute values of β_3 coefficients for the low market value portfolios are much bigger than those for the corresponding high portfolios for all the three expansions. It indicates that the average turnover rates for low market value portfolio stocks are decreased more significantly than those for high portfolio stocks compared to the control group stocks. Namely, speculative trading of underlying stocks with low market value is decreased more than that with high market value after the introduction of short selling.

We also conduct DID tests for low and high idiosyncratic volatility portfolios respectively. We obtain the low and high idiosyncratic volatility portfolios by the same method as above. Table 5 shows the DID test results for low and high idiosyncratic volatility portfolios for three expansion of underlying stocks. As shown in Table 5, the absolute values of β_3 coefficients for low idiosyncratic volatility portfolios are much bigger than those for corresponding high portfolios. It indicates that the average turnover rates of the low idiosyncratic volatility portfolio stocks are decreased more than those of the high portfolio stocks compared to the control group stocks. That's to say, speculative trading of underlying stocks with low idiosyncratic volatility is decreased more than that with high idiosyncratic volatility after short selling is introduced.

Above all, we can draw a conclusion that the introduction of short selling business reduces the speculative trading of underlying stocks. Notably, the spe-

Table 4. Results of DID tests for low and high market value portfolios. P^{MVL} represents the low market value portfolios and P^{MVH} represents the high market value portfolios. ***, ** and * represent 1%, 5% and 10% significant level respectively.

		First Expansion	Second Expansion	Third Expansion
P^{MVL}	β_3	−0.69***	−2.37***	−0.80***
	Std. Error	(0.18)	(0.33)	(0.31)
P^{MVH}	β_3	−0.36**	−1.40***	−0.63***
	Std. Error	(0.16)	(0.24)	(0.21)

Table 5. Results of DID tests for low and high idiosyncratic volatility portfolios. P^{IVL} represents the low market value portfolios and P^{IVH} represents the high market value portfolios. ***, ** and * represent 1%, 5% and 10% significant level respectively.

		First Expansion	Second Expansion	Third Expansion
P^{IVL}	β_3	−0.55***	−1.97***	−0.14**
	Std. Error	(0.17)	(0.31)	(0.27)
P^{IVH}	β_3	−0.47***	−1.81***	−1.22***
	Std. Error	(0.18)	(0.28)	(0.28)

culative trading of underlying stocks with low market value and low idiosyncratic volatility is decreased more than these with high market value and high idiosyncratic volatility respectively.

3.3. Robustness Checks

In the subsection, we test the effect of the introduction of short selling business on the speculation by using subsamples of the samples in Section 3.2. Similarly, we still apply DID method. Table 6 reports the results of DID tests for turnover rates for different subsamples of the three expansions of underlying stocks. It's not hard to see that the results shown in Table 6 are similar to the results shown in Table 3. The β_3 coefficients are all significantly negative for all the subsamples, which also demonstrates that the introduction of short selling business reduces the speculative trading of underlying stocks.

4. Further Analysis

According to Section 3, it's obtained that the speculative trading of underlying stocks is decreased after the introduction of short selling mechanism. Specially, speculative trading of stocks with low market value and low idiosyncratic volatility are decreased more than those with high market value and high idiosyncratic volatility respectively. In this section, from the aspect of the changes in shareholder structure, we attempt to explore the cause of such results.

In this paper, we divide investors into three kinds: small individual investors, median and large individual investors and institutional investors. In Chinese stock market, it's well known that institutional and small investors are mainly

Table 6. Results of DID tests on turnover ratios for different subsamples. ***, ** and * represent 1%, 5% and 10% significant level respectively.

Panel A First Expansion		
Sample period	2011.9.4-2012.3.4	2011.5.4-2012.6.4
β_3	−0.28**	−0.13*
Std. Error	(0.14)	(0.51)
R^2	0.26	0.21
Panel B Second Expansion		
Sample period	2012.11.1-2013.4.30	2012.9.4-2013.6.25
β_3	−1.15***	−1.53***
Std. Error	(0.27)	(0.26)
R^2	0.30	0.32
Panel C Third Expansion		
Sample period	2013.6.1-2014.1.31	2013.3.12-2014.3.12
β_3	−1.35***	−0.96***
Std. Error	(0.28)	(0.23)
R^2	0.35	0.37

inclined to speculative trading. Small individual investors are noise traders, and institutional investors trade based on private information. Due to the unavailability of numbers of shares each shareholder hold, we analyze the changes in shareholder structure indirectly by analyzing the differences of shareholding ratio of institutional investor and the growth rate of shareholding ratio of per household before and after short selling business is introduced between treatment and control group using DID method.

The DID model is designed as follows:

$$GrowthRate_{i,t}\left(InstRatio_{i,t}\right) = \beta_0 + \beta_1 D_t + \beta_2 G_i + \beta_3 G_i * D_t + \varepsilon_{i,t} \quad \left(i = 1, \cdots, n; t = 1, 2\right) (2)$$

where *GrowthRate* is the growth rate of shareholding ratio of per household, and shareholding ratio of per household means the average ratio of shares held by each shareholder to all circulating shares of the stock. *InstRatio* is the shareholding ratio of institutional investor, which means ratio of shares held by institutional investors to all circulating shares of the stock. Table 7 shows the results of the DID estimations on variables of *GrowthRate* and *InstRatio* for three expansions of underlying stocks.

As shown in Table 7, the β_3 coefficients are all significantly positive in the level of 1% on the DID tests for *GrowthRate* and all significantly negative at least in the level of 5% on the DID tests for *InstRatio* for three expansions of underlying stocks. It means that the shareholding ratios of institutional investors are decreased and the growth rates of per household shareholding ratio are increased after the introduction of short selling. So we can infer that some institutional and small investors who tend to speculative trading leave but median and large investors join the underlying stock market after the short selling business is introduced. That's to say, the leaving of speculative traders causes the decreases of speculative trading of underlying stocks.

In order to demonstrate why speculative trading of stocks with low market value and low idiosyncratic volatility are decreased more than these with high market value and high idiosyncratic volatility respectively, we also conduct DID tests respectively for low and high market value portfolios and for low and high idiosyncratic volatility portfolios on *GrowthRate* and *InstRatio*. Table 8 reports the results of DID tests for low and high market value portfolios. It's easy to obtain that the shareholding ratios of institutional investors for high market value portfolios are all decreased more than those for low portfolios, and the growth

Table 7. Results of DID test on *GrowthRate* and *InstRatio*. ***, ** and * represent 1%, 5% and 10% significant level respectively.

	First Expansion		Second Expansion		Third Expansion	
	GrowthRate	*InstRatio*	*GrowthRate*	*InstRatio*	*GrowthRate*	*InstRatio*
β_3	4.28***	−2.99*	5.15***	−3.58*	3.97***	−5.60**
Std. Error	(0.91)	(1.10)	(1.32)	(1.78)	(1.32)	(2.38)
R^2	0.03	0.02	0.02	0.02	0.02	0.03

Table 8. Results of DID test on *GrowthRate* and *InstRatio* for the high and low market value portfolios. P^{MVL} represents the low market value portfolios and P^{MVH} represents the high market value portfolios. ***, ** and * represent 1%, 5% and 10% significant level respectively.

		First Expansion		Second Expansion		Third Expansion	
		GrowthRate	*InstRatio*	*GrowthRate*	*InstRatio*	*GrowthRate*	*InstRatio*
	β_3	5.11***	−2.47*	8.28***	−3.46*	3.74**	−4.82*
P^{MVL}	Std. Error	(1.05)	(0.78)	(1.53)	(1.98)	(1.56)	(2.28)
	R^2	0.03	0.04	0.06	0.01	0.01	0.03
	β_3	3.45***	−3.52**	2.54	−3.62*	2.17	−6.36**
P^{MVH}	Std. Error	(1.16)	(1.15)	(1.64)	(2.07)	(1.68)	(3.57)
	R^2	0.03	0.10	0.02	0.07	0.01	0.02

rates of shareholding ratio of per household for low portfolios are all increased more than those for high portfolios for three expansions of underlying stocks from Table 8. We all know that small investors prefer to trade low market value stocks due to the limitation of fund of their own. They worry that the introduction of short selling will increase their losses, so they sell their stocks which are eligible for short selling.

Table 9 shows the results of DID tests for low and high idiosyncratic volatility portfolios. We can see that the shareholding ratios of institutional investors for low idiosyncratic volatility portfolios are all decreased more than those for high portfolios and the growth rates of per household shareholding ratio for the low portfolios are all increased more than those for the high portfolios for three expansions of underlying stocks from Table 9. As we know, institutional investors possess more private information and prefer to invest stocks with high idiosyncratic volatility. So they sell their low idiosyncratic volatility stocks after the introduction of the short selling in order to earn more interest.

According to the results and analysis of Table 8 and Table 9, some small investors sell their underlying stocks with low market value and some institutional investors sell these stocks with low idiosyncratic volatility after short selling business is introduced. Therefore, due to their leaving, the speculative trading of underlying stocks with low market value and low idiosyncratic volatility is decreased more than that with high market value and high idiosyncratic volatility.

5. Conclusion and Perspective

In this paper, we examine the effect of the introduction of short selling on the speculative trading of underlying stocks and explore the cause from the perspective of the changes in shareholder structure using DID method. We find that the introduction of short selling decreases the speculative trading of underlying stocks. In particular, speculative trading of stocks with low market value and low idiosyncratic volatility are decreased more than those with high market value and high idiosyncratic volatility respectively. According to the further DID re-

Table 9. Results of DID test on *GrowthRate* and *InstRatio* for the high and low idiosyncratic volatility portfolios. P^{IVL} represents the low market value portfolios and P^{IVH} represents the high market value portfolios. ***, ** and * represent 1%, 5% and 10% significant level respectively.

		First Expansion		Second Expansion		Third Expansion	
		GrowthRate	*InstRatio*	*GrowthRate*	*InstRatio*	*GrowthRate*	*InstRatio*
	β_3	4.39***	−3.45*	6.13***	−3.99*	3.09*	−6.07**
P^{IVL}	Std. Error	(1.06)	(1.35)	(1.54)	(1.15)	(1.70)	(2.20)
	R^2	0.03	0.03	0.02	0.03	0.05	0.02
	β_3	4.17***	−2.54*	4.50***	−3.13	2.82*	−5.12
P^{IVH}	Std. Error	(1.16)	(0.75)	(1.66)	(1.88)	(1.54)	(3.29)
	R^2	0.02	0.02	0.03	0.01	0.01	0.02

search and analysis on the shareholding ratio of institutional investor and the growth rate of shareholding ratio of per household, we find that a part of small and institutional investors' leaving from the underlying stock market maybe one cause of these results.

In this paper, it's useful and effective to use turnover rate as speculative index to research the effect of the introduction of short selling on speculative trading. However, there are still some unsolved problems that need further study. For example, it's also very interesting and meaningful to directly study the changes in concrete speculative behaviors such as first buy low then sell high, policy speculation and private information speculation and so on before and after short selling is introduced in the future research.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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