The impact of margin trading and short selling on the investment efficiency. Evidence from China

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Abstract. We use a quasi-natural experiment of the introduction of margin trading and short selling in China. We investigate the impact of margin trading and short selling on the investment efficiency. The results show that margin trading and short selling can improve the investment efficiency of listed firms.The further group regressions show that margin trading and short selling can effectively alleviate over-investment but have no effect on the under-investment problem.

Keywords: margin trading;short selling;investment efficiency.

1. Introduction

Based on the introduction of margin trading and short selling in China,We exam how margin trading and short selling affects investment efficiency of listed firms. China's margin trading and short selling started late. The institutional background and market environment in China are very different from those of developed countries, so the empirical results of foreign literature may not necessarily be applicable to Chinese firms. Therefore,we select the data of A-share listed firms in China from 2009 to 2010, and use a quasi-natural experiment of the introduction of margin trading and short selling in China to test the effects. Using a difference-in-differences(DiD) approach, we find that the introduction of margin trading and short selling in China can improve investment efficiency of listed firms. Further group regression results show that compared with control firms, the firms that are eligible for margin trading and short selling significantly reduce over investment.

Investment has always been the basic driving force of the country's economic development. Investment activities can realize resource allocation, put production factors into the most needed sectors, avoid wasting resources, and also promote enterprises to strengthen management and reduce costs. From the micro level, investment activities are an important part of enterprise income sources. How to invest reasonably becomes a mandatory course for every enterprise, which is related to the survival and development of enterprises. For a long time, people differentiate between financing and investment. People pay more attention to financing, but think less about how to invest, resulting in the widespread existence of inefficient investment in many firms. The impact factors and improvement solutions of investment efficiency have also become a topic of research by scholars.

Margin trading and short selling is an important securities trading mechanism in the stock market. Investors can borrow funds or securities from a securities company by paying a certain amount of margin, and then trade the securities to obtain greater returns. This type of securities trading has a leverage effect. If investors can correctly judge the trend of the stock price, they can use less capital to obtain greater returns. However, if investors make a wrong prediction, they will take bigger losses.

In the traditional stock exchange market, investors who are positive about the stock market can buy the corresponding stocks and wait for the price to rise.But investors with a negative attitude can only exit the market.This trading system allows investors to participate in the market through short selling, broadening the ways of trading in the stock market.

Margin trading and short selling has been commonly implemented in overseas markets for a long time. Many developed capital markets have carried out this business, which is more mature and has a large trading scale. On March 31, 2010, the SSE and the SZSE opened the margin trading and short selling trading system. This has filled the gap in the short-selling mechanism in China's

securities market. This also marked China's entry into the era of bilateral market. China gradually liberalized the scope of underlying stocks that could participate in margin trading. At the beginning of the trial period, only 90 underlying stocks and 6 brokerages were qualified to conduct the business. In 2019, the number of underlying stocks has increased to 1,600, and the scale of trading has also been gradually expanded. This trading mechanism has become an important part of the securities market. The impact of this mechanism on the real economy has become a hot topic of discussion. Scholars continuously study its economic consequences from different perspectives.

Margin trading and short selling is likely to alleviate the inefficient investment for two main reasons. First, margin trading and short selling may solve the agency problem between shareholders and managers. This is the first time that short selling has been introduced into China's securities market, enabling investors to profit from short selling. Short selling is closely related to negative corporate news. In addition, the entry threshold for short selling in China is high. The investors need to pay a certain amount of guarantee which makes the investor's transaction costs higher. As a result, investors have stronger incentives to dig for real and reliable negative information. If the short selling operation causes a wave of stock selling, the share price will fall sharply and the interests of shareholders will suffer. Shareholders may supervise managers more strictly to avoid share price collapse, which in turn reduces opportunistic behavior of managers and improve investment efficiency. Second, margin trading may alleviate the information asymmetry problem. Short selling investors sell at a high price and recover at a low price to profit from the buy-sell price difference. In order to anticipate the possibility of stock decline, Short selling investors need to capture as much negative information as possible. Most investors who engage in short selling are highly capable and financially strong. Their ability to collect and analyze negative information is higher than ordinary investors. This allows various types of information about the firms to be better reflected in the stock price. As an external constraint mechanism, margin training and short selling motivates firms to improve their investment efficiency and reduce inefficient investment.

Our study contributes to the emerging literature in the following aspects. First, based on the landmark event of introducing margin training and short selling, we study its impact on investment efficiency.We enrich the literature on the effects of the margin training and short selling. Second, we explore the factors influencing the investment efficiency of firms and expand the research literature on investment efficiency.We use data from listed firms to test empirically and draw conclusions that are consistent with China's listed firms based on the special institutional background. Third, we provide a more direct observation of the consequences of policy implementation. It can provide direction for the government departments to improve the policy.

2. Related Literature

2.1 Research about margin trading and short selling

Researches on margin trading and short selling can be divided into two main areas: the impact on the capital market and corporate governance. The impacts on the capital market broadly include improving market efficiency, increasing the information content of stock prices, and improving pricing efficiency. Chang et al.(2014) shown that the introduction of margin trading and short selling can improve the stock price efficiency. Qing Ye et al.(2020) pointed out that leveraged trading can improve the trading liquidity for relevant stocks.

The other aspect studies are about the impact of margin trading and short selling on corporate governance. Prior studies found that short selling can reduce information asymmetry and corporate misconduct. Jiaoliang Jiang(2022)asserted that short selling can effectively constrain controlling shareholder tunneling,and then decrease the corporate diversification.

2.2 Hypothesis development

Due to a variety of factors, inefficient investments are common among listed firms in China. Overinvestment and underinvestment are two specific forms of inefficient investment. Both of them

increase the opportunity cost of existing decisions. The existing literature generally explains the causes of inefficient investment from two aspects, including agency theory and information asymmetry theory. The conflicts between shareholders and managers hamper making the right investment decisions. Managers can earn a personal benefit from inefficient investment. There also exit agency problems between controlling shareholders and minority investors. Controlling shareholders have incentives to expropriate resources from minority investors. Controlling shareholders may choose to invest in projects with negative net present value, instead of making dividends.(Alessandra Guariglia et al,2016)

Prior research has observed that short selling can track a firm's discretionary accruals and help detect financial misrepresentation. Short selling can also limit firms' incentives to manipulate or misrepresent earnings. Short sellers have stronger incentive to uncover negative information about firms, and thence help decrease information asymmetry(Fang et al., 2016). Prior studies have found that short selling can act as a disciplining mechanism. Investors short sell based on the firms' negative information. If the short selling operation triggers a massive stock sell-off in the market, the share price will fall sharply and cause damage to shareholders' interests. Shareholders will reduce corporate misconduct due to the downward pressure from short selling(Jiefei Yang et al,2023).Short selling is helpful to mitigate the agency problems. After the firms being eligible for margin trading and short selling, managers will face stricter shareholders' supervision. And managers will reduce opportunistic behaviors and improve the investment efficiency.

3. Research Design

3.1 Data

We use a difference-in-differences model to test the hypothesis. The model requires at least one year of data before and after the implementation of the policy. So we select the data of A-share listed firms in Shanghai and Shenzhen Stock Exchanges from 2009 to 2020. At the same time, We process the data as follows: (1) exclude ST or ST* listed firms; (2) exclude listed firms in the financial industry; (3) exclude listed firms with missing financial data during the sample period; (4) in order to eliminate the influence of outliers on the regression results, all continuous variables used in this paper are processed at the 1% level winsorize treatment.

The corporate financial data and market data used in the research process were partially obtained from the CSMAR database.The data about the securities that are eligible for margin trading and short selling was downloaded from the official websites of the Shanghai and Shenzhen Stock Exchanges and compiled manually.

3.2 Methodology

Richardson (2006) was the first to construct a measure of investment efficiency. Subsequently, according to the actual situation in China, many scholars have made necessary amendments to the model, and the amended model is as follows:

$$
\begin{aligned}
\mathrm{Invest}_{i,t} = {} & \beta_0 + \beta_1\mathrm{Invest}_{i,t-1} + \beta_2\mathrm{Growth}_{i,t-1} + \beta_3\mathrm{Lev}_{i,t-1} + \beta_4\mathrm{Cash}_{i,t-1} + \beta_5\mathrm{Age}_{i,t-1} \\
& + \beta_6\mathrm{Size}_{i,t-1} + \beta_7\mathrm{Ret}_{i,t-1} + \sum \beta_8\mathrm{Industry} + \sum \beta_9\mathrm{Year} \\
& + \varepsilon_{it}\,, \qquad\qquad\qquad\qquad\qquad\qquad （1）
\end{aligned}
$$

Where Invest $_{i,t}$ is the investment scale in year t, Invest $_{i,t\text{-}1}$ is the investment scale in year t-1, Growth i,t-1 is the growth rate of main business revenue in year t-1, Levi,t-1 is the ratio of liabilities to assets in year t-1, Cash i,t-1 is the cash scaled by total assets in year t-1, Age i,t-1 is the number of years between year t-1 and the year when the firm is listed, Size i,t-1 is the natural logarithm of the firm's total assets in year t-1,Ret i,t-1 is the annual stock return in year t-1. We also control for alliance industry effects and year effects. We measure investment efficiency (IE) by the absolute value of residuals from Equation (1). It means the difference between the actual investment scale

and the estimated theoretical optimal investment scale. If the residual is over 0, it means over investment; if the residual is less than 0, it means under investment. In short, a greater value of the absolute value of the residual indicates lower investment efficiency.

The margin trading and short selling is gradually implemented in China, and the number of underlying stocks are gradually expanded.This provides a good quasi-natural experiment that divides the sample into treatment and control groups. So we adopt a difference-in-differences model to test the impact of the implementation of the margin trading and short selling on the investment efficiency of listed firms. So we estimate the following model:

$$IE_{i,t} = \beta_0 + \beta_1 List_i \times Post_t + Controls_{i,t-1} + IndustryFixedEffects + YearFixedEffects + \varepsilon_{it} \qquad (2)$$

The variable $List_i$ is a indicator variable that is equal to 1 for the underlying securities and 0 otherwise. The variable $Post_t$ is a indicator variable that is equal to 1 for the period after the firms being eligible for margin trading and 0 otherwise. Besides,we control for a variety of factors that could influence investment efficiency. Finally, we control for industry effects and year effects. If the coefficient on $List_i \times Post_t$ is significantly negative, our hypothesis is tested. Margin trading and short selling can improve the investment efficiency of listed firms.

Table 1. Variable Definition

Variable	Definition
IE	The firm's investment efficiency, measured using the absolute value of the residual from Equation (1)
Overinvest	The part of the regression residuals in Equation (1) that is over 0
Underinvest	The absolute value of the regression residuals in Equation (1) that are less than 0
List	An indicator variable that takes the value 1 if the firm eligible for margin trading
Post	An indicator variable that takes the value 1 for the period after the firms being eligible for margin trading
Growth	The growth rate of main business revenue
Lev	The ratio of liabilities to assets
Cash	Cash scaled by total assets
Size	The natural logarithm of the firm's total assets
Age	The number of years between current and the year when the firm is listed
Ret	The annual stock return
Industry	Industry dummy variables
Year	Year dummy variables

4. Empirical Analysis

4.1 Descriptive Statistics

Table 2 provides descriptive statistics. The mean value of IE is 0.051, indicating that the phenomenon of over-investment is more common. The maximum value of investment efficiency invest is 0.23 and the standard deviation is 0.031, which indicates that the inefficient investment behavior of Chinese firms is common and serious. It's necessary to improve the investment efficiency. The mean value of Lev is 0.457, indicating that listed firms are able to control their asset-liability ratio at a reasonable level .The standard deviation of Cash is 0.116, indicating that there are large differences in the monetary capital holdings of the listed firms. The mean value of Size is 22.43,indicating that the size of assets of A-share listed firms in China is large. The standard deviation of Size is 1.339,indicating that the differences among firms are small. The mean value of Age is 11, which indicates that the selected sample firms have been listed for a long time. The mean value of Ret is 0.05 and the standard deviation is 0.472, which shows that the individual differences

in stock returns of listed firms in China are large. The mean value of Growth is 0.174, indicating that the main business income of listed firms in China can achieve gradual growth.

Table 2. Descriptive statistics

variable	N	mean	S.D.	min	max
Invest	16280	0.0510	0.0310	0	0.230
IE	16280	0.0510	0.0310	-0.0310	0.230
List×Post	16280	0.278	0.448	0	1
Lev	16280	0.457	0.206	0.0520	0.924
Cash	16280	0.167	0.116	0.0150	0.620
Size	16280	22.43	1.339	19.77	26.37
Age	16280	11.47	6.668	1	30
Ret	16280	0.0500	0.472	-0.711	1.771
Growth	16280	0.174	0.445	-0.529	3.043

We divide the entire sample into two subsamples : the underinvestment group and the overinvestment group. If IE is over 0,the sample is divided into overinvestment group. If IE is less than 0,the sample is divided into underinvestment group. Then we conduct descriptive statistics for each of the two subsamples.

The variables do not differ significantly in the two groups, indicating that the overall conditions of the firms in the two subsamples are relatively similar. The differences of Ret in the two groups are larger. The mean value of Ret in the underinvestment group is larger, and the growth of main business income is faster.

Table 3. Descriptive statistics

variable	underinvestment				overinvestment			
	mean	S.D.	max	min	mean	S.D.	max	min
IE	-0.008	0.007	0	-0.031	0.053	0.03	0.23	0
Invest	0.008	0.007	0.031	0	0.053	0.03	0.23	0
List×Post	0.474	0.5	1	0	0.272	0.445	1	0
Lev	0.63	0.197	0.924	0.059	0.452	0.204	0.924	0.052
Cash	0.116	0.079	0.62	0.015	0.169	0.117	0.62	0.015
Size	23.416	1.565	26.366	19.772	22.403	1.323	26.366	19.772
Age	19.46	4.564	30	4	11.257	6.584	30	1
Ret	0.216	0.471	1.771	-0.703	0.045	0.472	1.771	-0.711
Growth	0.145	0.557	3.043	-0.529	0.175	0.441	3.043	-0.529

4.2 Regression results

We use a difference-in-differences(DiD) model to test the hypothesis. We conduct Hausman test before the regression. According to the results of the Hausman test, we finally select fixed effect model for the regression. The regression results are shown in Table3 below. The regression results show that the coefficient of the key explanatory variable List×Post is -0.00282. It is negative and significant at the 1% statistical level, indicating that margin trading and short selling improves the investment efficiency.The results of group regression on the overall sample show that the coefficient of List×Post in the over-investment group is -0.00262, which is negative and significant

at 1% statistical level. The coefficient of List×Post in the under-investment group is -0.000251, but it is not significant. The results indicate that margin trading and short selling can effectively curb over-investment but not alleviate the problem of under-investment.

The reason for the above results may be that margin trading and short selling mainly solves the conflict between shareholders and managers. managers mostly tends to increase investment, so margin trading and short selling effectively suppresses the over-investment problem. However, margin trading and short selling has increased the downside risk of stocks. So the incentive of listed firms to raise equity has been affected. The conflict between shareholders and investors has not been effectively alleviated.Therefore, under-investment has not been alleviated.

Table 4. The Association between margin trading and investment efficiency

variable	IE	Overinvest	Underinvest
List×Post	-0.00282*** (-4.12)	-0.00262*** (-5.28)	-0.000251 (-0.30)
Lev	-0.0140*** (-7.01)	-0.0123*** (-10.84)	-0.00154 (-0.71)
Cash	0.0171*** (7.00)	0.0291*** (17.66)	0.00546 (0.13)
Size	0.00812*** (16.27)	0.000175 (0.90)	0.0000337 (0.01)
Age	-0.00551*** (-52.40)	-0.00181*** (-57.60)	0.000202* (2.09)
Ret	-0.00872*** (-21.11)	-0.00656*** (-15.06)	0.00202 (2.03)
Growth	0.00351*** (8.51)	0.00755*** (19.64)	0.000468 (0.60)
constants	-0.0633*** (-6.15)	0.0612*** (13.79)	0.00465 (0.56)
N	16280	15856	424

4.3 Robustness Test

We conduct robustness test by replacing the key variable measures. We use TobinQ to calculate the investment efficiency.The regression results are still the same as above.

Table 5. Robustness Test

variable	IE	Overinvest	Underinvest
List×Post	-0.00318*** (-4.41)	-0.00354*** (-6.07)	-0.000352 (-0.47)
Lev	-0.0129*** (-5.84)	-0.0115*** (-8.13)	-0.000264 (-0.13)
Cash	0.00856** (3.28)	0.0180*** (9.20)	0.000933 (0.24)
Size	0.0113*** (20.29)	0.00288*** (11.58)	-0.000263 (-1.17)
Age	0.00488*** (4.35)	-0.00204*** (-49.80)	0.000247** (2.85)

Ret	-0.00834*** (-17.11)	-0.00805*** (-17.01)	0.00183* (2.07)
Growth	0.00123*** (9.28)	0.00163*** (25.44)	0.0000617 (0.32)
constants	-0.298*** (-14.14)	0.00290 (8.67)	0.00840 (1.06)
N	15128	14655	473

5. Conclusion

Based on the introduction of margin trading and short selling in China,We exam how margin trading and short selling affects investment efficiency of listed firms.   We manually collect the data of underlying securities and adopt difference-in-differences(DiD) model.The regression results confirm the hypothesis. We show that margin trading and short selling can improve investment efficiency. The further group regressions show that margin trading and short selling can effectively curb over-investment and have no effect on the under-investment problem. It indicates that the margin trading and short selling has a significant corporate governance effect.As an external mechanism, it alleviates the motive of generating inefficient investment, and promotes enterprises to consciously regulate their investment behavior.

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