

# Research on the Effect of Margin Trading on Pricing in Stock Market

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**Abstract**—In order to explore the influence mechanism of margin trading on stock pricing, this paper analyzes the impact of margin trading on China's stock market pricing by analyzing the cross-section data horizontally and constructing a Difference-in-Difference model. The research finds that: (1) Through the horizontal comparison between the target stock and the non-target stock, it is found that the pricing efficiency of the target stock is significantly higher than that of the non-target stock; (2) The effect of margin trading in bear market on stock pricing efficiency is greater than that in bull market; (3) The results of difference-in-difference model show that the target stocks in the experimental period have higher pricing efficiency than non-target stocks, and the stocks increase their pricing efficiency after entering the target pool.

**Keywords**—Margin Trading; Pricing; Difference-in-Difference Model

## I. INTRODUCTION

Margin trading, also known as margin financing and securities lending transactions, are divided into two forms: borrowed capital buy-in and borrowed securities sell-off, that is, “buy” and “sell short” in the usual sense. The reason why it is called margin trading is that investors can obtain more capital by pledging and participating in the trading and investment of the securities market.

The development of margin trading business not only helps to meet the diversified trading needs of investors, expands the business scope of securities companies, increases the trading volume of the market, activates the securities market, and facilitates the full play of the pricing function of the stock market, establishing a truly efficient and orderly capital market.

With the continuous improvement of China's capital market, the diversification of investor demand and the improvement of the legal system, the financing and securities lending began on March 31, 2010. The stocks initially included in the target pool were 90, all of which were index constituents. The trading volume on the day of launch was only ten billion CNY. This shows that investors are still on the sidelines of this emerging trading model. In the following five years, the target stock was expanded four times, and the number of targets has been expanded to 900. In addition, the balance of the two financings also broke through the trillion CNY mark at the end of 2014. It can be seen that the margin financing and securities lending business has also developed rapidly. On June 18, 2015, the

total balance of margin financing and securities lending in Shanghai and Shenzhen reached its peak, about 227.3 billion CNY. On December 12, 2016, the fifth expansion was carried out. The two stocks were expanded to 950. The 77 stocks newly added to the target pool have higher activity and lower P/E ratio.

The theoretical significance of this paper is to provide evidence from emerging markets for the “Overvaluation Hypothesis” and the rational expectations model. The practical significance of this paper is to provide reference and basis for the policy authorities to develop and implement the margin financing and securities lending policy.

## II. RELATED LITERATURE REVIEW

### A. Research on the Degree of Response of Stock Prices to Information

Many classical theories are based on the premise of rational investors, such as the capital asset pricing model, which means that investors have the same expectation for the expected return on stock prices. Miller [1] believes that investors have different views on the risks and returns of stocks. When the market restricts short selling, participants with pessimism do not have the right to speak. In contrast, bullish market players have increased their share prices through buy-in operations. In this way, the stock price will deviate from its intrinsic value, which is manifested as being elevated. Harrison and Kreps [2] (1978) argue that under the combined effect of short-selling restrictions and heterogeneous beliefs, investors with different ideas have different appraisal of assets, which makes profits for investors who correctly expect, and even generates speculative bubbles.

### B. Research on the Speed of Stock Price Response to Information

Foreign scholars started relatively early on the research about the speed of information reaction to information, and can be traced back to the birth of the rational expectations model in 1987. Diamond and Verrecchia [3] have found that the market is completely effective and the investor is completely rational. It is found that due to the limitation of short selling, the stock price has different reaction speed to information, and the response to the positive information is faster than the bad news. Stock prices convey the judgment of more optimistic investors.

The rational expectation model has been extended and empirically tested by scholars in various countries. Jennings and Starks [4](1986) first selected the target and non-standard stocks in the US option market as the research object, and measured the reaction speed by constructing the stock price continuity index, and obtained the target stocks respond to the new information faster and more timely. Isaka [5] (2007) takes the related transaction data of Japanese stock market as a sample, and classifies the research object according to the actual profit and the expected profit. Isaka found that stocks subject to short selling were lagging behind in excess returns, thus confirming the effect of short selling on pricing efficiency through the speed of information response.

### C. Research Literature on the Impact of Margin Trading on Stock Market Pricing

Most scholars are optimistic about short selling. Charoenrook and Daouk [6](2003) have selected stock markets in 111 countries around the world to prove this. Since most of the short-selling deals were made in developed countries, they formed a comparison with emerging markets. By comparing the fluctuations in market yields, they concluded that countries that allow short-selling have higher stock pricing efficiency. Zhao Jie [7] (2013) used the event data from the pilot and the first expansion to use the event research method to obtain the conclusion that margin financing and securities lending can improve pricing efficiency. Lian Lanlan [8] (2016) selected the stocks of the target pool after the fourth expansion in 2014, which verified the improvement of pricing efficiency after the expansion. Compared with previous studies, the innovation lies in the use of SVM algorithm of support vector machine. This machine learning language method is used to construct a model to measure pricing efficiency.

Judging from the existing research at home and abroad, the conclusion of the margin trading is controversial about whether it can improve the pricing efficiency of the stock market. In terms of the impact of margin trading on stock price response, most scholars believe that the existence of short selling restrictions will lead to overvaluation of stock prices, and margin trading can effectively solve this problem, while the introduction of margin trading can reduce stock returns and maintain the stock market. In addition, from the perspective of reaction speed, margin trading can speed up the reaction of stock prices to market information, that is, to reflect current market information more quickly and in a timely manner. However, some scholars disagree with these views. They believe that stock market pricing is not significantly affected by margin trading. On the contrary, margin trading will encourage market speculation, fueling the stock market's ups and downs and becoming a financial crisis. This paper draws on the research methods of predecessors, studies the target stocks in China's stock market at the present stage, and explores the differences in the performance of margin trading between China's bull market and bear market in order to have a clear conclusion about the impact of margin trading on stock pricing.

## III. THE IMPACT MECHANISM OF MARGIN TRADING ON STOCK PRICING

Luo Yuding and Liao Shiguang [9] (2007) proposed to increase the stock demand through the margin leverage of financing transactions and the "demonstration effect" brought to investors by the undervalued signal. From the perspective of capital and stock supply, the market liquidity was increased, the stock price was returned to its intrinsic value, and the positive information of individual stocks was reacted in time, so that the stock pricing efficiency could be improved.

Similar to the transmission mechanism of financing transactions, Liao Shiguang and Yang Chaojun [10] (2005) believe that securities lending increases the elasticity of the relevant stock supply, adjusts the market supply and demand relationship and thus increases the liquidity of stocks, so that the stock price responds to the negative information of individual stocks and accelerates the stock price return. Its intrinsic value improves pricing efficiency.

When the market share price is overvalued due to malicious speculation or excessive pursuit, rational investors are aware of it in time, and expect the stock price to fall in the future, so the short selling of securities will increase the supply of these stocks in the market. On the one hand, the phenomenon of the shortage of high-priced stocks has been alleviated, and the possibility of stock price bubbles is suppressed. On the other hand, through the "demonstration effect", other investors are released with signals that the stock price is overvalued, so that the stock price falls and returns to the intrinsic value.

## IV. MODEL CONSTRUCTION AND VARIABLE DESCRIPTION

### A. Model Building

In order to achieve as comprehensive and unbiased as possible, this paper constructs two models of horizontal contrast and vertical contrast to conduct empirical research, and combines the regression results of the two to draw conclusions.

The first model is to establish a direct comparison between the target stock and the non - target stock based on the factors that may affect the pricing efficiency. The specific formula is as follows:

$$\text{Efficiency}_{i,t} = \alpha_0 + \beta \times \text{Margin}_{i,t} + \gamma \times \text{Controls}_{i,t} + v_i + e_t + \varepsilon_{i,t} \quad (1)$$

In the explanatory variable on the right side of the formula,  $\text{Margin}_{i,t}$  is a dummy variable that determines whether it is the target stock.  $\text{Controls}_{i,t}$  is the relevant variable that controls the possible impact on the outcome;  $v_i$ ,  $e_t$  respectively represent individual random error components and time random error components;  $\varepsilon_{i,t}$  is a random error term.

$\text{Efficiency}_{i,t}$  represents the pricing efficiency of stock  $i$  at time  $t$ . In this paper, the information response degree index  $\rho$  and the price lag response indicators D1 and D2 represent  $\text{Efficiency}_{i,t}$ . The specific formula is as follows:

$$\rho_{i,t} = \text{Corr}(r_{i,t}, r_{m,t-1}) \quad (2)$$

$r_{i,t}$  represents the rate of return of stock  $i$  at time  $t$ ,  $r_{m,t-1}$  represents the market yield of lag period, and  $\rho_{i,t}$  represents the correlation coefficient of the two. In addition, this paper adopts the method of Hou and Moskowitz [11] (2005), selects the lag period in the four-phase lag as an extended market model and obtains the  $R^2$  and  $R^2$  of generalized market model and extended market model. Then calculate the ratio of the two, the formula is as follows:

$$D1_i = 1 - \frac{R_i^2}{R_m^2} \quad (3)$$

The price lag indicator  $D1_i$  reflects the degree of dependence of stock prices on historical information and is inversely proportional to pricing efficiency. At the same time, they also started from the regression coefficient of the market model and constructed a second price lag indicator  $D2_i$ . Specifically, the numerator is the sum of the absolute value of the regression coefficients of the market returns of the 1-4 period, and the denominator is the sum of the absolute value of the regression coefficients of the numerator and the market return rate. The specific formula is as follows:

$$D2_i = \frac{\sum_{n=1}^4 |\delta_{i,n}|}{|\beta_i| + \sum_{n=1}^4 |\delta_{i,n}|} \quad (4)$$

The higher the price lag indicator  $D2_i$  indicates that the stock price has a lagging response to the information, and more reflects the past rate of return, and the pricing efficiency has decreased.

From the vertical perspective, the difference-in-difference(DID) model can be used to solve the endogenous problems that may exist in the first model, so as to obtain the net impact of margin trading on stock pricing efficiency. The specific formula of the DID model is as follows:

$$\text{Efficiency}_{it} = \alpha_0 + \beta_1 \times \text{Treat}_i + \beta_2 \times \text{Time}_t + \beta_3 \text{Treat}_i \times \text{Time}_t + \gamma \times \text{Controls}_{it} + v_i + e_t + \varepsilon_{it} \quad (5)$$

In model (5),  $\text{Treat}_i$  is the group dummy variable,  $\text{Time}_t$  represents the time dummy variable.  $\beta_3$ , as the regression coefficient of the interaction items of the two, reflects the net impact of the introduction of margin trading on stock pricing efficiency.

### B. Variable Description and Data Description

Each control variable is processed monthly. Based on the data of China A-share main board market sample stocks are from April 1, 2011 to August 31, 2018. According to the standard deviations of  $\rho$ ,  $D1$  and  $D2$ , they are 35.98%, 26.51% and 18.71%, respectively, indicating that the volatility of the three is large, which can be concluded that there is a big difference between the pricing efficiency of individual stocks.

The correlation coefficient of each pricing efficiency index is calculated. The results show that the correlation coefficients of the pricing efficiency index  $\rho$  and  $D1$  and  $D2$  are 0.096 and 0.131, respectively.

## V. EMPIRICAL RESULTS AND ANALYSIS

Before regression analysis of the model, Hausman test is performed on the panel data to determine whether to use a

fixed effect or a random effect model. The Hausman test results show that the random effect model is better.

### A. Comparison of Pricing Efficiency between the Target Stocks of Margin Trading and Non-target Stocks

First, carry out the horizontal analysis, and use the processed full sample (all data of 1225 stocks of A-share main board from April 1, 2010 to August 31, 2017), and return the model (1) to get the margin trading to the stock market. The regression coefficients of margin for the three pricing efficiency indicators  $\rho$ ,  $D1$  and  $D2$  are -0.020, -0.036 and -0.023, respectively, and both are significant at the level of 1%. It indicates that the value of the pricing efficiency index is less than the value when the margin is 1, that is, the pricing efficiency index of the target stock is smaller than the pricing efficiency index of the non-target stock. It can be seen that the target stocks respond more and faster to the information than the non-target stocks, which proves that the pricing efficiency of the target stocks is significantly higher than that of non-target stocks.

### B. Comparison of Pricing Efficiency between Target Stocks and Non-target Stocks in Bull and Bear Markets

In order to compare the difference in efficiency between the bull market and the bear market, the time interval is divided into a bull market (July 1, 2014 to May 31, 2015) and a bear market (June 1, 2015 to February 29, 2016). Specifically, the regression coefficients of the proxy variable margin in the bear market for the three pricing efficiency indicators  $\rho$ ,  $D1$ , and  $D2$  are -0.033, -0.061, and -0.058, respectively. The absolute value is slightly higher than the absolute values of the regression coefficients -0.020, -0.044 and -0.023 in the bull market. It shows that the pricing efficiency of the stocks that are won in the bear market is higher than that of the non-target stocks.

### C. Difference-in-Difference Model

In order to solve endogenous problems, the second regression of this paper chooses the difference-in-difference model to compare the difference in pricing efficiency between the target stock and the non-target stock. The regression is performed on the difference-in-difference model. The interaction term variable  $\text{Treat} \times \text{Time}$  reflects the net impact of the margin financing policy on stock pricing efficiency. The regression coefficients for the three pricing efficiency indicators  $\rho$ ,  $D1$  and  $D2$  are -0.123, -0.154 and -0.127, respectively, and both are significant at the 1% significance level. This shows that compared with non-target stocks, the target stocks are more efficient in pricing, and at the same time, after the stocks enter the margin financing, the pricing efficiency is higher than before.

## VI. ANALYSIS CONCLUSION

The research conclusions are as follows:

Through the horizontal comparison between the pricing of stocks and non-target stocks. The margin trading agent variable has a negative regression coefficient for the price response degree and the reaction speed pricing efficiency index, and both are very significant, indicating that the pricing efficiency

of the target stock is significantly higher than that of the non-target stock.

Due to the large span of the first regression sample, it may lead to the violent fluctuations in the special period being suppressed. So the second regression of this article results showed that the pricing efficiency of the target stocks in the two market conditions was still higher than that of the non-target stocks, and the value was not much different from the previous one. This phenomenon is more obvious in the bear market.

In order to solve the endogenous problems that may exist, this paper constructs a difference-in-difference model from a vertical perspective, and takes the 65 stocks newly added to the margin trading on December 12, 2016 as the experimental group, in the constituents of the China Securities 800 Index. The 120 non-target stocks were analyzed as a control group. The results showed that the target stocks in the experimental period were more efficient than the non-target stocks, and the stocks entering the target pool could improve their pricing efficiency.

Through the analysis of the control variables in the model, it is concluded that the exchange, circulation market value and turnover rate are indicators that significantly affect the pricing efficiency of stocks. Among them, the stocks listed on the Shanghai Stock Exchange are more efficient than those in Shenzhen Stock Exchange. The market capitalization and turnover ratio are inversely proportional to the stock pricing efficiency. The smaller company size, the higher pricing efficiency; the lower turnover rate, the higher pricing efficiency; the P/E ratio only has an explanatory effect on the information response speed index. The lower P/E ratio, the faster stock price reacts to the information.

## REFERENCES

- [1] Miller E M. Risk, Uncertainty, and Divergence of Opinion[J]. *The Journal of Finance*, 1977, 32(4): 1151-1168
- [2] Harrison J M, Kreps D M. Speculative Investor Behavior in a Stock Market with Heterogeneous Expectations[J]. *Quarterly Journal of Economics*, 1978, 92(2): 323-336
- [3] Diamond D W, Verrecchia R E. Constraints on short-selling and asset price adjustment to private information[J]. *Journal of Financial Economics*, 1987, 18(2): 277-311
- [4] Jennings R, Starks L. Earnings announcements, Stock Price Adjustment, and the Existence of Option Markets[J]. *Journal of Finance*, 1986, 14: 107-125.
- [5] Naoto Isaka. On the informational effect of short-sales constraints: Evidence from the Tokyo stock exchange[J]. *Journal of Financial Research*, 2007, 455-471.
- [6] Charoenruek A, Daouk H. The World Price of Short Selling[J]. *Social Science Electronic Publishing*, 2003
- [7] Zhao Jie. Short Selling Constraints and Capital Market Pricing Efficiency [D]. *Southwestern University of Finance and Economics*, 2013 (In Chinese)
- [8] Lian Lanlan. Research on Volatility and Pricing Efficiency of China's Stock Market[D]. *Dongbei University of Finance and Economics*, 2016 (In Chinese)
- [9] Luo Yuding, Liao Shiguang. Research on the Liquidity Effect of Financing Short Selling Transaction—Evidence from Taiwan Securities Market[J]. *Financial Research*, 2007, (5): 118-132 (In Chinese)
- [10] Liao Shiguang, Yang Chaojun. The Impact of Short Selling Mechanism on Stock Price—Evidence from Taiwan Stock Market[J]. *Financial Research*, 2005, (10): 131-140 (In Chinese)
- [11] Hou K, Moskowitz T J. Market Frictions, Price Delay, and the Cross-Section of Expected Returns[J]. *Review of Financial Studies*, 2005, 18(3): 981-1020