

Influence of Chinese Securities Margin Trading Mechanism to Stock Market Volatility

Xin-yuan Xiao¹, Liu-liu Kong²

¹Business School, University of Shanghai for Science and Technology, Shanghai, China, 200093

²Business School, University of Shanghai for Science and Technology, Shanghai, China, 200093

Email: xiaoxinyuan_2012@163.com

Abstract: On Mar 31, 2010, Chinese stock markets of Shanghai and Shenzhen officially accepted the securities margin trading declaration of securities traders, thus 4-year preparatory securities margin trading officially entered market operation stage. Since then China changed unilateral trading mechanism used for many years, while permitting bilateral trade. The establishment of such trading mechanism can effectively reduce the probability of sharp rise and fall existed in unilateral speculative market trend, which can maintain the stability of market. So far, securities margin trading had been launched for more than 2 years, can it remarkably ameliorate the situation of high speculation and sharp rise and fall in Chinese stock market as expected by us? Basing on the single day financing amount and turnover rate data of Chinese stock markets of Shanghai and Shenzhen from Mar 31 2010, to Dec 30, 2011, this paper carried out empirical analysis on the relations between the two by applying econometric methods including Granger causality analysis and VAR model. Analysis results show that the launch of securities margin trading has no significant influence to stock market volatility, while the change of volatility has big influence to financing amount.

Keywords: Securities Margin Trading; Short Purchase; Turnover Rate; Impulse Response Function

1. Introduction

Securities margin trading (or Securities credit trading) means that investors provide collateral to Securities Company, and borrow fund to buy the listed securities of stock exchange or borrow the listed securities of stock exchange. When market price is expected to rise, investors borrow fund from Securities Company with the qualification in carrying out securities marginal trading business, so as to buy underlying

securities for securities margin trading, and appoint the repayment deadline. When deadline expires, investors sell the underlying securities to repay the principal and interest of Securities Company, trading on equity is also called short purchase. When market price is expected to fall, investors borrow the underlying securities from Securities Company and then, immediately sell it; when appointed deadline expires, investors purchase the same quantities of underlying securities to deliver it to securities company, trading on equity is also called short

sales. The United States had established perfect securities margin trading system through Securities Exchange Act in 1934. In Asia, Japan passed Securities Exchange Act in 1954. While standardizing previous short sales, Japan also introduced the mechanism of short sales. Taiwan Stock Exchange also launched margin trading mechanism in Feb 1962, permitting investors to conduct short sales. In Jan 1994, the Stock Exchange of Hong Kong launched short selling test program, and appointed that 17 stocks can be sold short in the first batch. It further expanded the quantities of short selling stocks. China Securities Regulatory Commission (CSRC) declared to launch the pilot project of securities margin trading in Oct 2008. On Mar 31, 2010, Shanghai and Shenzhen Stock Exchange officially issued notice to pilot securities traders, starting to accept securities margin trading declaration, which marked that China had officially entered market operation stage. While launching short sales mechanism, the actual influence of short sales mechanism to securities market also gradually gave rise to the concerns of scholars, insiders and the management. This paper shall carry out empirical analysis on whether short sales mechanism can stabilize the volatility of market or cause the fall or even "collapse" of stock market, so as to find the internal relations between margin trading and stock price volatility.

2. Literature Review

Since short purchase mechanism was introduced to securities market, scholars both in home and abroad carried out a series of studies targeting on the actual influence of short purchase mechanism to market. However, there's no uniform study conclusion on whether it can accelerate securities market volatility. Bogen and Krooss had put forward the classical theory of "pyramid and inverted pyramid effect" as early as 1960s, illustrating in theory that securities margin trading mechanism would cause the acceleration of stock market volatility. Such theory was accepted by vast researchers during a very long period. But the experimental results of King, etc (1993) showed that short sales mechanism has neither remarkable influence to the occurrence of price bubble, nor played the role in stabilizing price. According to experimental results, Porter and Smith (2000) pointed

out that short sales mechanism cannot remarkably reduce the bubble volume of market and the duration of bubble. Other scholars believe that securities margin trading in itself can play the role of stabilizing the market. Bris, etc (2003) found that in markets permitting short sales, the volatility of stock return is much lower. Meanwhile, through the research on stock markets of 111 countries, Charoenrook and Daouk (2005) found that when market permits short sales, the volatility of such market is lower than markets prohibiting short sales. In Aug 2000, one research report of American Chase Manhattan showed that short sales can stabilize the severe volatility of stock price index, i.e. stabilizing the market. Hong and Stein (2003) found that if not permitting short sales or restricting too strictly on short sales, it may cause the collapse of stock market.

At the initial establishment of Chinese securities market, Han Zhiguo (1994) and Dai Xianglong (2000) etc appealed to introduce margin trading system. Most of the early domestic study literatures in this direction were limited in macro introduction and function analysis. For instance, Xiao Tiao and Zhou Wanhe (2001) analyzed that the problem of over speculation of Chinese stock market can be solved by introducing short sales mechanism. Through empirical analysis in the regions including Hong Kong and Taiwan recently, Chinese scholars also got similar conclusions with Western scholars. By studying the relations of short sales mechanism and stock price in Taiwan Stock Market from Aug 1998 to Feb 2004, Liao Shiguang and Yang Chaojun (2004) found that short sales mechanism didn't accelerate the volatility of securities market. Empirical analysis of Liao Shiguang and Zhang Zongxin on Hong Kong stock market the following year also found that the existence of short sales mechanism would to certain extent, play inhabiting effect on sharp rise and fall phenomenon in the market. Wu Shukun and Liao Shiguang (2007) tested the impact effect of margin trading of Taiwan Securities Market to the market by applying co-integration and Granger causality test method, which showed that securities margin trading would not accelerate volatility level of market.

Thus it can be found that most of current studies are concentrated on securities lending, while very few scholars discuss the influence of trading on equity to market volatility. This paper tries to find their internal

relations by analyzing the data of trading on equity and turnover rate in the stock markets of Shanghai and Shenzhen.

3. Data selection and empirical study

Study route of this paper is as follows: firstly, screen and confirm sample data to check data stability; then establish VAR model on this basis and carry out Granger causality test; finally, quantitatively determine the lasting effect of influence by applying impulse response function.

3.1. Selection and Introduction of Data

Stock volatility index: this paper adopts the weighted market day turnover rate of A share negotiable

market cap of the stock markets of Shanghai and Shenzhen compiled by Resset Database as the index. If there's no special instruction, such variant is recorded as TURNOVER in this paper. Index of stock market financing amount: in order to correspond to turnover rate data, this paper selects the amount of transaction in financing (Unit: RMB 0.1 Billion Yuan) of A share of such two markets as index of stock market financing amount. Time intervals of the two are both the daily data from Mar 31, 2010 to Dec 30, 2011. Such variant is recorded as RZ in this paper if there's no special instruction.

The paper uses the ADF unit root test method to test the stability of sample data. Moreover, it applies EvIEWS software and selects constant term (without trend term) to respectively carry out ADF test to sample data RZ and TURNOVER, and the obtained results are as follows:

Chart 1. Results of unit root test on the sample data

Variant	Test Category	ADF values	5% threshold	DW value	AIC	SC	Stable or not
TURNOVER	(0,0)	-2.914397	-2.868105	2.030506	-0.362311	-0.324241	Stable
RZ	(0,0)	-2.704428	-2.868121	2.014019	4.547549	4.595221	Unstable
D(RZ)	(0,1)	-16.893965	-2.868121	2.019978	4.560108	4.598245	Stable

Notes: adding D before variant means the first-order difference on variant. First character in the bracket means the category of test (0 means only containing constant term, and 1 means not only including constant term, but also including trend term), and the second character means lag order.

Results of chart 1 shows that market turnover rate TURNOVER passed unit root test, which is stationary series. Market financing amount RZ didn't pass unit root test, but its first-order series D (RZ) passed unit root test under 1% significance level, which shows that it's integrated of 1, recorded as I(1).

3.2. Establishment of VAR model

In order to deeply study the relations between short sales mechanism and the market volatility, we apply Vector Auto-regression (VAR) model to carry out empirical study on the mutual relations between the selected two variants. As VAR model requires that endogenous variable sequence must be stationary, we also choose TURNOVER and D (RZ) to carry out VAR analysis. As per 5 selection standard of VAR model optimal lag order, experiment shows that when lag order is 2, the values of VAR model LR (sequential modified

LR test statistic), FPE (final prediction error), AIC (Akaike information criterion) and HQ (Hannan-Quinn information criterion) are all the minimum. Therefore, we select P=2 as optimal lag order, and establish VAR (2) model. After demonstration by applying EvIEWS software, the obtained results are as follows:

$$y_t = \begin{bmatrix} 0.703641, 0.000739 \\ 0.541439, -0.459994 \end{bmatrix} y_{t-1} + \begin{bmatrix} 0.228781, -0.009469 \\ -0.934987, -0.166992 \end{bmatrix} y_{t-2} + \begin{bmatrix} 0.074868 \\ 0.499095 \end{bmatrix}$$

$$y_t = \begin{bmatrix} \text{TURNOVER} \\ \text{DRZ} \end{bmatrix}$$

Thus it can be seen from above results that in TURNOVER equation, influence coefficient of DRZ(-1) and DRZ(-2) are respectively 0.000739 and -0.009469, which shows that when stock financing amount increases, the influence to volatility is not big (very tiny). While in

DRZ equation, coefficient of TURNOVER (-1) and TURNOVER (-2) are respectively 0.541439 and -0.934987, illustrating that market volatility plays certain role on whether to buy shares through financing by investors, and the closer the time, the positive effect would be more obvious. The causes may have the following several points: 1. As Chinese stock markets mainly have small and medium-sized investors, only institutional investors have the qualification to engage in margin trading. On the one hand, the proportion of institutional investors is very small in stock market; on the other hand, their investment strategies are mainly long-term, so volatility is smaller. 2. When volatility is higher, i.e. the majorities of small and medium-sized investors frequently carry out share change operation, it's the good chance for institutional investors to approach, and the possibilities of margin trading would also be

greatly increased.

3.3. Granger causality Test

Granger causality test is to test whether the lagged variable of a variant can be introduced to other variable equations. If variable A subjects to lagged effect of variable B, then we call B as Granger cause of A. In order to solve the causality of money supply and market interest rate change with Shanghai Composite Index, we adopt Granger causality test method to confirm whether they have significant Granger relations on the basis of VAR model. As such method requires that the tested series must be stationary series, we choose TURNOVER and DRZ to do Granger causality analysis. The results are as follows:

Chart 2. Granger Causality Test Result

Original hypothesis	Lag phase	F value	probability	conclusion
TURNOVER does not Granger cause DRZ	2	3.84634	0.0221	Rejected
DRZ does not Granger cause TURNOVER	2	4.90542	0.0078	Rejected

Test results show that when lag phase is 2, original hypothesis DRZ does not Granger cause TURNOVER is strictly rejected (at 1% significant level), while TURNOVER does not Granger cause DRZ is generally rejected (at 5% significant level). Such results show that both have mutual influence under such test method, which furthered evidenced the conclusion obtained in VAR of foregoing text.

3.4. Impulse response analysis

In order to understand the influence of one party to another party more dynamically and accurately, we carried out impulse response analysis basing on VAR (2) model. Impulse response analysis was done basing on the stability of VAR (2) model and the results are as follows:

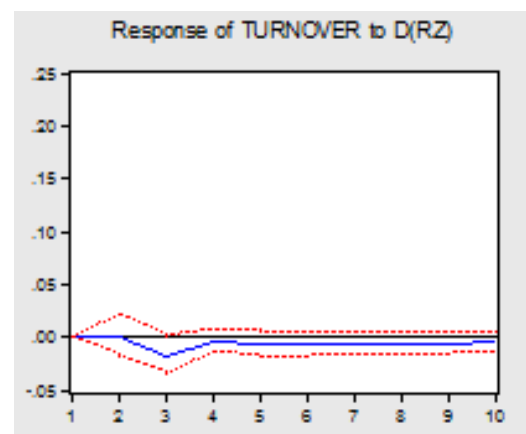


Figure 1. Response of TURNOVER to DRZ

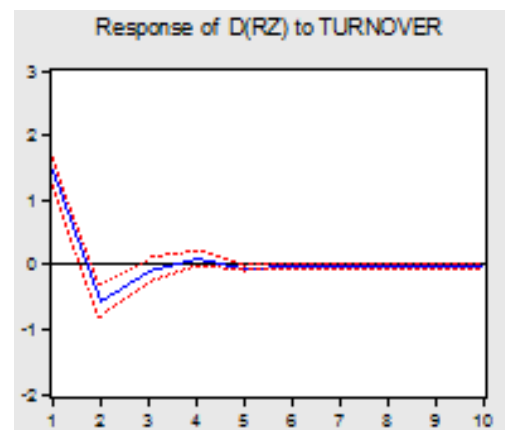


Figure 2. Response of DRZ to TURNOVER

As shown above, we firstly analyze the response of TURNOVER to one standard deviation impulse of DRZ. When giving DRZ a positive impulse at this stage, the influence to TURNOVER was very weak, which began to slowly enlarge in the second stage and reach the maximum in the third stage, but it's still very small. Then it began to slowly decrease, which basically stabilized in the fifth stage until becoming very little, and such influence basically vanished in the tenth stage. The response of DRZ to one standard deviation impulse of TURNOVER was far more intense, which was enormous positive impulse at the beginning. It suddenly turned to negative influence at the second stage, then slowly decreased, which basically calmed in the forth stage as shown in the picture. It illustrated that the effect of turnover rate change to financing amount is very intense.

4. Reviews and suggestions

This paper aims at deeply discussing the influence of securities margin trading mechanism to stock market volatility, which empirically tested the mutual influence between financing amount and change of stock market volatility by adopting a great deal of econometric methods including VAR model, Granger causality test and impulse response function. Thus it obtained the result that: after the launching of financing mechanism, the influence of change of financing amount to stock market volatility is not significant, or even very weak, which is different as imagined by us. On the contrary, the influence of stock market volatility to financing amount is quite obvious. Such situation is slightly different with the study results of Western scholars, and the cause is estimated to have close correlation with the composition of Chinese specific market participants. Institutional investors account for lesser proportion in Chinese stock market, however, securities margin trading business is developed targeting at such investors, while ordinary small and medium-sized investors cannot participate. Thus the influence of securities margin trading of institutional investors group to market is very limited. Nonetheless, with the gradual maturing of Chinese stock market, the proportion of institutional investors would become bigger and bigger. Meanwhile, the value

investment philosophy of small and medium-sized investors would also be slowly cultivated. Volatility of Chinese stock market would gradually decrease in the end, just like that of Western countries, and the application of securities margin trading would also play active role in reducing volatility.

Acknowledgements

This research is supported by Shanghai municipal education commission's key discipline construction project(Project NO. J50504)

References

- [1] Woolridge, J. R. & A. Dickinson, 1989, "Short-selling and common stock price", *Financial Analysts Journal*, pp. 20-28.
- [2] The Chase Manhattan Bank and the ASTEC Consulting Group, Inc, "Short selling"[R], 2000.08.18.
- [3] Hong, Harrison & Jeremy C. Stein, 2003, "Differences of opinion, short-sales constraints, and market crashes", *Review of Financial Studies*, Vol. 16, pp. 487-525.
- [4] Senchack, A. J. & Laura T. Stark, 1993, "Short-sale restrictions and market reaction to short-interest announcement", *Journal of Financial and Quantitative Analysis*, Vol. 28, pp. 177-194.
- [5] Figlewski, Stephen & Gwendolyn P. Webb, 1993, "Options, short sales and market completeness" *Journal of Finance*, Vol. 48, pp. 761-777.
- [6] Conrad, Jennifer, 1994, "The price effect of short interest announcement", Working paper of University of North Carolina
- [7] Bris, A., W.N.Goetzmann and N.Zhu., 2007, "Efficiency and the bear: Short sales and markets around the world", *Journal of Finance*, Vol. 62, pp. 1029-1079.
- [8] Aitken, M., A.Frino, M.McCorry and P.Swan. 1998, "Short Sales are Almost Instantaneously Bad News: Evidence from the Australian Stock Exchange" *Journal of Finance*, Vol. 53, pp. 2205-2223.
- [9] Gikas A.Hardouvelis and Stavros Peristiani, 1992. "Margin Requirements, Speculative Trading and Stock Price Fluctuations: The Case of Japan", *The Quarterly Journal of Economics*, Vol. 107, pp. 1333-1370.
- [10] Bogen Jules, Herman E.Krooss, 1960, "Security credit and its economic role and regulation", Englewood Cliffs.
- [11] King Ronald R, Smith Vernon L, Williams Arlington W. and Van Boening Mark, 1993, "The Robustness of Bubbles and Crashes in Experimental Stock Markets", *Nonlinear Dynamics and Evolutionary Economics*, Vol. 06, pp. 183-200.

- [12] Porter David P. and Smith Vernon L., 2000, "Stock Market Bubbles in the Laboratory, in *Bargaining and Market Behavior*", Cambridge University Press.
- [13] Kraus, Alan, and Amir Rubin, 2003, "The Effect of Short Sale Constraint Removal on Volatility in the Presence of Heterogeneous Beliefs", *International Review of Finance*, Vol. 04, pp. 171-188.
- [14] Marsh, Ian W. and Norman Niemer, 2008, "The Import of Short Sales Restrictions", Report, Cass Business School.
- [15] Jiang, D., 2005, "Overconfidence, Short-sale Constraints, and Stock Valuation", Working Paper, Ohio State University, September.
- [16] Jarrow, Robert, 1980, "Heterogeneous Expectations, Restrictions on Short Sales, and Equilibrium Asset Prices" *Journal of Finance*, Vol. 35, pp. 1105-1114.
- [17] Cai Xiao, 2010, "The Influences of Margin Trading on Security Markets", Working Paper.
- [18] Yudong Zhang, Lenan Wu, Shuihua Wang, Geng Wei, 2010, "Color Image Enhancement based on HVS and PCNN", *Science China Information Sciences*, Vol. 10, pp. 1963-1976.
- [19] Zhang Guodong, 2011, "Research on the Influence of Margin Trading to the Security Market", Working Paper.
- [20] Yu Xiaojian, 2012, "The Impact of Margin Purchasing and Short Selling on Liquidity and Volatility: Evidence from Shanghai Stock Market", *Journal of South China University of Technology*, Vol. 02, pp. 01-07.
- [21] Liao Shiguang, Zhang Zongxin, 2005, "The Shock Effect of Short Selling Mechanism to Emerging Market: Evidence from Hong Kong Stock Market", *Journal of Finance and Economics*, Vol. 10, pp. 143-154.
- [22] Yudong Zhang, Lenan Wu, 2009, "Stock Market Prediction of S&P 500 via Combination of Improved BCO Approach and BP Neural Network", *Expert systems with applications*, Vol. 05, pp.8849-8854.

Vitae

Xin-yuan Xiao, Master candidate in Finance, Business School, University of Shanghai for Science and Technology, Shanghai, China.

Dr. Liu-liu Kong, PHD supervisor, director of the finance department, Business School, University of Shanghai for Science and Technology, Shanghai, China. His research interest includes financial engineering, investments and finance.