

The Industry Index Effect of Non-tradable Share Reform

Jianxi LI¹, Le TANG²

¹ School of Finance, Jiangxi University of Finance and Economics, Nanchang 330013, China,

² School of Foreign Languages and International Business, Jiangxi University of Technology, Nanchang 330098, China
759958339@qq.com, (J. LI), tangle1978@163.com (L. Tang)

Abstract - This paper discusses the impact of non-tradable share reform on the volatility and efficiency of market. The rich empirical studies based on EGARCH(1,1)-M model and the data of CSRC(China Securities Regulatory Commission) industry indexes (including 13 industry indexes) are done and the empirical results show that, the reform of non-tradable share increases the short term volatility and it reduces the long term volatility of market. Especially, for some industries, such as, Commercial trade industry, Manufacturing industry and Social services, the short term volatility raised by the reform of non-tradable share is the maximum, while is the minimum in the Financial services industry, Culture industry and Public utility. In addition, after the reform of non-tradable share, the impact of new information on the market is weakening for most non-public service industries, while the impact is strengthening and significant for Public utility, Mining industry, Delivery warehousing and Social services.

Index Terms - Non-tradable shares reform, EGARCH model, Volatility, Market efficiency.

1. Introduction

In May 1992, the document of *the company specification opinions* makes a clear regulation that the state shares, legal person shares, public stock and foreign shares coexist with these four kinds of ownership form. Only public stock can flow freely, other three kinds of shares cannot flow in China. That formed two different kinds of the stocks, non-tradable shares and tradable shares. This is known as the unique “non-tradable shares” problem in China’s securities market. With the development of China’s securities market, the disadvantages of “non-tradable shares” problem are emerging. There are three major hazards [1], firstly, the holder of non-tradable shares conflicts with the holder of tradable shares in company’s interest; secondly, it hurts the pricing function of capital market; thirdly, it makes China’s capital markets cannot formed the scientific assessment standards and effective incentive mechanism. Therefore, non-tradable shares reform is imperative. On May 9, 2005, non-tradable shares reform enters substantive operation stage, with the first batch of pilot firms, *jinniugufen*, *sanyizhonggong*, *zijianguqiye* and *qinghuatongfang*. By the end of 2007, 97% of the listed companies had completed the non-tradable shares reform. That means the stock market realized “full circulation”. How does the non-tradable shares reform influence Chinese stock market? What are different influences between short-term volatility and long-term effect? And how does it influence the effectiveness of different industries? This paper will focus on these problems.

2. Literature Review

The literature of non-tradable shares reform is rich and

can be found from both micro-and macro-segregation. The micro levels, researchers considered the impact of share reform on market in companies’ governance structure, profitability and other prospects, such as Zhao, Liao and Li (2006) [2], Liu, Niu and Zhang (2010) [3], Hu, Gong and Jun (2007) [4], Chen, Zhou and She (2009) [5]. Liao and Shen (2008) [6] found from Fama-French three-factor model [7] that the market effects of non-tradable share reform is significant. Recently, Yu and Jiang (2013) [8] found from the accumulation preferences of controlling shareholder that reform of non-tradable share can relieve the motivation of conversion of property from controlling shareholders.

At the macro level, researchers focused mainly on the impact of the reform of non-tradable share on the effectiveness and volatility of the market index, such as SHE and SSE indices. These studies are mostly based on GARCH models for empirical research. Such as, Wang and Chen (2008) [9], Li, Li and Fu (2008) [10], Sun (2009) [11], Xie and Shao (2011) [12], Wei (2013) [13]. Zhang (2009) [14] found by adjusted TAR model that after the split share structure was reformed, both the rising and the falling phase, overall volatility in China’s A-share market is increasing dramatically. Recently, Luo (2012) [15] from the application of ARCH models, found that the market volatility caused by new information is reducing, and the market volatility for long-term is rising after the non-tradable shares reform.

The current paper will further discuss the problem that the impact of the reform of non-tradable shares on China’s stock market in the volatility and efficiency of market. Using 13 industry group data series from April 2001 to April 2013 in SSE, we study the impact of share reform on various industry groups with EGARCH model. This is a new perspective to study the effects of non-tradable shares reform. And we consider the effects of non-tradable shares reform completely.

3. Data and Methods

We choose 13 industries from SFC industry index: 01 Agriculture Forestry Animal Husbandry and fishery, 02 Mining industry, 03 Manufacturing industry, 04 Public utility, 05 Construction industry, 06 Delivery warehousing, 07 Information Technology industry, 08 Commercial trade industry, 09 Financial service industry, 10 Real estate industry, 11 Social service, 12 Culture industry and 13 Synthesis industry. The samples are daily transaction data from April 2, 2001 to April 2, 2013 in which there are 2,909 samples of each industry, and the data are from the WIND data set. We use the soft Eviews6.0 to analyze the data.

Industry index $P_{i,t}$ is denoted by at time t and the logarithm return rate at time is

$$r_{i,t} = \ln(P_{i,t}) - \ln(P_{i,t-1}). \quad (1)$$

We test the normality, stability and ARCH effects of return series, $r_{i,t}$. The test results show that: (1) $r_{i,t}$ have the characteristic of sharp peak and heavy tail and Jarque-Bera statistic is significant at 1% confidence level, therefore, the residuals are not normally distributed and we choose the generalized error distribution (GED) with the error; (2) the daily returns series are clearly stationary time series; (3) the residuals have strongly clustering phenomenon. Hence, we will choose EGARCH model to analyze our data and explain our problems in the following section.

As an asset volatility forecasting model, GARCH model has a wide range of applications since its can be responded to the volatility clustering effect of asset return. The following asymmetric GARCH model, namely exponential GARCH (EGARCH) with $p=q=1$, i.e., EGARCH (1,1)-M is considered in this paper. In order to know better the impact of the reform of the shareholder on the short-term or long-term volatility effects, we introduce two dummy variables F and L in the variance equation, that is, we take $F=1$ after the reform of non-trade shares, and $F=0$ otherwise. And $L=1$ if the time is the long-term effect and otherwise $L=0$. As we know, the time of share reform starting is May 9, 2005 and Dec. 20, 2007, the reform had been completed. Hence, we take all F as one after May 9, 2005 and otherwise $F=0$. Additionally, the long-term effects should appear in 2-3 years later after the reform. Thus,

in order to test the long-term effect, we take $L=1$ after January 1, 2010, otherwise $L=0$. After introducing dummy variables F and L , EGARCH are modified as follows:

$$r_t = c_0 + c_1 \sigma_t^2 + \varepsilon_t, \quad (2)$$

$$\ln(\sigma_t^2) = \alpha_0 + \alpha_1 \frac{|\varepsilon_{t-1}|}{\sigma_{t-1}} + \alpha_2 \frac{\varepsilon_{t-1}}{\sigma_{t-1}} + \beta_1 \ln(\sigma_{t-1}^2) + \theta_1 F + \theta_2 L. \quad (3)$$

The coefficient θ_1 reflects the short-term effect of the reform and the coefficient θ_2 reflects long-term effect of volatility.

4. The Empirical Results

In this section, we give the use of section 3 in front of some results of empirical data. We first give a stock volatility, impact on all industry results, then, gives the share reform on the effectiveness of various industries.

First of all, Table 1 shows the share reform on the industry volatility results. From table 1, we get the following conclusions: (a). 13 sector indices of the stock dummy variables (F) factor θ_1 are positive, and in front of 1% levels significantly, the mean value of θ_1 is 0.0391, which indicates reform made 13 trades stocks for short term volatility average in 0.0391. Due to the share of the total equity of two-thirds "non-trade shares" concentrated lifting and success factors were unknown, the impact of short-term fluctuations in the market are inevitable.

TABLE I The numerical results for the impact of reform on volatility

Industry	c_0	c_1	α_0	α_1	α_2	β_1	θ_1	θ_2
r_{01}	-0.0019***	6.3934***	-0.4836***	0.1970***	-0.0253**	0.9608***	0.0433***	-0.0273**
r_{02}	-0.0011***	3.6930***	-0.3796***	0.1635***	-0.0241**	0.9699***	0.0336***	-0.0352***
r_{03}	-0.0014***	7.5800***	-0.5191***	0.1814***	-0.0396***	0.9568***	0.0497***	-0.0315***
r_{04}	-0.0014***	6.1432***	-0.4341***	0.1741***	-0.0346***	0.9653***	0.0317***	-0.0288**
r_{05}	-0.0021***	7.4394***	-0.4961***	0.1710***	-0.0350***	0.9570***	0.0424***	-0.0358***
r_{06}	-0.0011***	5.1545***	-0.3916***	0.1622***	-0.0411***	0.9692***	0.0329***	-0.0285***
r_{07}	-0.0018***	6.6234***	-0.4894***	0.1720***	-0.0367***	0.9575***	0.0353***	-0.0283***
r_{08}	-0.0017***	8.8977***	-0.5647***	0.1961***	-0.0319**	0.9524***	0.0513***	-0.0363***
r_{09}	-0.0015***	3.9938***	-0.3717***	0.1432***	-0.0337***	0.9678***	0.0265***	-0.0400***
r_{10}	-0.0018***	4.9606***	-0.3564***	0.1265***	-0.0393***	0.9691***	0.0386***	-0.0241***
r_{11}	-0.0017***	6.7477***	-0.4471***	0.1577***	-0.0462***	0.9625***	0.0465***	-0.0300***
r_{12}	-0.0018***	4.7972***	-0.4172***	0.1648***	-0.0400***	0.9642***	0.0315***	-0.0300***
r_{13}	-0.0014***	6.5977***	-0.4778***	0.1811***	-0.0357***	0.9608***	0.0452***	-0.0267**

Notes: "***, ** and *" at superscript mean that the confidence level at 1%, 5% and 10%, respectively.

(b). By studying the dummy variables (F) the coefficient in front of θ_1 the size of the value, we find that short-term fluctuations in the share reform on the 13 industry large industries are 08 Commercial trade industry (0.0513), 03 Manufacturing industry (0.0497) and 11 Social service (0.0465); Stock less impact on industries are 09 Financial services industry (0.0265), 12 Culture industry (0.0315) and 04 Public utility (0.0317). Because Commercial trade industry, itself belongs to the traditional industries such as

Manufacturing industry, which fragmented shareholder interests before the share reform of listed companies, its corporate governance structure is not perfect; The Financial service industry and Culture industry are emerging industries, started late, but listed companies in these industries, from creation, drawing on company management system in western developed countries, the interest differentiation between tradable shareholders and non-tradable shareholders are not so serious, so short-term fluctuations of the stock is smaller.

(c). In the long term, stock long term effect of dummy variables (L) earlier factor of θ_2 is negative, and significantly at the level of 1%, and its mean value for all industries is -0.0308. This suggests that, on average, share reform made 13 trades stocks to hence long-term volatility 0.0308. After the share reform, the mechanism of interests between shareholders is clarified; capital markets play a role of pricing, so in the long run, it reduces market volatility.

(d). Researching the size of long-term effect of dummy variables θ_2 , we find that 09 Financial service industry (-0.0400), 08 Commercial trade industry (-0.0363) and 05 Construction industry (-0.0358) are affected greater by reform; 10 Real estate industry (-0.0241), 13 Synthesis industry (-0.0267) and 01 Agriculture Forestry Animal Husbandry and fishery (-0.0273) are affected smaller. Because Financial services industry, after reform, will receive a fairer valuation of assets of listed companies and take advantage of domestic and overseas capital markets to grow; Commercial trade industry as a traditional industry after reform, greatly reduced its volatility. However Real estate industry reduced less, closely related to the fluctuation of house price in that period.

Then we consider the effectiveness of reform from the empirical results here. Considering May 9, 2005, which is the start point of reform, as the threshold, using EGARCH(1,1)-M model to fit this 13 industries, we analyses the values α_1 and

β_1 in stock before and after the change, as well as α_2 "leverage effect" to see changes before and after the stock market's efficiency. α_1 indicates the former issue of the impact of information on variances in the period, β_1 represents for historical information on the continuing effects of the variance in the period; When the value of α_1 and β_1 become smaller, it means that the reform increase the effectiveness of marketing; Instead, the reform decrease the effectiveness. α_2 can be used to measure the negative impact and positive impact on the current influence of variance are the same, this asymmetric reaction is also called the "leverage effect". If the "leverage effect" from significant into not significant, that indicates share reform enhance the effectiveness of marketing. In order to study short-term fluctuations and long-term fluctuations in the stock market, we introduce the unit dummy variables (F), the long-term effect of dummy variables (L). In the demonstration that followed was for the purpose of comparing share reform before and after an interval of two samples derived from the coefficients of the model changes, taking into account the two dummy variables F and L will not affect the other differential equations, so we just do not need empirical equations the variables F and L . Our empirical results are shown in table 2. By comparing the 13 sectors of market efficiency in non-tradable share reform, we find:

TABLE II The numerical results for the impact of reform on effectiveness

Industry	Reform Before/After	Mean equation		Variance equation			
		c_0	c_1	α_0	α_1	α_2	β_1
r_{01}	Before	-0.0028***	6.2584*	-0.5220***	0.2081***	-0.0855***	0.9568***
	After	0.0001	3.8164**	-0.2901***	0.1856***	0.0100	0.9806***
r_{02}	Before	0.0557	-2.8772	-7.7493***	-0.0298	0.0059	0.0786
	After	-0.0002	2.1870	-0.1318***	0.1181***	0.0149*	0.9946***
r_{03}	Before	-0.0021***	7.7527**	-0.5037***	0.2030***	-0.1051***	0.9600***
	After	0.0003	4.9837***	-0.2925***	0.1662***	-0.0030	0.9790***
r_{04}	Before	0.0614	-3.8368	-8.7014***	-0.0180	0.0048	-0.0190
	After	-0.0005	4.8038***	-0.1643***	0.1293***	0.0103	0.9918***
r_{05}	Before	-0.0029***	7.3187**	-0.54440***	0.2172***	-0.0963***	0.9553***
	After	-0.0009	5.8470***	-0.2076***	0.1368***	0.0049	0.9867***
r_{06}	Before	0.1098	-6.8526	-8.5104***	-0.0154	0.0006	0.0111
	After	-0.0008	4.5843***	-0.1366***	0.1146***	0.0035	0.9937***
r_{07}	Before	-0.0028***	6.0322*	-0.3830***	0.1745***	-0.1099***	0.9697***
	After	0.0003	3.4994*	-0.2983***	0.1633***	0.0055	0.9778***
r_{08}	Before	-0.0022***	8.6599**	-0.5325***	0.2141***	-0.0880***	0.9574***
	After	-0.0004	6.5175***	-0.3401***	0.1811***	0.0018	0.9744***
r_{09}	Before	-0.0041***	9.6622**	-0.6664***	0.2182***	-0.0473**	0.9380***
	After	-0.0004	2.2908	-0.1058***	0.0971***	-0.0017	0.9959***
r_{10}	Before	-0.0031***	9.3627**	-0.5191***	0.1938***	-0.0746***	0.9557***
	After	-0.0002	2.5856	-0.0932***	0.0753***	-0.0016	0.9952***
r_{11}	Before	0.1108	-5.2143	-7.7012***	-0.0323	0.0007	0.0920***
	After	-0.0004	5.0054***	-0.2121***	0.1354***	-0.0080	0.9860***
r_{12}	Before	-0.0033***	5.9256**	-0.4053***	0.1727***	-0.0911***	0.9655***
	After	0.0001	3.0055*	-0.2013***	0.1467***	0.0058	0.9883***
r_{13}	Before	-0.0014***	3.5365	-0.3988***	0.1872***	-0.1052***	0.9702***
	After	-0.0001	5.2923***	-0.2993***	0.1694***	0.0009	0.9780***

Notes: "***, ** and * " at superscript mean that the confidence level at 1%,5% and 10%, respectively.

(a). After the reform of non-tradable share, 01 Agriculture Forestry Animal Husbandry and fishery, 03 Manufacturing industry, 05 Construction industry, 07 Information Technology industry, 08 Commercial trade industry, 09 Financial service industry, 10 Real estate industry, 12 Culture industry and 13 Synthesis industry, the value of α_1 become smaller, β_1 become larger, and α_2 from significant into not significant. These results suggest that, after the share reform, in the 9 industries, a smaller impact on the respective markets of the new information (α_1 become smaller); The "leverage effect" disappeared (α_2 from significant into not significant), that markets respond to positive and negative news is no longer a significant difference. From the perspective of α_1 and α_2 , share reform improved the efficiency of markets. However, the value of β_1 become larger, historical information for persistent market volatility increased, in this sense, effectiveness of the stock market decreased. To sum up, after non-tradable share reform, whether 9 industries market efficiency increased, depending on the size between the positive effect of α_1 and α_2 and the negative effect of β_1 . By studying the nature of the 9 industries, we find that the public nature of these industries is relatively weak, in line with general market characteristics, so these findings are consistent with most scholars have come to the conclusion, For example: Xie Shiqing, and Shao Yuping (2011) [12] use of GARCH models to empirical analysis found the Wind A index stock of short-term effect of increased market volatility, long-term effects led to a drop in market volatility, new information on the impact of market volatility become smaller and the impact of shocks on the market of long-term memory.

(b). We find 02 Mining industry, 04 Public utility, 06 Delivery warehousing, 11 Social service, the four industries of public nature comparison is strong, before the reform of non-tradable share, effectiveness of these listed company is poor, for example, in the equation of the mean value of these industries, and coefficient of variance is a negative number, and is not notable, there is no "high risk, high return" feature; values of α_1 and β_1 , are small and not significant, indicating the volatility of the stock market information as well as historical information for the preceding period are not sensitive. After the reform of non-tradable share, 4 industries mean coefficient of variance equations become positive, and significantly at confidence level of 5% (except the Mining industry), embodies the "high risk, high return" feature; and the values of α_1 and β_1 , became noticeable. To summarize, the validity of 4 industry after stock markets greatly enhance the effectiveness and have the basic characteristics of common industry.

5. Conclusion

This paper establishes the internal connection between market volatility, effectiveness and non-tradable shares reform based on EGARCH-M models, which use the stock data of listed companies in China. We discover the reform of non-tradable shares had differential impact on various industries. Our empirical results show that, on the one hand, the reform of non-tradable shares increased China's stock market volatility

in the short term, on the other hand, in the long term, volatility had declined. Also, for some as, Mining industry, Public utility, Delivery warehousing and Social service, public nature of strong industries, after the reform of non-tradable shares, reflected "high risk high return" of market features, Their volatility for market information as well as historical information for the preceding period are becoming sensitive. For public nature of weak industries, after the share reform, the last issue of the new information on fluctuations become smaller, the "leverage effect" disappeared, and the effectiveness of the market are improved; But historical information on fluctuations of continuous enhancement, reduced the effectiveness of the market. Compared with the results of current literature, this study clearly has strong relevance and comparability; results are more convincing and reasonable.

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