A TEST OF "BLACK THURSDAY EFFECT" OF CHINESE

STOCK MARKET

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Abstract

As a kind of market anomaly shared by various national stock markets, week effect has important research value in EMH study, and "black Thursday effect" is a part of all the week effects. In this paper, Shanghai Stock index and Shenzhen A share index were analyzed to verify the existence of week effect. GARCH model with dummy variables is selected to test the week effect of the yield of A shares. Conclusions can be made through the test that "Black Thursday effect" indeed exists in Chinese stock market. Then the possible related reasons are put forward so as to make some suggestions for the regulators and traders of the securities market.

Key words: Black Thursday effect; GARCH model; Chinese stock market

JEL code: G14

1. Introduction

Calendar effect refers to a phenomenon that the stock returns, variance and other characteristics in every day, week, month or season show a cyclical, stable movement mode in the stock market. Calendar effects include day effect, week effect, month effect, and holiday effect. Recently, "black Thursday effect" is a prevalent phenomenon in the stock market, which means that stock price usually shows a downward trend on Thursday. These effects means certain income can be obtained only based on historical price data without considering the transaction costs. Previous studies have found that week effect is significant on Monday and Friday, but it also can be found that week effect also exists on Thursday through an observation of recent stock market. Based on the study of week effect, this paper particularly focuses on "black Thursday effect".

Foreign scholars have done some research on this effect. Fields (1934) found that in the period from 1915 to 1930, the DJIA on Friday is generally lower than the other trading day, Fields believes that it is due to that the shareholders, based on uncertainty of holiday, usually sell the stock held on Friday. Wang *et al.* (1997) have shown that for the US market, the well-known Monday effect occurs primarily in the last two weeks

of a month. For the US market, Peiro (1994) has, in fact, obtained a positive Monday returns. However, no satisfactory explanations have been found for the observed day of the week effect in volatility either. Campbellet (1997) reveals that returns from almost all capital markets are weakly related to their past values. Gibbons (1981) analyzed the data of S & P 500 index yield from 1962 to 1978, and drew the conclusion that the stock market has a week effect. Kamara (1997) studied the S & P 500 index yield data from 1962 to 1993, confirming that although the S & P 500 index has a significant weekly effect, the effect is diminishing.

Some domestic scholars also have some study results on this. Chen and Zhang (2008) study the data of the Shanghai Composite Index and the Shenzhen Composite Index from 2000 to 2006, it is found that there is a significant negative effect on the Shanghai and Shenzhen indices in Chinese stock market. Chen (2015) studies futures yield data of Shanghai and Shenzhen 300 index, and uses ARCH model and GARCH model to make empirical test and finds that the futures yield of Shanghai and Shenzhen 300 stock index have a significant negative effect on Monday and significant positive effect on Friday. He (2003) concluded that week effects of returns and volatility of Shanghai stock market were significant, and observed that the stock had the highest benefits on Friday, the lowest average earnings on Monday. Meng (2000) found that Shanghai stocks have the lowest yield on Tuesday, the highest on Friday.

It can be seen from the above that scholars usually use the Shanghai A share Index and Shenzhen A share Index to carry out the empirical study on week effect in the stock market. This paper also uses these two indexes to verify week effect. The next section selects GARCH model with dummy variables to verify the existence of the week effect in Chinese stock market, and explain the causes.

3. Model Design and Test

3.1. Theoretical Model

The transaction data is collected from Shanghai A share in TongHuaShun, The sample interval is 1990.12.19-2017.02.17; the Interval of Shenzhen A share Index is 1996.04.16-2017.02.17.

This paper discusses the advantages and disadvantages of using the Generalized Autoregressive Conditional Heteroscedasticity model (GARCH) to analyze the week effect of China stock market. This paper analyzes the differences between the week effect of A shares in Shenzhen and Shanghai cities in different periods, and explains the reason of the week effect in China stock market. The daily rate of return is transformed to logarithmic differential form, Which is：

$$R_t = \log(P_t) - \log(P_{t-1})$$

P_t refers to Closing price on t -day, P_{t-1} refers to closing price on day t-1, and R_t is the yield in t-day. GARCH model is a method for modeling time series with conditional heteroscedasticity errors. The standard GARCH model is:

$$y_t = X'_t \beta + \gamma_t$$

$$v_t = \varepsilon_t - \theta_1 v_{t-1} - \cdots - \theta_m v_{t-m}$$

$$\varepsilon_t = \sqrt{h_t e_t}$$

$$h_t = w + \sum_{i=1}^{q} \alpha_i \varepsilon_{t-i}^2 + \sum_{j=1}^{p} \gamma_j h_{t-j}$$

This paper introduces the dummy variables to study the week effect of Shanghai and Shenzhen stock market, the model is as follows:

$$R_t = \varphi_1 MON_t + \varphi_2 TUE_t + \varphi_3 WED_t + \varphi_4 THU_t + \varphi_5 FRI_t + v_t$$

1

$$v_t = \varepsilon_t - \theta_1 v_{t-1} - \cdots - \theta_m v_{t-m}$$

2

$$\varepsilon_t = \sqrt{h_t e_t} \hspace{6cm} 3$$

$$h_t = w + \sum_{i=1}^{q} \alpha_i \varepsilon_{t-i}^2 + \sum_{j=1}^{p} \gamma_j h_{t-j} \hspace{3cm} 4$$

Among that: MON_t TUE_t WED_t THU_t FRI_t are all dummy variables.

$$MON_t = \begin{cases} 1 & Mon \\ 0 & other \end{cases} \quad TUE_t = \begin{cases} 1 & Tue \\ 0 & other \end{cases} \quad WED_t = \begin{cases} 1 & Wed \\ 0 & other \end{cases}$$

$$THU_t = \begin{cases} 1 & Thu \\ 0 & other \end{cases} \quad FRI_t = \begin{cases} 1 & Fri \\ 0 & other \end{cases}$$

The parameters φ_1 φ_2 φ_3 φ_4 φ_5 are the estimates of the mean of the yield on Monday, Tuesday, Wednesday, Thursday and Friday.

In equation (1), if the parameter φ_j estimated by a given sample is not significantly zero at a particular significance level, it means that the yield of the day is obviously

affected by the condition that "today is day j", then it means that there is a week calendar effect in day j. On the other hand, if φ_j is not remarkably zero and positive, then the condition that " today is day j " makes the average yield of the day significantly higher than the average return, and the week effect is positive ;Similarly, if φ_j is not significantly zero and negative, it is called negative week effect.

3.2. Empirical Test

The parameter estimation process is as follows: In the first step, the model (1) is conducted least squares estimation to check whether the autocorrelation coefficient of the residual v_t is zero so as to determine whether autocorrelation correction is required. In general, autocorrelation correction is required. In the second step, model (1) and (2) are performed gradual regression. In the third step, the residuals ε_t of the models (1) and (2) are subjected to heteroscedasticity tests to determine whether heteroscedasticity correction is required. In general, heteroscedasticity correction is required. In the fourth step, select the appropriate q, p value to estimate the parameters of the model (1…(4) and test the normality of e_t.

Table 1. Model parameter table

	φ_1	φ_2	φ_3	φ_4	φ_5	Normality
ARCH（1）	-0.115	-0.029	0.103	-0.133	0.74***	26400.88
ARCH（2）	-0.096	-0.102	0.087	0.030	0.39***	27425.05
GARCH(1，1)	-0.075	-0.089	0.085	0.083	0.212*	28586.23
GARCH(2，2)	-0.101	-0.110	0.031	0.098	0.253**	11864.13
GARCH(3，3)	-0.131	-0.183	-0.083	0.059	0.230**	6804.93
GARCH(10，10)	-0.216	-0.140	-0.102	-0.052	0.42***	1248.97
AGARCH(1，1)	-0.077	-0.100	0.108	0.091	0.213*	31045.98
AGARCH(2，2)	-0.092	-0.116	0.050	0.112	0.240*	14584.00
AGARCH(3，3)	-0.111	-0.091	0.009	0.129	0.274**	10037.77

Note: * refers to significance level is 10% , ** refers to significance level is 5% , *** refers to significance level is 1%, and all normality tests is significant at 0.0001 significance level.

As can be seen from column 7 of Table 1, all models can not pass the normality test. Therefore, the of the quality of the model can be not judge by the Normality .In theory, GARCH does not require e_t to defer normal distribution, except that SAS ATOREG does not give a method of evaluating parameters for other distributions. When e_t does not meet the requirement of normality, the reliability of the obtained parameter estimation is problematic. In addition, different models have a great influence on the

estimation of φ_1、φ_2、φ_3、φ_4、φ_5,and the sign of GARCH(10，10)parameter also changes with that. Therefore, the higher order is not desirable. However, the GARCH model can improve the estimation of heteroscedasticity model parameters. Therefore, this paper decides to use AR(2)-GARCH(1,1) model in empirical research.

Table 1 and table 2, respectively, list the estimation of week effect of Shanghai A share index and Shenzhen A share.

Table 2 .Week effect of Shanghai Stock Exchange (%)

	Number of samples	φ_1	φ_2	φ_3	φ_4	φ_5
1900-2000	2492	-0.0001	-0.2413**	0.2162*	0.2018*	0.4397***
2001-2010	2418	0.1227*	-0.00366	0.1060*	-0.1153*	-0.0132
2011-2017	1487	-0.0418	0.0642	0.0860	-0.1718**	0.1054
1900-2017	6397	0.0343	-0.0927*	0.1440**	-0.0001	0.1905***

Table 3 .Week effect of Shenzhen A shares (%)

	Number of samples	φ_1	φ_2	φ_3	φ_4	φ_5
1996-2000	1148	0.3390***	-0.1251	0.3514***	-0.1105	0.2795**
2001-2010	2417	0.1481**	0.01433	0.1420**	-0.1210*	-0.0417
2011-2017	1487	-0.0409	0.1307*	0.1614*	-0.1965**	0.0794
1996-2017	5052	0.1371**	0.0168	0.1951***	-0.1410***	0.0664

Note: * refers to 10% of the significance level, ** refers to the significance level of 5%，*** refers to 1% of the significance level.

Table1 shows that except the year from 2001 to 2010, the average yield of Shanghai A share on Friday is positive, whose significance level α is 0.01 and significantly higher than the level of other trading day. In all time, the yield on Wednesday is positive and the significance level α is 0.05. Except 2011-2017, Tuesday's yields were negative and were the lowest in a week. Monday, Thursday earnings level is not significant. Therefore, the Shanghai A shares on Tuesday has the lowest earnings, Friday earnings has the highest level of yield.

As can be seen from Table2, The situation that Monday earnings of Shenzhen A shares is significantly positive in recent years no longer exist; The yield of significance level on Tuesday and Friday was worse; Wednesday earnings in general are positive, and is the highest level Within a week. The yield on Thursday is generally negative and can be interpreted as a callback to the peak of Wednesday's earnings. Therefore, the Shenzhen A shares also have a week effect, but the situation is significantly different from the Shanghai A share index, which is that the highest earnings appears on

Wednesday, and on Thursday it will fall back.

From the two tables, it can be concluded that the average yield on Thursday is general negative, though this effect is insignificant before 2011, after 2011,whatever in the Shanghai or Shenzhen stock markets, the correlation coefficients is significant, which to some degree verify the "black Thursday effect".

4. Explanation

This paper introduces the dummy variables in the GARCH model, which is the innovation of this article. However, when considering the yield of A shares, only the daily closing price is used, and the intraday price range is not taken into account. There are many reasons for the "black Thursday effect" in the stock market, which can be classified into four factors.

- Clearing mechanism. First, the clearing mechanism of Chinese stock market can explain the reason why the Shanghai A share on Friday has the highest yield in a week. It is because of the implementation of "T + 1" clearing system, but due to weekends, "T+3" clearing system is actually complemented on Friday, which contributes to Friday's higher capital costs than the rest day of the week, and high capital costs requires a higher rate of return. Second, because of the uncertainty of future, traders usually choose to sell their stocks and hold money on weekends. However, if people sell the shares on Thursday, they will get the money out of the stock account on Friday, which brings about the low or negative yield on Thursday.

- Emotional factors. Emotional factors refers that investors have better feeling on Friday, because there will be two days off, which causes a low yield on Shanghai stock market on Monday and Tuesday, and a high yield on Friday; When emotional factor is applied to Shenzhen stock market, Wednesday is in the middle of the week, people have more stable mood, so they will make a more rational decision, creating the highest income on Wednesday. On Thursday, there will usually be a call-back.

- Policy. Through the observation of Shanghai stock market, many major news were generally introduced on Thursday. For example, on May 18th,1995, CSRC decided to suspend bond futures trading news suddenly, then stock index quickly rose to the highest point for the whole year in five days, and then fell back sharply, this "5.18 blowout" event also happened on Thursday. In addition, the information on the reduction of state-owned shares also occurred on 14th, June, 2001, which is just Thursday. Due to the long memory of the stock market, stock market participants will therefore form an expectation that the stock price will fall on Thursday, which to a higher degree causes a low yield on this day.

- Expectation. As the rule has been discovered, people will have an expectation and sell the shares they hold before Thursday, creating a "black Thursday effect".

5. Conclusion

The main conclusions of this paper are as follows:

- Shanghai A share has the highest yield on Friday, and the lowest yield on Tuesday, indicating a clear week effect; and Shenzhen A shares has the highest yield on Wednesday ,then Thursday earnings will be significantly decreased .The linkage of A shares yield between the two cities is not obvious.

- There is a "black Thursday effect" in the market, that is, the stock market usually trends down on Thursday. The policy factors、 the clearing mechanism、 emotional factor and expectation can all explain this effect.

- In the empirical study, a careful examination of the data is necessary, but different groups of regression can bring about different results. In this paper, if two-year data is classified for one group, the week effect no longer exists.

- According to the conclusions of the week effect, the regulators of the stock market should distinguish between different markets and different periods, according to the specific performance of the market effect, thus formulate corresponding regulatory policies.

- When investors generally find the presence of the week effect, they will utilize this phenomenon to change their investment strategy. In this way, with increasing arbitrage behavior, week effect will begin to gradually weaken or even disappear.

According to the conclusions, we have some inspirations. When investors make trading choices, it should be considered based on the national economic policy. The fundamentals, market, psychological and technical aspects also should be taken into comprehensive account and analysis, combined with their own risk Preferences, so as to develop appropriate trading strategies, thereby reducing the decision-making mistakes to maximize investment income.

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