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A Study on the Bursting of the Stock Market Bubble and the Mean Reversion: Evidence from the Southeast Asia

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Abstract

This paper uses technical indicators to capture the stock market bubbles in seven regions of Southeast Asia, and observes the time required for the bursting of the captured bubble and the mean reversion after the bubble burst. It can be seen from the empirical results that the bubbles captured by the technical indicators will generally rupture within 10 weeks, and will return to the 13-week moving average after the bursting. Hong Kong, South Korea, Japan and Singapore have a shorter time to return to the 13-week moving average, while the times of the mean reversion in Malaysia, Thailand and China are longer and different. Therefore, the phenomenon of the mean reversion in the mature markets are more obvious, and the emerging stock markets are unstable, so the mean reversion time is difficult to determine.

Keywords: Technical Indicators; the Mean Reversion; Stock Market Bubbles;
JEL Classification: G15

1. Introduction

The stock market bubble and the mean reversion has always been the focus of academic community. This paper attempts to use the technical indicators to study the stock market bubble and the mean reversion phenomenon. The three technical indicators used are the stochastic indicator (the K value), the relative strength indicator (the RSI value) and Bias. When the K value and the RSI value are both greater than 90, and the Bias is greater than 10%, the current stock price index is overheated compared with the history, so it is considered to exist a bubble. On this basis, this paper tries to observe the bubbles captured by the technical indicators. When the bubble fell more than 5% within 12 weeks (3 months), the bubble was considered to have burst. We use the 13-week moving average as the mean line to observe the time that the stock price returns back to the mean after bubbles bursting.

This paper takes seven regions in Southeast Asia: Hong Kong, Malaysia, South Korea, Thailand, Japan, China and Singapore as research objects, analyzes the stock market bubble from the perspective of technical indicators, and studies the bubble bursting time and the mean reversion.

2. Literature Review

The traditional efficient market hypothesis believes that stock returns are unpredictable, but obey the random walk process. The widely recognized stock price model is geometric Brownian motion. However, some scholars believe that stock returns have Mean Reversion. Mean Reversion means that the stock price or stock return, whether temporarily higher or lower than its mean value, will return to the mean with a high probability after a period of time. Poterba et al. (1988) conducted a study on the mean reversion of stock log-return yields, and found that the stock price will return to the mean in the long run. Balvers et al. (2000) selected data from 18 developed country stock markets as a sample during 1969-1996, to find evidence that stock returns had mean reversion in long-term.

The mean return theory coincides with the theory of value investment, that is, stock prices always fluctuate around their "intrinsic value". Although the fluctuation of the stock price is normal, in the long run, prices have a response to their "intrinsic value". The trend is that the price of any stock will not deviate from the mean value for a long time. Many scholars try to invest according to the theory of the mean reversion. DeBondt et al. (1985) first analyzed the returns of the US stock market. They ranked stocks according to the yields of the past 3-5 years. They found that stocks with higher past yields performed poorly in the future, while stocks with worse past yields performed better in the future. The yield of the loser's portfolio is higher than the winner's portfolio by nearly 25% after three years. In addition, Baytas et al. (1999) conducted research on seven industrialized countries. Liew et al. (2000) selected ten developed countries around the world as research objects. Their paper results prove that the use of mean reversion theory to guide investment can be profitable. Contrary to that, Lo and Mackinlay (1988) used the US stock market weekly data to find opposite evidence of mean reversion. Jegadeesh et al. (1993) found that momentum strategies can achieve the excessive return in the US stock market. They buy stocks with better performance and sell stock with poor performance, which based on market performance over the past 3-12 months. The stock portfolio yields an average of 1% per month in the next year. In short, there is always debate about whether there exists the mean reversion phenomenon.

From the perspective of behavioral finance, Barberis et al. (1998) constructed the BSV model, which is based on two aspects of cognitive psychology: conservative bias and representative bias, and explained how the investor decision model leads to the overreaction and insufficient response of the stock price change, and then cause the mean reversion. Daniel et al. (1998) proposed the DHS model to analyze from the perspective of information asymmetry. If investors have positive private news, investor's confidence will increase with the public information containing noise gradually releasing, causing stock price overreacting. However, as private information becomes public, the stock price will come back to the mean. Hong et al. (1999) proposed the HS model, from the perspective of investor behavior bias, that when the new information emerges, asset price changes depend on the way in which different investment entities interact. In terms of the investors' subjective judgment and reactions to information, the three models of BSV, DHS and HS strongly explain the phenomenon that stock price deviates from the intrinsic value and subsequently return to the mean.

Regarding the research on the mean reversion of the stock market, the main focus is on discussing whether the reversion phenomenon exists and its causes, but the starting point of the mean reversion process and the time to return to the mean are not discussed much. Song et al. (2005) believe that the cycle of mean reversion is “random walk”, that is, the time interval of reversion is not predictable, and the time the stock price returns to the mean is different. If we can find the distribution of the mean reversion time cycle, it will be a major advance for the mean reversion theory. This paper attempts to apply three bubble warning conditions of technical analysis in the southeast Asian stock markets to identify bubbles :

1. the K value of the stock price is greater than 90;
2. the RSI value is greater than 90;
3. the Bias is greater than 10%

When these three conditions are met, the current stock price is considered to be a bubble, which is at a high point, then the bubble will burst and the stock price will return to the mean. Then we study the distribution of the cycle of the return to the mean after the stock market bubble burst in the seven Southeast Asian regions.

3. Research Method

This paper predicts the stock market bubble and analyzes the mean reversion, which is based on the stock market gravity line introduced by Taiwan investment expert Hu Liyang (2009). He thinks that the track line consists of three lines, and the middle track line is 51-day moving average. In this paper, the weekly data is used, therefore, the 51-day moving averages of daily prices are changed to the 13-week moving averages of the weekly data; the upper track is the +10% of the middle track, the lower track is -10% of the middle track.

Figure 3.1: the stock price of HSI with three lines

Taking the Hong Kong Hang Seng Index (HSI) as an example (Figure 3-1). When the stock price rises to the upper trajectory, it means that the stock price exceeds the middle trajectory (the mean value) by +10%, so the stock price is too high relatively, brewing a bubble, and it's a selling point. The principle of gravity will pull the stock price back to the middle trajectory 13WMA (13-week moving average). On the contrary, when the stock price falls to the lower trajectory, it means that the stock price falls below the middle trajectory by -10%, it is a buying point, because the principle of gravity will make the stock price rebound to the middle trajectory 13WMA.

This paper uses the weekly data of the stock price index of seven regions in Southeast Asia, which is from January 1, 1993 to May 31, 2019. When the K value of the stock price index and the RSI are both greater than 90, and the Bias is greater than 10%, the current stock price index is considered to be a bubble. Assuming that the stock price bubble appears at the time t_0, if the stock price index falls below 5% within 12 weeks after the time t, the bursting time of the bubble is considered to be t_0 to t, as defined below:

$$BT = t - t_0 \quad (Declines_t < -5\%, \quad t_0 \leq t)$$

$$Declines_t = \frac{P_\tau - P_t}{P_t} \times 100\%$$

$$P_\tau = \min\left(P_{t+1}, P_{t+2} \cdots\cdots, \quad P_{t+12}\right)$$

Where,

BT : the bubbles' bursting time

t : the bubble burst at time t

t_0 : the bubble appear at time t_0

$Declines_t$: the max declines of the stock price index in 12 weeks;

P_t : stock price index at time t;

P_τ : stock index price at time τ;

When the stock price index bubble bursts, the time taken for each bubble in each region to return to the 13-week moving average is calculated separately. The specific definition is as follows:

$$13MA_t = \frac{1}{13}\sum_{n=0}^{12} P_{t-n}$$

$$RT = t' - t \quad (P_{t'} < 13MA_t)$$

Where,

$13MA_t$: 13 weeks moving average of the stock price index;

RT : the reversion time;

t' : the stock price index drops back to the 13-week moving average at time t'.

4. Empirical Results

Using the bubble warning conditions (K>90, RSI>90, Bias>10%) to capture the bubbles in seven regions of Southeast Asia, and analyze the time from the bubble appearing to the bubble bursting (Declines>5%), that's the bubble bursting time (BT). On this basis, this paper further discusses the phenomenon of mean reversion after the bubbles burst, and observes the time that the stock price index returns to the 13-week moving average after the bubble bursts, that's the mean reversion time (RT).

1. Hong Kong

Figure 4-1: the bubble points of HSI

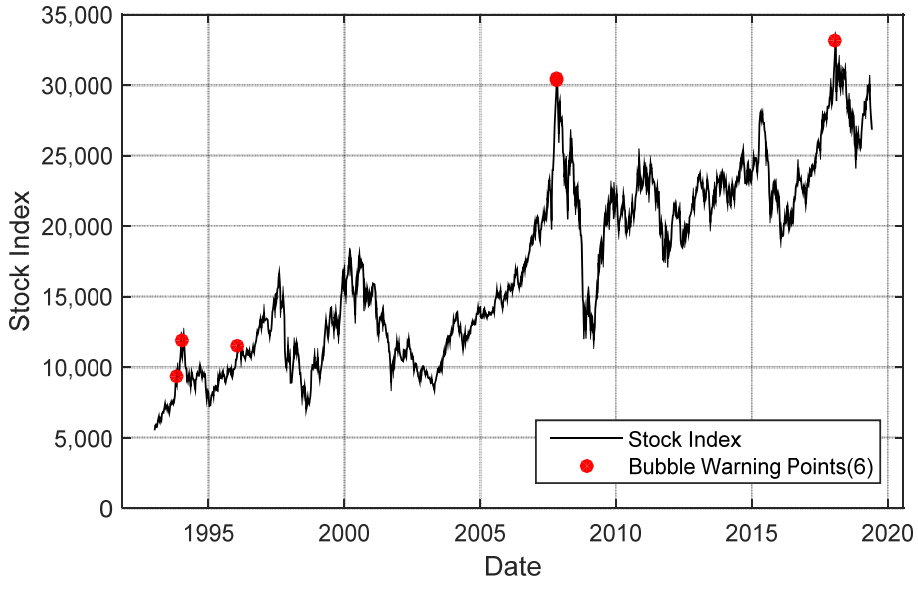
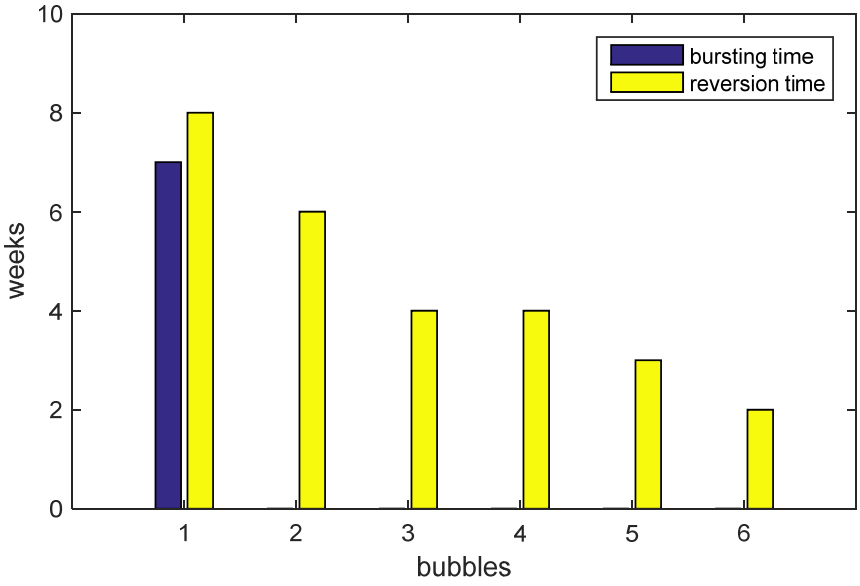


Figure 4-2: the bursting time and reversion time of bubbles in HSI



We can see from Figure 4-1 that the Hong Kong stock market has captured a total of six bubble warning points under the warning conditions, and Figure 4-2 shows the bursting time and the reversion time of the six bubble warning points. The blue bar in Figure 4-2 indicates the bubble bursting time, which is the time required from the bubble point appearing to the bubble bursting (the drop of stock price index excesses 5% within 12 weeks). The yellow bar is the mean reversion time, which is the time required from the bubble bursting to the stock price index falling back to the 13-week moving average. The vertical axis represents the number of weeks, the horizontal axis represents each bubble captured (the first bubble, the second bubble …… the sixth bubble). From the empirical results, the first bubble point in the Hong Kong stock market bursts in 7 weeks, and the mean reversion time is 8 weeks. The other five bubbles spend 0 weeks bursting, that is, the maximum declines of these bubbles are all more than 5% in 3 months when the financial bubbles appeared, and they return to the 13-week moving average within 2 to 5 weeks. Therefore, the Hong Kong stock market bubble captured by the technical indicators will burst quickly, and the stock price index will return fast to the mean after the bubble bursts.

2. Malaysia

Figure 4-3: the bubble points of KLSE

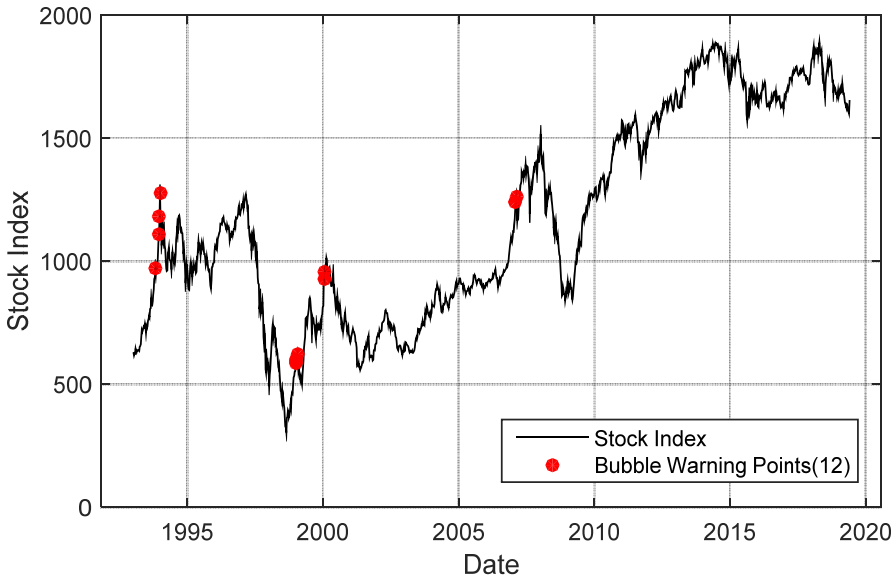


Figure 4-4: the bursting time and reversion time of bubbles in KLSE

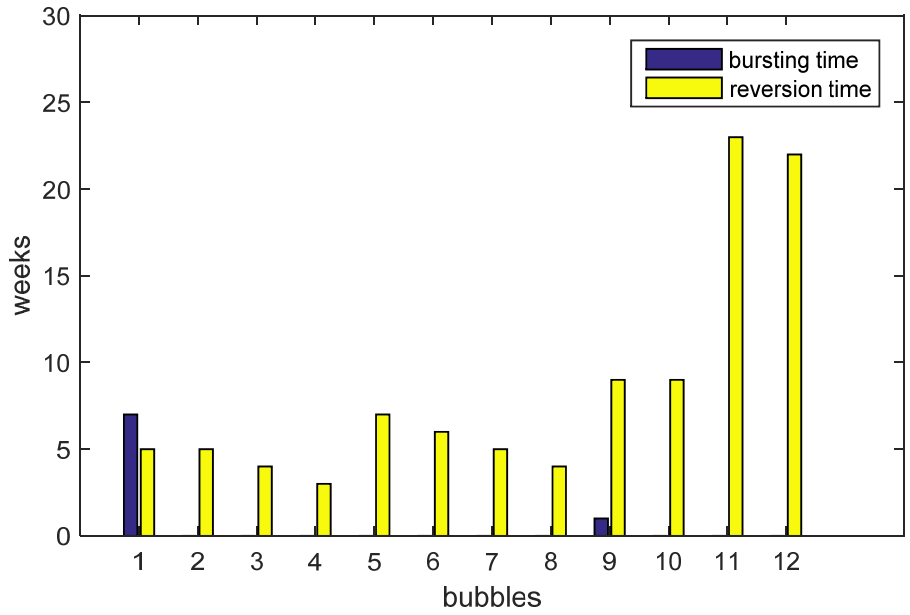


Figure 4-3 shows that there are 12 bubbles in the Malaysian stock market. From Figure 4-4, it can be found that only one bubble bursting time takes 7 weeks, and the rest of the bubble warning points usually burst in this week or the next week. The time of 12 burst bubbles to return to the 13-week moving average was generally less than 10 weeks, but there are two bubbles taking 23 and 22 weeks respectively to return to the mean. It can be seen that the Malaysian stock market bubbles captured by the technical indicators will burst fast, but the time they needed to return to the moving average after the bubble bursts varies.

3. South Korea

Figure 4-5: the bubble points of KS11

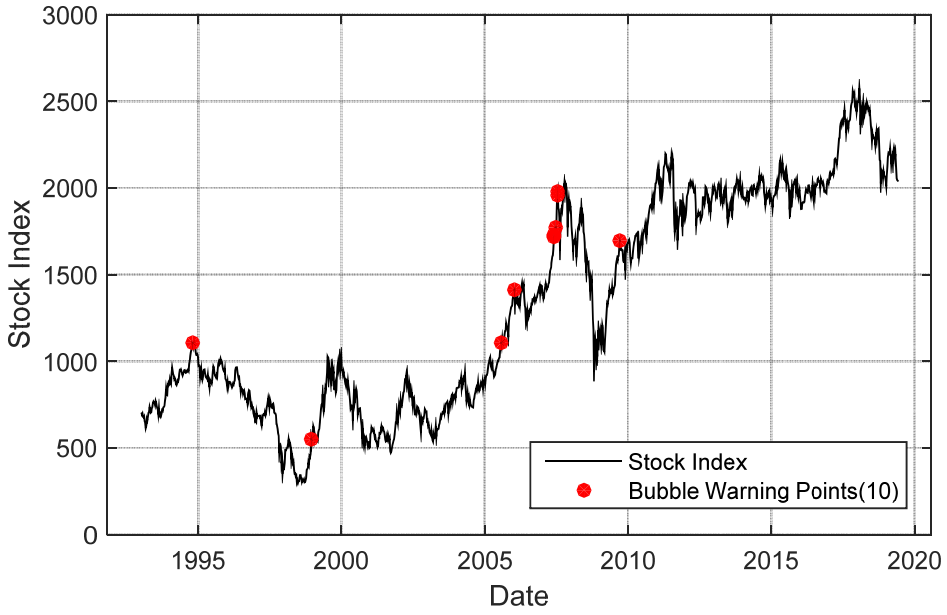


Figure 4-6: the bursting time and reversion time of bubbles in KS11

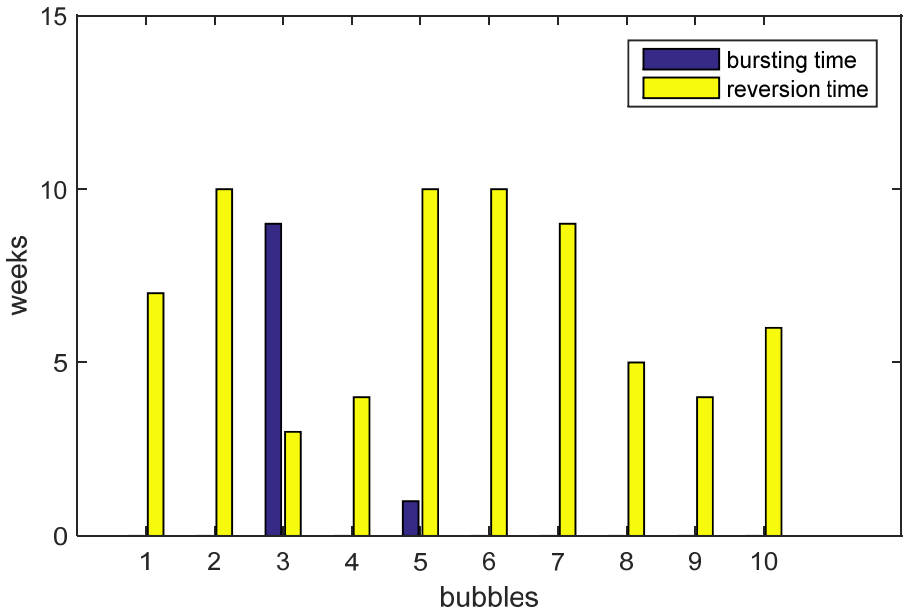


Figure 4-5 shows that there are 10 bubbles in the South Korean stock market. It can be seen from Figure 4-6 that most bubbles generally burst in the week, but there are 2 bubbles with a bursting time of 9 weeks and 1 week, respectively. The reversion time of these bubbles is within 10 weeks. Thus, the South Korean stock market bubble captured by the technical indicators will burst fast, and the stock price index will return to the mean fast after the bubble bursts.

4. Japan

Figure 4-7: the bubble points of N225

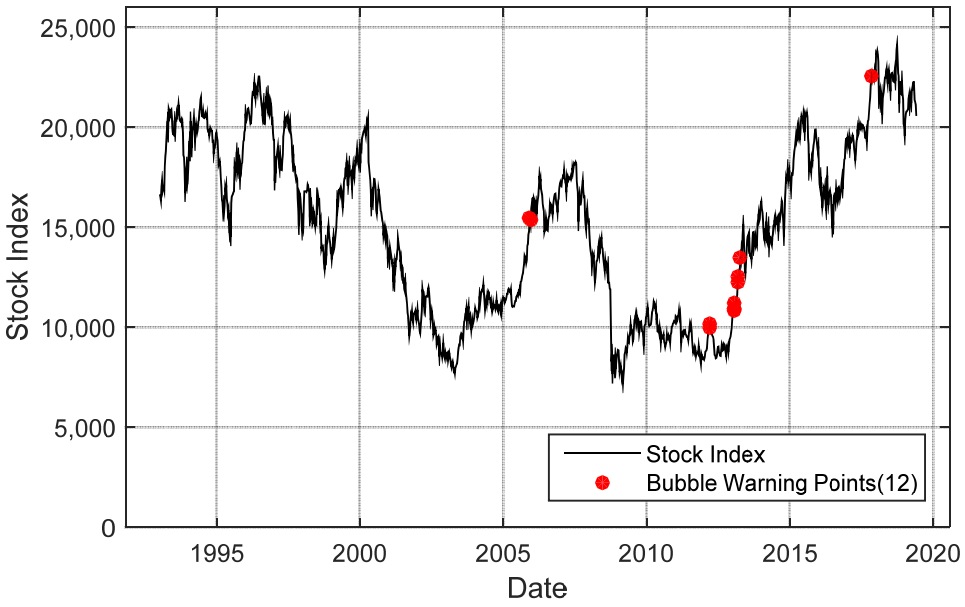
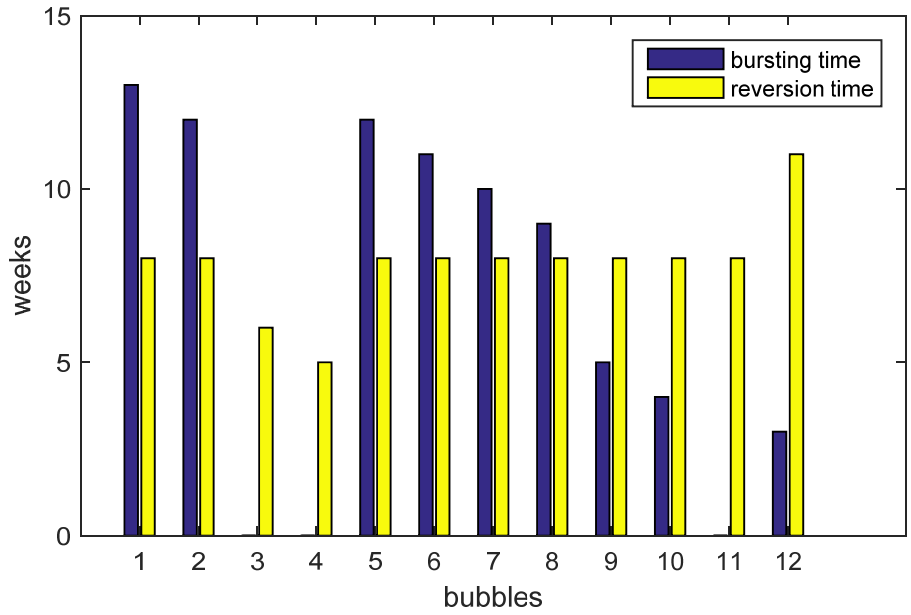


Figure 4-8: the bursting time and reversion time of bubbles in N225



It can be seen from Figure 4-7 that the Japanese stock market has captured 12 bubble points under the bubble warning conditions. It can be observed from Figure 4-8 that the bursting time of these bubble points generally takes about 10 weeks, and the time which returns to the 13-week moving average after the bubble burst generally requires around 8 weeks. Therefore, the Japanese stock market bubble captured by the technical indicators has a different time of bursting and is generally slower, but the stock price index returns fast to the mean after the bubble bursts.

5. Thailand

Figure 4-9: the bubble points of SETI

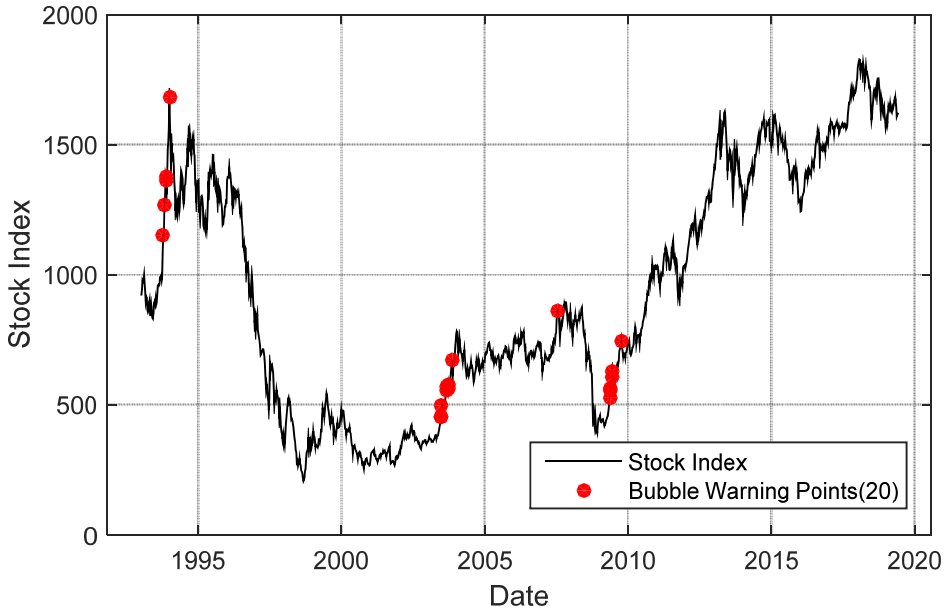


Figure 4-10: the bursting time and reversion time of bubbles in SETI

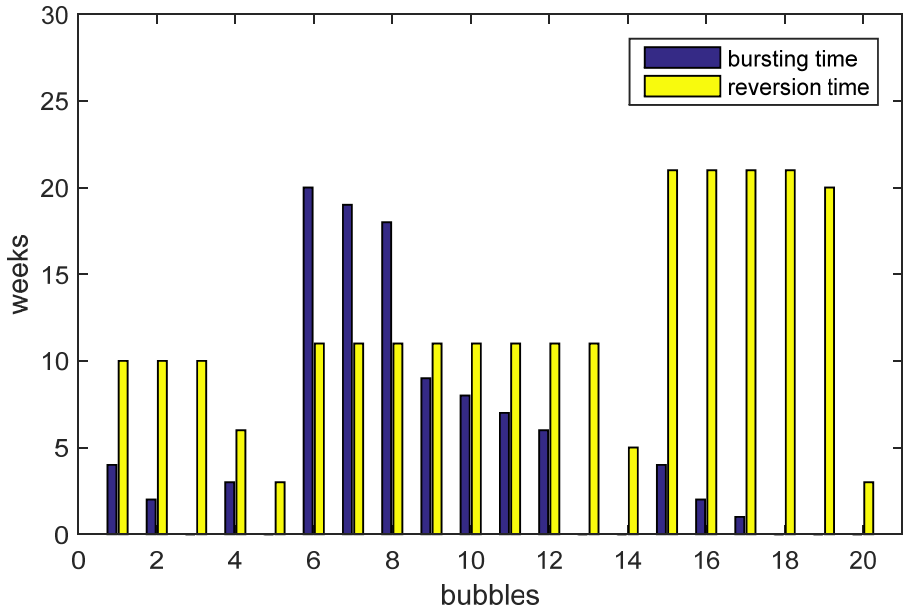


Figure 4-9 and Figure 4-10 indicate there are 20 bubbles in the Thai stock market, and the bubble bursting time is generally shorter, all within 10 weeks, but there are still 3 bubbles that will take about 20 weeks to burst. The time to return to the moving average after the bubble burst is generally around 10 weeks, while there are still 5 bubbles that need about 20 weeks to return to the mean. It can be seen that the Thai stock market bubble captured by the technical indicators has different time to burst, which is as short as 1 week or longer than 20 weeks. The time needed to return to the moving average after the bubble burst is also different.

6. China

Figure 4-11: the bubble points of SHI

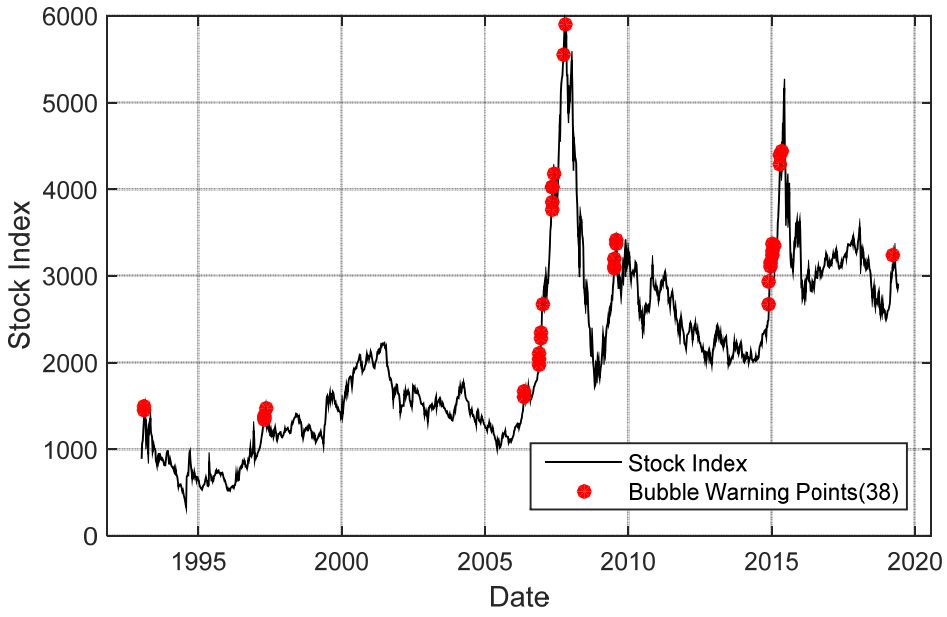
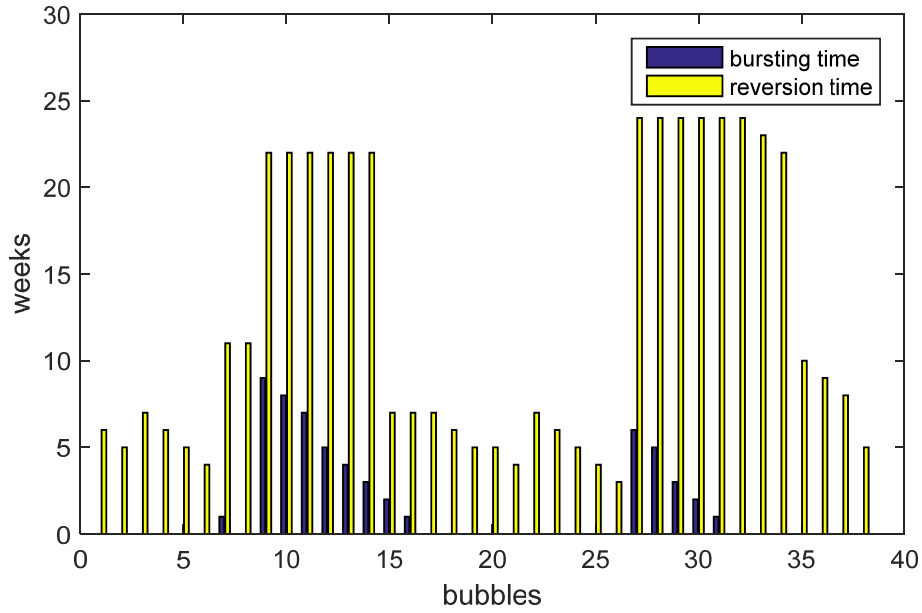


Figure 4-12: the bursting time and reversion time of bubbles in SHI



We can see from Figure 4-11 and Figure 4-12 that there are 38 bubble warning points in Chinese Shanghai stock market. Most of the bubbles burst in the week, the longest bursting time is only 9 weeks, and the mean reversion time varies from 3 weeks to 24 weeks. Thus, the Chinese stock market bubble captured by the technical indicators will burst fast, while the time to return to the mean value after the bubble burst is not necessarily the same.

7. Singapore

Figure 4-13: the bubble points of STI

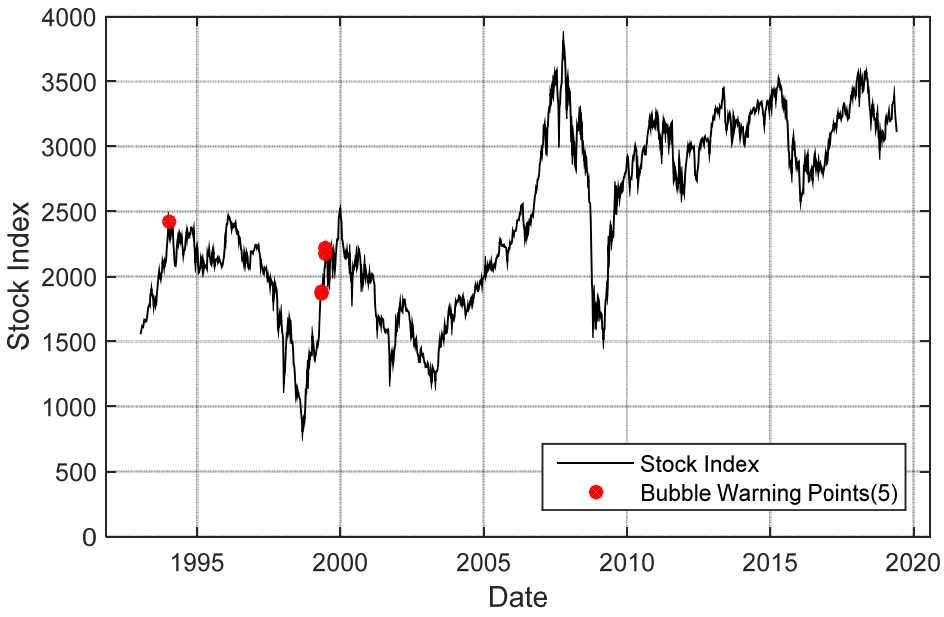
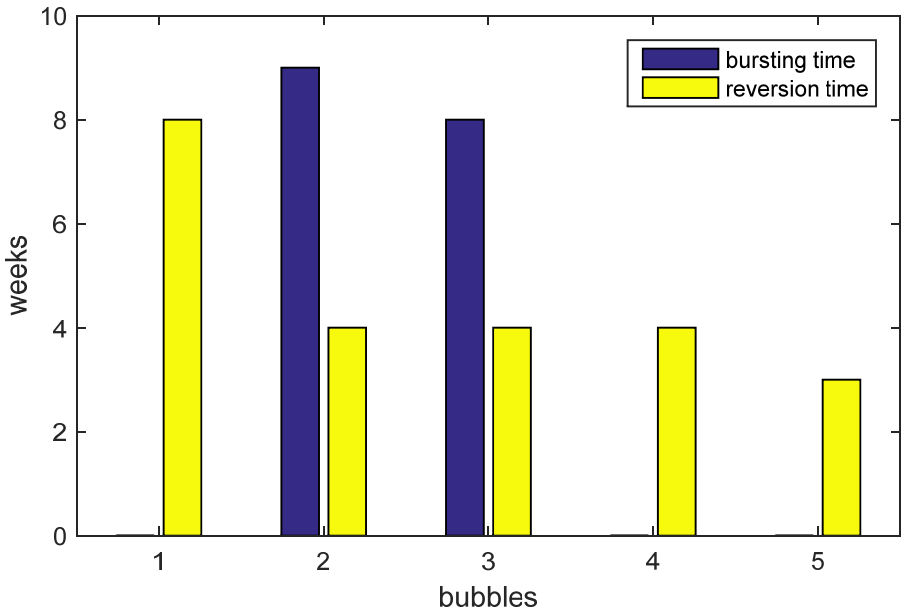


Figure 4-14: the bursting time and reversion time of bubbles in STI



As you can see from Figure 4-13, the Singapore stock market has captured a total of five bubbles. Figure 4-14 shows that three bubbles burst in the week, while the other two bubbles take 9 weeks and 8 weeks to break. After the bubbles bursting, they return to the 13-week moving average within 8 weeks. Therefore, the Singapore stock market bubble captured by the technical indicators will burst fast, and the stock price index will return quickly to the mean after the bubble bursts.

5. Conclusion

This paper uses the three technical indicators (K, RSI and Bias) in the technical analysis to capture the stock market bubbles in seven regions of Southeast Asia. From the empirical results, it can be seen that in addition to Japan and Thailand, the other five regions' bubbles captured by this method will burst within 10 weeks. Because the technical indicators depend on past historical trends, if the economy of the region is optimistic and lead to a bull market, using this method to capture the stock market bubble will be distorted. Therefore, using this method to determine whether there is a bubble in the stock market should be combined with the current economic development of the region, and the results will be more accurate.

The paper not only tries to capture the stock market bubbles, but also further studies the phenomenon of mean reversion after the bubbles burst. The mean reversion times of Malaysia, Thailand and China are varied. It takes more than 20 weeks for the stock price index to return to the 13-week moving average after bubble burst. While the reversion times of Hong Kong, South Korea, Japan and Singapore are only around 10 weeks. This shows that the stock market is relatively matured, the mean reversion after the bubble burst is more rapid and obvious, while the mean reversion of the stock markets in the emerging markets are weaker.

There are still few studies on applying technical indicators to capture the stock market bubble. This paper attempts to explore it and hopes to provide new research ideas for the stock market bubble and the phenomenon of the mean reversion.

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