Applying Crisis Warning Conditions of Technical Analysis to Predict Stock Market Bubbles in China, Hong Kong and Taiwan

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Abstract

In this paper we will apply the technical analysis technique to investigate the accuracy of conventional crisis warning conditions in technical analysis. The crisis warning conditions are 3 measures including RSI, MACD and Envelope deviation and they are applied to the stock market data of China, Taiwan and Hong Kong from 1995 through 2016. Our empirical results show that firstly, there are 36, 18, and 6 bubbles in the respective stock markets. Secondly, the drop in stock price greater than 10% with probability greater than 50%, needs six months for China market, two months for Taiwan market, while it only need one month for Hong Kong market. These evidences show that the number of bubbles is higher for China market and is fewer for Hong Kong market, and the impact duration is longer for China market. The reasons for the bubble warning and impact duration may be due to the composition of the three markets' investors: there are more retail investors in China market while there are more institutional investors in Hong Kong market.

Keywords: Stock Market Bubbles, Technical Analysis, Deviation, Moving Average Line **JEL Classification:** G15

1. Introduction and Literature Review

Since 1637, the crisis of Tulip Mania, to 2009 of subprime financial crisis, these many economic crises occurred during 372 years. Almost every economic crisis will cause great depression and dramatic drop of stock price. In this research we will apply pure technical analysis technique to investigate

whether the conventional over buying signals will accurately cause extensive price decline. In general, the stock price analysis has two approaches. One is fundamental analysis which will compare the actual price with a fair value calculated by some appropriate asset pricing model. For example, Campbell and Shiller (1998, 2001), they use price earnings ratios and dividend-price ratios as forecasting variables for the stock market. If the actual market price deviate this fair value to a large extent, then this will be viewed as a signal of over buying situation.

Other strands of fundamental analyses for the test of stock market bubbles are cointegration test in Engle and Granger (1987), Euler test in West (1988), dynamic regression method in Zhou (1998), price-earnings ratio in White (2000), and the similar methods are used in Pan (2000) and Wu et al. (2004).

The uses of technical analysis in stock markets are actually prevailing in practical financial dealing, although most of the empirical evidences show that stock markets are at least weak-form efficient and any technical analysis can't generate consistent excess returns. Shi (2013) analyzed the effectiveness of technical analysis for the stock markets of Taiwan, Hong Kong and China. He used daily data and from which 7 technical indicators including KD, MACD, quarter moving average, transaction volume, neck line, supporting and resistance lines to investigate the efficacy of technical analysis during Asian financial crisis (1997), dot-com bubble or internet bubble (2000) and subprime financial crisis (2008). In this paper, we will employ technical analysis to investigate the predictability of stock market bubblers rather than the efficiency of trading rules based on technical indicators and the resulting test of market efficiency. We apply the technical analysis to predict stock market bubbles by using some indicators from price data.

2. Research Method

The weekly data we will investigate are three stock indices including Shanghai Stock Index (SHI), Hang Seng Index (HSI), and Taiwan Weighted Index (TWII), and the dates are from January 6, 1995 to December 30, 2016.

The method we use to predict a financial bubble is based on three indicators of too-hot conditions of over buying in stock market. The original idea of strategic buy and sell was proposed by Granville (1976), as shown in Figure 1. In that figure, he used moving average of 200 daily stock prices, whereas the points marked by 1B to 3S are the first buying point and the third selling point. Our too-hot or stock market bubbles are the points like 4S which means the stock prices are deviating the average prices too far and forming a possible bubble and thus will be a drop down in a relative large extent.





In the following investigations, we use the weekly data instead of daily data to catch a mid-term trend. Furthermore, we use 13 weekly data average to form an envelope line, the envelope line are constructed from +5% to +15%, a total of 11 upper envelopes, a higher percentage vias means higher possibility of price drop down.

In addition to the price biases from 5% to 15%, we add two other technical conditions: one is RSI (Relative Strength Index) and the other is KD (Stochastic Oscillator), we will need these two indicators of over 90 to show the overbuying situation and to have a higher accuracy of predicting stock market bubbles. The situations are shown in Figure 2 and Figure 3.



Figure 2: Moving Average Envelope of HSI

Figure 3: Moving Average Envelope and RSI and KD of HSI



Figure 2 shows the 13 week average prices envelope with upper envelope of 10%. Figure 3 shows the envelopes with RSI and KD of over 90. Both Figure 2 and Figure 3 are using Hong-Kong HIS as examples. Here, we want to mention one important point of using RSI and KD indicators of over 90. As shown in Figure 4, without RSI and KD of over 90, there will be no large drop down in stock price. The situations in Figure 4-1 are different that they satisfy three conditions: price hits upper envelope, and both RSI and KD are greater than 90, then there have the following drop down of stock price. Therefore three conditions as a whole are better than only price deviations.









Our empirical investigations can be visualized in two set of diagrams. The first set is a bubble warning points which indicates the date of stock price satisfying three bubble conditions, as shown in Figure 5, 7, and 10 of respective markets: SHI (Shanghai Stock Index), HSI (Hang Seng Index), and TWII (Taiwan Weighted Index). If the three conditions are really good predictive indicators of stock price bubbles, then the stock prices following the bubble warning points should have large drop down of prices and it shows the usefulness of technical analyses applied to predict stock price bubbles.

To investigate the effects of upper envelope (from +5% to +15%, each step increases by one percentage point) and to observe the price adjustment duration, we allow the observation period from 1 month to 6 months, each step increase by one month.

We define:

$$Drop(m) = \frac{Min(m) - Max(m)}{Max(m)}$$
, where

m = observation months,

Drop(m) = the maximum stock price drop down in m months,

Min(m) = the minimum stock price in m months,

Max(m) = the maximum stock price in m months.

And we define the probability of stock price drop among less than 5%, between 5% and 10%, larger than 10% as follows:

$$P(<5\%) = \frac{n(<5\%)}{N}; P(5\%\sim10\%) = \frac{n(5\%\sim10\%)}{N}; P(>10\%) = \frac{n(>10\%)}{N}$$

Here,

P = the probability of stock price drop,

N = the number of points satisfying three bubble conditions,

n(< 5%) = the number of drop less than 5% in m months.

3. Empirical Results

We empirically investigate three stock market including SHI (China), HSI (Hong Kong) and TWII (Taiwan), the weekly data from 1995-2016. Each market has two results (Hong Kong market has three figures) represented in Figure 5 to Figure 11.

SHI 6000 5000 4000 Imm .000 P10 MM 2000 1000 SHI Bubble Warning(36) 1995 1997 1999 2001 2003 2005 2007 2009 2011 2013 2015 2017 2019 Date

Figure 5: Bubble Warning Points of SHI













Figure 9: The Distribution of Drop in HSI(RSI=85, K=85)





Figure 10: Bubble Warning Points of TWII

Figure 11: The Distribution of Drop in TWII



The first figure and the second figure for each market is to identify the stock price satisfying the three too-hot conditions, hence in an ideal situation it should follow a large drop down of prices to be qualified as a good predictive indicators of stock market bubbles. The second diagram represents two dimensional extention analyses: the vertical 6 diagrams represent the length of observation period, from one month to six months, to see the effect of time. In the other direction, the horizontal way of 11 diagrams represent the deviation degree from the 13 week moving average, the deviations from the mean are from 5% to 15%.

For any individual box in the figure, there are two things need to explain. First, the triplet (1, 5, 36), for example, represents (months of observation, bias (%), number of bubbles). The second thing to explain is the bar in the box, the three bars represents the frequency of price drop down from less than 5%, between 5% and 10%, and larger than 10%. Given this understanding, we can see the results from Figure 5 to Figure 11.

We can make observation and draw some general conclusions:

Firstly, the number of price bubbles, SHI has the greatest number followed by TWII and HIS has the smallest number of price bubbles. This may be due to the three markets participants: the Hong-Kong market is a developed market and the investors are mostly institutional, on the other hand, most China SHI market participants are retail investors, the price movement and duration last longer than Hong Kong market. The Taiwan market lies between the two.

Secondly, the extent of upper envelopes is different for the three markets, so the structure of the market will influence the volatility of the stock prices.

Thirdly, for the Hong-Kong market when the bias is 13%, there are two bubbles and the drop downs are all greater 10%.

Fourthly, the extent of bias in China SHI market doesn't change the distribution of price drop down very much, it means the envelopes have the same effect in general.

4. Conclusion

In this paper we investigate the price bubbles of three markets including China SHI, Hong Kong HIS and Taiwan TWII by using three technical indicators. Instead of using technical analysis to test its efficacy and hence the efficiency of the financial market, we use technical analysis to predict stock market bubbles. In general, we find that our three conditions of too-hot or overbuying situation are suitable for predicting stock market bubbles.

Further, we find the constitutents of the investors in each of the market will influence the degree of stock price volatilities and the speed of adjustment. The more developed market such as Hong Kong, the volatility is smaller and the adjustment speed is faster than the less developed market.

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