The Feedback Model and Formation of Bubbles

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Abstract. This paper aims to summarize Shiller's point of view regarding the Feedback Model and how humans react to the price bubble. It introduced the formation process and measurement method of foam of bubbles in detail. Many phycologists have indicated several principles and perspectives regarding human behaviors in support of the formation process. Moreover, this paper indicated several circumstances and measurements of bubbles, along with historical evidence.

Keywords: Feedback Model; Bubbles; Inefficient Market; Information Asymmetry; Market Sentiment.

1. Introduction

1.1 The Feedback Model and Bubbles

The Feedback Model is also known as the price-to-price feedback theory. The theory was initially recognized in official terms of Positive Feedback Trading in 1990 by De Long, Shleifer, Summers, and Waldmann (1987). They concluded that investors under such a model "buy securities when prices rise and sell when prices fall." Rational speculators expect to purchase it today and hope to sell it for a higher price tomorrow. As the speculative price increases, investors seek the opportunity to succeed in their investment and may further expect price increases of the attractiveness of public attention (Shiller, 2003). This led to different expectations in the increase of price. Shiller further claimed that this process increases the demand of investors as well as the price rise for another round. The cycle continues and eventually forms a bubble due to price and demand expectations. The bubble thus begins with the stage of good news in the market. Although many investors may not react immediately to the good news due to misoneism, their perspective and reaction to the market will change slowly. However, the "bubble" will not sustain since this formation is only due to public expectation. If the expectation is volatile, the bubble will ultimately burst and cause a price decrease. This could lead to market anxiety; the public is pessimistic about their expectations. The negative reaction causes downward price movements propelling further downward price movements until they reach an unsustainable level.

1.2 Reason for Feedback Model Formation

The Feedback Model exists only through public discussion instead of in the financial or economic textbook. It did not affect how other scientists experienced some experimental evidence in the Models. Several reasons that cause the formation of bubbles and the utilization of the Feedback Model.

Bubbles formed due to "follow[ing] the herd," indicated by John Maynard Keynes in The General Theory (1936, pp. 157-58). This is caused by the concern of how others will access market information. People lose their rational thinking as they obtain information from the public. Sharfstein and Stein (1990) indicated several forces that lead the herd behavior in investment and cause the formation of a bubble. People tend to imitate others' investment decisions when the information is inefficient and causes irrationality in the market. This phenomenon is where investors cease doing their own analysis and follow the "herd." As a result, this investment is not very profitable, and it has a well-known history of massive movement on unfounded support during market rallies and falls. The following trend causes sudden investment or market withdrawal, which leads to bubble formation and bursts. Additionally, herd instinct affects the Dot-com Mania in the later 1990s and early 2000s. The high expectation of internet-based businesses led to the rise, persistence, and eventual fall of Internet stock prices. The article by Ofek and Richardson (2003) indicated three stages of the bubble formed in the internet business field. The price begins to increase with short-sale restrictions on

internet stocks. Then, data and trading histories reflect the inter-relationship between heterogeneity and price. The internet bubble burst due to lockup expirations and inside selling.

Another reason of bubble formation is the psychological perspective. Psychologists have also found that the bubble will form again if people analyze the historical stock price and variability in investment decisions. This is due to human expectations in the future having some types of systematic bias. The point of view is supported by many other phycologists in which people make predictions based on past stock patterns into types of categories without close attention to probabilities in matching. By the same principle, people may tend to match stock price patterns into salient categories, such as dramatic and persistent price trends, thus leading to feedback dynamics, even if these categories rarely appear in fundamental underlying factors.

2. The Formation of Bubbles

2.1 Stages of Bubbles

The formation of the bubble can be identified in four stages: excitement, boom, panic, and bursts. During the beginning of the stage where the good news occurs, many investors waited to react to the appearances in the market. However, they will start obtaining diverse information from others, news, the internet, etc., to change perspectives. Conservative investors with different education levels, investment experiences, and logical structures have diverse sensitivity to new information in the market. Investors and arbitrager begin their reaction in making profitability. In reality, arbitragers react more rationally compared to optimistic feedback investors. However, arbitragers do not always know the inside resource or always know the information before positive feedback from investors (Yang, 2011). These people will take advantage of the gap when information is released, and price adjustments are made. Arbitragers under the gap period will re-evaluate the stock price and begin to purchase massive stocks. By doing this, the stock price pushes up, and consumer demand increases, further accelerating the price rise. The price increase causes feedback traders to have higher anticipation of earnings. The loop begins when investors compete with the purchase rate and cause the price to continue to increase, and other investors follow on. The bubble boom and reaches the highest-level point.

The phenomenon is supported by an experiment by Edwards (1968) that compare human behavior with the outputs of Bayes's theorem. The theory regards the optimal and rational reaction based on new information. The experiment aimed at opinion changes orderly and proportional to Bayes's theorem. Conservatism misinterprets the data and often chooses to retain it with its original estimation. According to Edwards, investors need to adequately organize the information they have in order to deliver the best estimation. As many investors hesitate at the beginning to react to new market information, the gap between such price changes brings opportunities for arbitragers to boost the price. The price boom sustains only when traders' and arbitragers' demand increase. On the other hand, Arbitragers keep adding noise to predict future prices to boost their earnings. The bubble will not form without assistance from both the arbitragers and feedback traders. Arbitragers can be seen as the bubble producer, and feedback trader is the promoter.

After such a long run of maintaining and adding up price level, the bubble cannot sustain for long and begin to burst. When investors begin to be skeptical about the price, the market begins to panic, and the price starts to fall. However, arbitragers will leave enough time to sell off and gain the most benefit out of the action. Feedback traders anticipate the decrease in stock price and sell-off as well. They will not take reaction as quickly as arbitragers; thus, they do not gain too much or have the possibility of gaining nothing. Other investors in the market become the victim of inaccurate predictions. The herd behavior is reflected in the action of sell-off the stock when the market appears to be unstable. The bubble bursts quickly, and prices fall to an unsustainable level.

2.2 The Psychological Perspective of Bubbles

The phycology principle of "biased self-attribution" will promote the feedback supported by Daniel, Hirshleifer, and Subramanyam (1999). Psychologists claim that people often confirm the validity of actions due to high abilities yet disconfirm their actions to bad luck. The bubble is the issue that caused and served as fundamental to human psychology and behavior. Such as the example of the Ponzi scheme, which further showed human behavior and speculative bubbles. The Ponzi scheme is a form of fraud that lures many investors with rounds of high returns. This scheme continues to operate sustainably as new investors contribute more funds and no investors demand full repayment. It is attached closely to the bubble since the market continues to have high returns, which increases the plausibility and investors' enthusiasm, causing the behavior to be close to reality. As the public attention and discussion topic focus on the speculative market, wishful-thinking theories in forming a new era continue to lead the relentless upward through word-of-mouth and social media.

Moreover, Marimon, Spear, and Sunder's (1993) experiments showed that bubbles repeat when people use past experiences to form predictions. This claim is further supported by psychologists Tversky and Kahneman. Investors try to closely match past prediction patterns and make decisions based on perceived losses or gains. People tend to match stock price patterns with other price trends, which leads to feedback dynamics (Kahneman & Tversky, 1974). As investors compare to previous decision-making, the loop of price prediction reforms and continue similar issues as previous. In this case, the bubble begins to form, and arbitragers spread out information that led the "herd" to follow.

2.3 Bubbles Formation under Several Circumstances

The inefficient market, information asymmetry, and improper government supervision are some of the conditions that lead to the formation of bubbles.

Shiller's early research in stock volatility is considered the most essential and meaningful work. He argued that price volatility is not simply determined by the expected net present value of future dividends. The point of view further indicated that the stock price would rebound for loss-making firms, and the stock price will overreact and begin decreasing for profit-making firms. Investors cannot simply make a profit by utilizing past price information. Fama (1991) further supports the market inefficiency that the past price prediction is different from earlier research. Market efficiency is a continuum that lower the transaction cost the more efficient the market is. The inefficient market leads to less excessive return, and new capital investment cannot go to the highest-value use. Moreover, the stock market is considered inefficient due to the time gap between the information released and investors' reactions. This period provides opportunities for stock bubbles.

The information asymmetry is unequal information for all participants in the market. This can lead buyers to pay much more than the market ceiling and suppliers to sell more products with a higher market floor, which is not an ideal situation economically. The asymmetry is caused by the realization capability of individuals and the equal distribution of sufficient information. In the stock market, information asymmetry results in bubble formation. First, the information between buyers and sellers is different. People will not always have the same information at the same time. The buyers have few advantages in transactions since they cannot know the implication behind each transaction. The transactions are made only based on the assumption that the stock price will continue to increase. The sellers have an information advantage, and selling at a higher price than intrinsic value will lead to bubble formation. Another factor that leads to the asymmetry is that the intrinsic value per stock is difficult to evaluate. The research institution-released valuation report often has some bias toward the company's performance. These institutions have more ability to obtain information but not adequately evaluate stock prices. Investors, thus, need help to obtain intrinsic value information.

The third factor is the improper supervision from the government that exaggerates the bubbles. The improper supervision includes inefficient regulations, law reinforcement, etc. In early 2015, China stock market had issues with improper supervision from the government; however, the issues were only addressed in the middle of the year. The inefficiency in addressing the problem caused the stock bubble to accelerate and become bigger (Lou, 2017).

2.4 Measurement of Bubbles

The Price-to-Earnings ratio is one of the common measurements in evaluating the appropriate price level. The P/E ratio is the current price relative to its per-share earnings. If the ratio is too high, the stock price is overestimation and has a higher possibility of forming bubbles. If the ratio is too low, the stock price is an underestimation and potentially receives more capital investment. The stand of the P/E ratio varies in different industries. The estimation of using the P/E ratio can be misleading for several reasons. First, the ratio is irrelevant if a capital loss firm has an unfavorable ratio and vice versa. Second, the underestimated firm could gain significant revenue as the asset is sold. This led to the result of the current increase in revenues and price per share. However, it will not boost the P/E ratio for such a long period. The firm is not worse to invest under such conditions and get a trap for capital investment.

Buffett Indicator utilizes the total U.S. stock market value divided by GDP. Buffett estimates the evaluation should be between 70% and 80%, which will lead to an excellent return. A giant bubble will likely form if a nation's stock market does not match the growing trend of the real economy. If the actual economic development exceeds the stock market or the virtual economy, it shows the opportunity to invest. In other words. The total stock market value should grow at the same pace as national economic growth. Buffett Indicator with the logistic behind the calculation is adequate for any country and its stock market. However, some adjustments need to be made in order to have efficient indicators. For example, China's A-Shares under the Buffett indicator are lower than the American stock market. This is because the IPO process for China A-Share is complicated, and many firms are excluded. The United States and Hong Kong markets included many IPO firms from China, bringing a disadvantage in evaluating the indicator.

Market sentiment is another element that affects bubble formation. The sentiment is significantly influenced by individuals' recognition, stimulation, and psychological. Investors will use their understanding and experiences to form their own analysis. As investors make similar purchases or are influenced by following the herd, the irrational behavior will cause the formation of bubbles. One emotional instability will affect the community entirely and cause inaccurate estimation of stock price. As the expected stock price increase due to irrational investment behavior, the infection leads to more capital investment. Thus, the bubble forms and the loop is indicated in the form above.

3. Evidence of Bubble Formation

The feedback theory and bubble formation had evidence support in the 1630s, which was the event of tulipmania in Holland. Charles Mackay (1996) supported the bubble theory and the ultimate result accordingly. In his book, he indicated that tulips in the 16th century became a luxury item destined for the garden in Europe. People are considered poor without the collection of tulips. Middle-class individuals in Dutch society begin to follow the herd with wealthier people. These people suddenly become rich and enter the market without consideration of potential risks. The tulipmania suddenly swept through Holland and became a national activity. Professional traders seek the opportunity and begin to enter the tulip market, the price increase in an uncontrollable trend. Nevertheless, prudent people did not put themselves in jeopardy and did not seek the opportunity; instead, they sold for a dollar to a dollar in return. Price collapse due to massive sell-off and bubble bursts. Moreover, the bubbles can be exaggerated by word-of-mouth or through social media. Shiller argues the potential risks in the stock market after the consequence of the bubble. People have also argued that if the Feedback Models can be applied to the tulip bubble or stock market until 2000, it could have a better speculative in price and volatility. The feedback theory can explain much of the "randomness."

The 2000 Dot-com Bubble showed the formation of the bubble. Goodnight and Green indicated in the journal Rhetoric, Risk, and Markets (2010) that the bubble formed resulted from a rapid surge in the NASDAQ stock market in the internet companies. The examination adopted Mitchel and Kilduff's (1988) perspective that "bubbles are not mere explosions of irrationality, but are events generated by the inter-influencing strategic action of buyers, sellers, bankers, and government

agencies." The 20th century is the period where technological advancement in many industries. Investors and spectators enter the IPO firms since these firms have not generated revenues yet. The stock price is expected to double or triple, which creates a frenzy for investors. The bubble bursts as many leading high-tech companies place colossal sell-off. Many new Dot-com firms evaporated and lost an enormous amount of investment capital.

The Chinese warrants bubble is caused by the transaction tax imposed on stock trades (Pearson, Yang, and Zhang 2019). The tax reform has made Chinese stocks overvalued, as have indexes in Shanghai and Shenzhen. Both the indexes and stock price decline immediately increased the Black-Scholes model in put warrants. The rise in the tax on share transactions has increased the appeal of warrants for short-term trading because they are tax-free—the increase in warrant turnover and other positive returns caused more investment in the market. The higher demand and increase in price lead to the feedback loop and asset price bubbles. The article indicated the use of brokerage to identify the precipitating event that caused the initial significant put warrant returns. The initiation led to a bubble since the interaction between feedback trading, and the precipitating event causes price increases in a feedback loop.

4. Conclusion

The research indicated the concept of the Feedback Model and the formation of bubbles. Rational speculators want to make a purchase today and expect to sell it for a higher price tomorrow. As the expected price increase, investors keep adding more capital, and the demand in the market becomes high. The cycle continues and eventually becomes bubbles due to price and demand expectations. If the market and price fluctuate, the bubble will ultimately burst and cause a price decrease. Many investors were victims of the bubble's formation and collapse. The article listed several steps of bubble formation, including excitement, boom, panic, and bursts. Moreover, herd behavior and psychological assumption lead to irrational investment decisions. These human behaviors are supported by many psychologists, such as Daniel, Hirshleifer, and Subramanyam (1999) and Marimon, Spear, and Sunder (1993).

Further, several circumstances and elements, such as an inefficient market, information asymmetry, and improper government supervision, lead to bubble formation. These bubble formations have some historical events in the past century and reflect how individuals follow the herd when making a capital investment, such as the tulipmania in Holland, the 2000 Dot-com Bubble, and the Chinese warrants bubble. The bubble has caused many detrimental events, and investors should not follow the trend with irrational investments.

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