

Research on the Impact Mechanism of Investor Sentiment on Stock Market Volatility

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Abstract: This paper addresses the flaws and shortcomings under the mechanism of investor sentiment's influence on the volatility of the stock market and analyzes the two directions of the precise measurement of sentiment and the time lag of sentiment. The article utilizes the authoritative AAI sentiment survey and the establishment of a sentiment thesaurus to solve the problem of accurately measuring investor sentiment. It is found that the AAI survey is only applicable to short-term judgment and is not supported by a model, while the sentiment thesaurus is more complete, and the use of searching for the corresponding sentiment performance can be a good response to the current market volatility trend. In the analysis of lag, both MFB and Composite Sentiment Index provide a good idea to solve or reduce the difference caused by this lag. Especially in the combination of MFB and BorutaShap algorithm research method, a very good dynamic model is established, which shows the direction for every market fluctuation prediction. Future research could do more to refine the design of dynamic models under this mechanism as well as precise quantitative research on the subjective variable of sentiment, applying prediction and analysis to stabilize market volatility trends over the long term.

Keywords: investor sentiment, market volatility, measure, time-lagged

1. Introduction

Investor sentiment has always played an important role in the financial stock market. It is often assumed that changes in investor sentiment can trigger price fluctuations. Studies have shown that rising sentiment indices increase stock market liquidity, and that trading volume increases positively as sentiment gradually rises [1]. In recent years, the importance of investor sentiment in determining stock market volatility has received much attention in academic and pragmatic circles.

In-depth research and quantification of the specific role of investor sentiment on stock market volatility, analyzing the dynamics under different market states, and revealing the remaining flaws and shortcomings of this influence mechanism. For example, in the financial stock market, how can investor sentiment be accurately measured and how can dynamic analysis be used to address the time lag between the manifestation of sentiment and its true manifestation in the volatility of the stock market.

Enrich the theory of behavioral finance by continuously exploring ways to accurately measure investor sentiment and give predictions of market volatility for regulators and investors when choosing better investment strategies. By utilizing theories and models to attenuate the time lag effect brought about by emotions, the author can not only alleviate market volatility but also promote the

stability of the financial stock market and prevent the emergence of huge fluctuations such as financial crises. This paper explores two flaws and shortcomings in analyzing this volatility mechanism. First, the first question: how can investor sentiment be accurately measured? Second question: How can the time lag effect of sentiment on market volatility be addressed through some modeling and dynamic analysis?

2. Literature Review

Sentiment as a measure, is influenced by psychological expectations as well as online media, and at the same time, these influences are reflected in investors' information responses to the market. In recent years, an increasing number of scholars have commenced their investigations into the impact of investor sentiment, which serves as a dependent variable, on stock market volatility. They have contributed pertinent insights via modeling theory.

2.1. Emotional Contagion and Collective Market Behavior

Emotional contagion refers to the interplay of emotional states among investors, which in turn leads to the development of collective behavior. Baker and Wurgler [2] point out that emotional volatility can be affected by the dissemination of information on social media, which in turn affects investor psychology and may even trigger collective investor behavior that has led to multiple stock market crashes. For example, in an optimistic mood, investors collectively choose risky assets, resulting in higher stock prices, while in a pessimistic mood, investor selling of stocks causes prices to fall. Chinese scholars Yi et al. [3] have devoted themselves to the study of the Composite Index of Investor Sentiment (CICSI) in the Chinese stock market and have predicted the trend of the stock market through the collective behavioral response of emotions to each of these indicators of investor behavior. The formation mechanism of this collective behavior reveals the central role of emotions in market volatility.

2.2. The Non-linear Relationship between Emotions and Market Volatility

The nonlinear characteristics of sentiment also provide new perspectives for risk management and investment strategies. Adjusting for the assumptions related to the Chinese stock market, He et al. demonstrate the importance of focusing on the intensity and direction of sentiment and its potential impact on price volatility under the mechanism of the nonlinear impact of investor sentiment on stock returns and volatility based on the DSSW model and using the use of the OLS regression and quantile regression methods [4]. According to Wang et al., both the Friedman effect and the spatial creation effect under this volatility mechanism confirm the different stock market volatility mechanisms of emotions in different market states [5]. Intuitively, under the Friedman effect, optimism will have a non-linear fluctuation on the stock market only when the stock market is in equilibrium or a bear market, while under the Creative Space effect, only pessimism in an equilibrium market will have a volatile effect.

2.3. Behavioral Finance Perspectives on Sentiment and Market Efficiency

Investors' decisions are often influenced by emotional factors, leading to irrational fluctuations in the market. Fama has proposed a theory of market effectiveness, which states that the price of a stock will truly reflect all valid information and that emotion, as an important factor, tends to cause the information to exhibit asymmetric propagation [6]. Traditional stock market theory provides insights into market trends and movements within the theoretical framework of EMH. P H and Rishad stated that the Irrational Sentiment Index is used to understand the asymmetric trend due to inefficient

markets and the significant volatility impact of irrational investor behavior on the stock market through the GARCH and Granger causality framework [7]. This perspective emphasizes the fact that markets are not always rational but are driven by mood swings.

Most studies have pointed out some patterns and roles of the mechanism of investor sentiment's influence on stock market volatility, but few scholars have pointed out the shortcomings of the mechanism in quantifying the sentiment or the lag of its influence. This study will explore the flaws and shortcomings of the mechanism of the impact of investor sentiment on stock market volatility to provide investors with a more scientific investment strategy.

3. Discussion

3.1. Measure Investor Sentiment Accurately

The stock market is most often characterized by price increases and decreases, and sometimes by large fluctuations, which stem from some panic or optimism on the part of investors [8]. However, emotions are subjective expressions that are often difficult to measure, and numerous scholars would like to use accurate sentiment indices to predict the mechanisms by which such stock price fluctuations affect them.

The AAI Sentiment Survey was first proposed as a measure of market sentiment index to explore investor sentiment and help investors think about future stock market trends through social media communication surveys [9]. This kind of sentiment survey is a kind of quantification based on investor psychology, trying to use the survey to influence the judgment of investors' possible future market behavior. This behavior can only be limited to short-term investment analysis, but you cannot make it into a long-term stable trend.

Not only in the stock market, but investor sentiment can also be applied to the cryptocurrency market as well as the stock exchange market, and for investors in each of these areas, it becomes a question of how to accurately analyze the trend of investor sentiment. And Chen, Després et al. created a sentiment thesaurus that can be used to analyze cryptocurrencies, which covers tens of thousands of sentiment words, and by categorizing these sentiment words into different categories, it is possible to find market information corresponding to different sentiments by finding different sentiments in the market analysis [10]. This dictionary of sentiment algorithms can accurately capture the impact of different investor sentiments that can bring about different movements in the investment market, giving investors a good idea of what to expect. Meanwhile, to better study the investor index accurately, Renault shows that it has utilized social media to collect information on different emotions and constructed an information base, which also has the emotional responses of different investors to the stock market [11]. However, the difference is that the information base from Chen, Després et al. is more comprehensive and can more accurately recognize the nuances of investor sentiment.

3.2. Time-lagged Effects of Sentiment

When researching the mechanism of the impact of investor sentiment on stock market volatility, it is found that subjective changes in sentiment are sometimes not reflected in market changes on time but are accompanied by a lag in the results. This creates some difficulties and biases for investors to use the mechanism to analyze the market. Some scholars have attempted to use Multimodal Fusion Bitcoin (MFB) to study the lag in this sentiment, using mathematical modeling to eliminate the errors associated with differences in temporal responses. Scholars Han et al. used a generalized multimodal fusion method, MFB, to construct a bi-directional long and short-term memory network (BiLSTM) and a bi-directional gated recurrent unit (BiGRU) layer [12]. Meanwhile, they used the BorutaShap algorithm to combine the data to cope with the problem of misjudging emotional behavior due to time lag [12]. As a groundbreaking financial market volatility prediction model, together with several

attention mechanisms and techniques such as spatial dropout, it provides precise judgment of every market sentiment delay. The emergent application of this dynamic model is extremely important for analyzing and predicting the overall trend of the large-scale financial stock market, as each delay caused by a tiny sentiment puts a thousand times more pressure on the market to fluctuate.

The Composite Sentiment Index, under which six basic sentiment proxies exist, is mentioned in numerous scholarly reports on market volatility mechanisms. According to Baker and Wurgler, the index summarizes the commonality of six factors-closed-end fund discount, New York Stock Exchange stock turnover, number of initial public offerings and average first-day returns, share of new issues, and dividend premiums - and calculates the correlation of each proxy with the lagged value through an indexing formula, which accounts for the fact that a single factor absorbs most of the common variance [13]. This result alone illustrates the high correlation between the SENTIMENT index and the first stage index, explaining that when removing these six terms together with other time subscripts, very little information is lost from them.

$$SENTIMENT_t = -0.241CEFD_t + 0.242TURN_{t-1} + 0.253NIPO_t + 0.257RIPO_{t-1} + 0.112S_t - 0.283P_{t-1}^{D-ND}, [13]$$

4. Discussion

4.1. Research Perspectives on Accurate Measurement of Sentiment

This paper cuts through the AII Sentiment Survey and the establishment of a thesaurus of sentiment specialized for market changes. The first perspective AII sentiment survey, although it can reflect the real and precise sentiment changes of investors as well as have some accurate judgment on the future market, it is not based on model research, lacks the support of mathematical data, and can only be used for short-term market fluctuations.

Under the second perspective, this paper points out two different market sentiment lexicons and applications under the approach such as the cryptocurrency trading market. These two sentiment lexicons are a novel way of searching for corresponding sentiment expressions in a large thesaurus, pinpointing possible stock market fluctuations feasibly and effectively. However, the sentiment lexicons still need to be updated to cope with changing trends if future investments have a complex mix of sentiments.

4.2. The Problem of Time-lagged Effects of Sentiment

In this paper, we choose to cut from the Multimodal Fusion Bitcoin (MFB) and Composite Sentiment Index under the indexing equation. The first angle is the MFB analysis; the mathematical model applies the BorutaShap algorithm and some data combinations about the attention mechanism and other techniques first to have a clear prediction of the time lag brought by the sentiment and use it to build a model to fundamentally change the lag on the direction of the market fluctuation of the misleading. This is a relatively well-modeled system.

The second perspective is analyzed using the Composite Sentiment Index Theory, which has been mentioned in numerous studies, and the index formula that extends under that index model. The indexing formula has six terms through which the values of each sentiment proxy can be substituted with lagged values, and correlations can be determined. The high correlations reflected in the data could justify the reduction of these time-lagged errors, but the index lacks an analysis of the common sentiment component.

5. Conclusion

This paper begins with a background of research on the mechanisms by which investor sentiment affects market volatility, pointing out what has already been done in this area: sentiment contagion and collective market behavior, the nonlinear relationship between sentiment and market volatility, and sentiment and market efficiency from a behavioral finance perspective. The results of research in all three directions have been devoted to analyzing the role of sentiment on market volatility, going to show how to influence the direction of stock market volatility. A question will arise through these data, there are some defects and deficiencies in that fluctuation influence mechanism? So this paper discusses the possible deficiencies under the mechanism, and combines many scholars' research and modeling in-depth analysis, hoping to get some ideas for solving the improvement of deficiencies.

This paper analyzes the research problem of how to accurately measure investor sentiment using both the AAI sentiment survey and searching from a huge sentiment thesaurus. The conclusion obtained is that AAI still has some limitations in long-term market volatility analysis, while the sentiment lexicon is more complete in comparison, and maybe a solution to accurately measure investor sentiment and provide some ideas for better research models. The next step is to discuss the issue of time lag in sentiment through the MFB and the indexing formula in the Composite Sentiment Index. After comparison, it is found that the MFB ignores the shortcomings of lagging as much as possible by combining various techniques as well as algorithms and different bi-directional screening layers to predict the possible future market fluctuations. The indexing under the Composite Sentiment Index, although supported by certain theoretical formulas, still ignores the analysis of the common sentiment component in terms of refinement. However, both methods are of great help to the study of hysteresis, providing a rich theoretical modeling framework.

However, there are still some shortcomings in this paper. First, the year of the data literature cited in this paper is not the latest, so the data may have some theoretical deficiencies in the analysis of the current research problems in the field. Secondly, the number of pieces of literature cited in this paper is not so much, not comprehensive enough to academic support, affecting the accuracy of the whole article's point of view. Finally, the discussion part is not comprehensive enough, the point of view is not in-depth to the essence of the formula model, and there may be a bias in understanding.

Investor sentiment as well as stock market volatility are important segments in financial markets. In future research areas, it is possible to delve into the impact of investor sentiment on cross-market flows and explore how sentiment affects capital flows and asset prices on a global scale. One could also look at combining investor sentiment with the current hot topic of artificial intelligence and try to use artificial intelligence to monitor market volatility in real-time, reducing labor costs as well as the chance errors of mathematical models.

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