The Impact of Social Media Users' Sentiment on Financial Markets

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Abstract. This article aims to comprehensively and deeply review and analyze the multifaceted impact of social media user emotions on financial markets. In the field of financial research in the past, emotional factors have been widely recognized by many scholars as key elements in the investor decision-making process. This article further analyzes the transmission mechanism of social media users' emotions, that is, how it indirectly affects the performance of financial markets by influencing the formation and dissemination process of mass media emotions. At the same time, the article also explores in detail the specific ways in which social media users' emotions directly affect the stock market. In addition, this article also focuses on the dual role of social media in emotion generation and emotion filtering processes, and explores in depth the application value of Granger causality research in this field. Finally, this article critically examines data bias and the limitations of sentiment analysis methods, and explores the potential applicability of these research findings under different market conditions.

1 Introduction

Traditional media has long been the primary source of sentiments in the financial market. Related reports are usually made by professional journalists and analysts, characterised by strong directionality and authority. However, with the rapid development of social media, how information is disseminated has undergone profound changes. Social media platforms (such as Twitter, Weibo, etc.) provide ordinary users with channels to express opinions and sentiments in real time and serve as essential sources for investors to capture market trends and sentiments. Compared to traditional media, social media features fast dissemination, broad coverage, and high user engagement, enabling it to play a unique role in forming and propagating financial market sentiment.

Research indicates that sentiment expressions on social media can quickly reflect market dynamics and may significantly impact market performance, such as stock prices and trading volumes. For example, Fekrazad et al. find that negative sentiment on social media may lead to declines in stock returns, while Chen et al. point out that social media users' sentiments can, to some extent, predict market trends [1,2]. However, empirical research on the specific mechanisms of social media users' sentiments' impact on financial markets and its predictive

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power remains divided, with some studies failing to confirm its stable predictive effect. Considering this, this paper further explores the underlying mechanisms by which social media users' sentiments can directly or indirectly influence financial markets.

The primary objective of this research is to analyse the mechanisms through which social media users' sentiment affects financial markets, focusing on how it indirectly impacts market performance by influencing the formation and dissemination of mass media sentiment. At the same time, this paper clarifies social media's dual role as a generator and a filter of sentiment and its potential causal relationship with stock market performance. Through a literature review and theoretical analysis, the paper reveals the pathways and limitations of social media users' sentiment in financial markets, providing theoretical insights for investors and regulators.

The widespread use of social media has made disseminating market sentiment more complex, exposing investors to the influence of herd mentality and information biases. This paper uncovers the sources of market inefficiencies by analysing the mechanisms through which social media users' sentiment affects financial markets. It also warns investors against the misleading effects of emotional information on investment decisions. Meanwhile, the research findings provide valuable insights for financial market regulators in formulating policies to mitigate market volatility risks. Also, this paper's discussion on data biases and the limitations of sentiment analysis contributes to the refinement and enhancement of future studies.

2 Theoretical framework

2.1 Market hypothesis and its perspective on sentiment

The Efficient Market Hypothesis (EMH), a cornerstone of financial market theory proposed by Fama in 1970, posits that stock prices reflect all available information, making it difficult for investors to achieve excess returns through information analysis. EMH is categorised into three forms: weak, semi-strong, and strong, each offering distinct implications regarding the role of sentiment in financial markets.

The weak-form EMH asserts that stock prices already incorporate all historical price and trading volume data, rendering technical analysis ineffective for consistently generating excess returns. However, behavioural finance suggests that panic sentiment on social media may influence investors' expectations of future prices, causing deviations from rational levels of historical data.

The semi-strong-form EMH maintains that stock prices reflect historical price data and all publicly available information. Although it should be impossible to gain excess returns by analysing public information, social media users' sentiments and cognitive biases may disrupt rational decision-making, leading to market inefficiencies. For instance, emotionally charged information on social media can spread through mass media. This information can affect investor judgment and cause short-term price deviations from fundamentals.

The strong-form EMH contends that stock prices reflect all information, including insider information. Strongly efficient markets are nearly non-existent, as insider information is rarely fully incorporated into prices. Social media sentiment may disrupt markets by influencing investor behaviour, leading to price fluctuations that deviate from fundamentals. The strong-form EMH assumes all investors are perfectly rational, yet the prevalence of social media sentiment highlights investors' irrational, emotion-driven behaviour.

The rise of social media has transformed the speed and scope of information dissemination, amplifying the volatility of market sentiment. Investors are susceptible to herd sentiment on social media, resulting in irrational investment decisions. This phenomenon

contradicts the assumptions of the EMH, particularly in weak-form and semi-strong markets, where sentiment may cause prices to deviate from levels reflecting information. Studying the impact of social media users' sentiments on financial markets helps uncover sources of market inefficiency. It also provides theoretical support for understanding the limitations of the EMH in modern financial environments.

2.2 Demand-driven media bias

Ren et al. reveal the "demand-driven media bias phenomenon," arguing that mass media, when reporting financial news, are influenced by social media users' sentiment, thereby amplifying market biases. This bias stems from mass media catering to reader preferences to increase article views and attract advertising revenue. They may provide news sentiment aligned with readers' beliefs, which can be tracked and measured through social media.

To illustrate this phenomenon, consider the following real-world cases: Amplified positive sentiment around popular stocks: In coverage of a trending tech stock, optimistic sentiment surged on social media. To cater to readers' and investors' preference for "growth stories" and "high returns," mass media reinforced the stock's positive news in headlines and articles, such as future product innovation and industry leadership status, to solidify market optimism. Amid the mutual reinforcement between social and mass media, the stock price may experience rapid short-term surges. However, once market sentiment shifts, mass media may quickly pivot, focusing on the company's potential risks or negative news, amplifying pessimism and triggering accelerated price declines.

Bandwagon effects from trending topics: On social media platforms, speculation about a company's merger rumours gains traction, with investor sentiment broadly optimistic about its prospects. To seek more attention, mass media may follow the social media trend with relentless, optimistic coverage. Under this "bandwagon effect," more investors, swayed by sentiment, may chase the rally, driving prices to overextend beyond the company's fundamentals. When rumours are confirmed, or market conditions turn cold, mass media may shift to critical reporting, causing pessimism to spread rapidly and exacerbating stock price declines.

From the above cases, social media users' sentiments can influence mass media's topic selection and reporting tendencies in the early stages of information dissemination. To cater to reader preferences and boost engagement, mass media further amplifies the emotional direction of social media on the market, leading to an over-reinforcement of rising or falling market sentiment. These factors exacerbate financial market volatility. Investors need to recognise the bubble and panic effects that demand-driven media bias may cause and remain vigilant against being swayed by emotional reporting when making decisions.

This demand-driven media bias allows sentiment on social media to be transmitted to a broader range of investors through mass media, thereby exerting a greater impact on the market. Investors must be wary of such bias and avoid being misled by emotional information.

3 The relationship between social media and financial markets

3.1 Empirical research on the impact of social media users' sentiment on stock performance

Substantial empirical research has examined the impact of social media users' sentiments on stock performance. Some studies indicate a significant link between social media users' sentiment and stock returns [3]. For example, Chen et al. demonstrate that sentiment reflected on social media can predict stock market trends [2]. Fekrazad et al. found that a higher

proportion of negative tweets leads to declining stock returns; social media users' sentiment reacts to stock price volatility [4].

Beyond Chen et al. and Fekrazad et al., various scholars have researched from multiple perspectives, employing broader samples and methodologies: Bollen et al. collect vast amounts of data from the Twitter platform, analyse different emotions (such as optimism, pessimism, anxiety, and calm) expressed on social media by constructing sentiment lexicons and emotion classification models, and compare these with daily fluctuations in the Dow Jones Industrial Average (DJIA). Results of Granger causality tests show that sentiment indicators on Twitter have some predictive power for DJIA movements.

Zheludev et al. employ text-mining algorithms (such as Naive Bayes classifiers and Support Vector Machines, SVM) to conduct sentiment analysis on real-time social media data [5]. They apply sentiment scores to high-frequency trading strategies, exploring the relationship between sentiment fluctuations and intraday stock price movements. Their study reveals that sentiment volatility in high-frequency data could generate significant excess returns, though noise and strategy instability are also observed. These studies suggest that social media users' sentiments can reflect the mood of market participants, influence investment decisions, and consequently impact stock prices.

3.2 Divergence in research findings

While some studies have identified a link between social media users' sentiment and stock returns, empirical evidence remains inconsistent. Certain research fails to confirm the predictive power of social media users' sentiment on markets. For instance, some studies reveal that the impact of social media users' sentiment on stock returns is unstable and can be influenced by market conditions, company size, and other factors [2].

This divergence may stem from the following aspects: Differences in sentiment analysis methods: Researchers or institutions may employ varying approaches and algorithms when conducting sentiment analysis, potentially leading to vastly different conclusions from the same dataset. For example, some methods may focus more on keywords and phrases in the text, while others consider contextual and semantic complexities, thereby affecting the final sentiment assessment.

Variations in data sources: The diversity of social media platforms and differences in data collection methods are also significant contributors to discrepancies in analysis results. Different platforms may attract distinct user demographics whose modes of expression and areas of interest may differ substantially. Besides, the tools and strategies used during data collection, such as whether temporal factors are considered or irrelevant information is filtered, can influence the final dataset and, consequently, the sentiment analysis outcomes.

Disparities in market conditions: Fluctuations and changes in market environments, such as economic conditions, industry trends, and regulatory policies, may affect investor sentiment and behaviour. Under different market conditions, investors may interpret and react differently to emotional expressions on social media. For instance, during periods of high market volatility, investors are more sensitive to negative sentiment, whereas in stable markets, they might be less responsive to such emotional expressions.

4 The impact of social media on sentiments

4.1 The dual role of social media as a sentiment generator and filter

Social media plays a critical dual role in the functioning of financial markets: it generates and filters sentiment. As a sentiment generator, social media provides users with a vast space

to express personal opinions and emotions. Users can freely post comments, share news, and exchange information on these platforms, and these interactions shape and influence market sentiment to some extent. Discussions and reactions on social media reflect the psychological state and expectations of investors and market participants, which may influence market trends.

At the same time, social media also serves as a sentiment filter. Due to the diverse sources and varying quality of information on social media, it often contains emotional expressions and misinformation. Such information may mislead investors, leading them to make decisions based on false data. Therefore, when using social media as an information source, investors must develop the ability to discern the authenticity of information. They have to filter and verify it to ensure they are not swayed by false narratives that could distort market sentiment.

4.2 Research on granger causality

Social media plays a significant role in financial markets as both a sentiment generator and a filter. On the one hand, mechanisms like information dissemination, topic amplification, and content sharing rapidly aggregate and amplify public sentiment [6]. On the other hand, it selectively filters and magnifies specific trending topics or extreme viewpoints, thereby influencing investors' emotional assessments of the market. As social media's influence on investment decision-making continues to grow, various emotions (such as optimism, pessimism, and panic) can quickly spread across markets, affecting fluctuations in stock prices, trading volumes, and other financial indicators.

However, the impact of social media users' sentiments on financial markets is neither linear nor unidirectional. There is often a feedback loop between sentiment and market prices, where market movements, in turn, influence the expression and dissemination of sentiment on social media. Granger causality testing effectively examines the dynamic relationship between social media sentiment and financial markets [7]. By conducting causality tests on time-series data, researchers can identify whether there is a significant causal effect between social media sentiment and market performance, thereby clarifying the sequence and interaction patterns between the two.

5 Challenges and limitations

5.1 Data bias and limitations in sentiment analysis

Data collected from social media platforms often contains inherent biases, which may stem from various factors [8]. For instance, the distribution of user groups is often uneven, which may lead to the overamplification of certain groups' opinions or information. In contrast, the voices of other groups may be overlooked or drowned out. Additionally, the authenticity of information on social media is often hard to verify. Therefore, analyses based on such data may include misleading information.

There are also methodological limitations in sentiment analysis. Sentiment analysis aims to identify and analyse emotional tendencies in text, but this technology may struggle with certain linguistic phenomena. For example, sarcasm and irony are typical in everyday communication, but they often convey emotions opposite to their literal meaning [9]. Sentiment analysis algorithms can hardly capture these subtle emotional nuances accurately. Moreover, the ways people express emotions can vary significantly across cultures, and these differences may introduce biases in sentiment analysis results, which can affect the accuracy of research. These data biases and limitations in sentiment analysis may adversely impact the

accuracy of research findings. When research relies on social media data, these factors must be considered to ensure the reliability and validity of conclusions.

5.2 Applicability issues in different market environments

When examining the impact of social media sentiment on financial markets, it is essential to fully consider how different market environments shape investor behaviour and psychology. Investors generally maintain an optimistic outlook in bull markets. Their risk appetite increases and confidence remains high. The constant stream of positive comments and favourable news on social media tends to trigger herd behaviour. Driven by sentiment, investors may further chase rising prices, creating a positive feedback mechanism that drives stock prices higher. This virtuous cycle often becomes more pronounced in bull markets, potentially causing stock prices to deviate significantly from their intrinsic value in the short term.

Conversely, in bear markets, prevailing sentiment is pessimistic, investor confidence is weakened, and negative information becomes more impactful. Gloomy remarks, panic psychology, and concerns about future economic or corporate earnings on social media can intensify downward pressure on markets. Fearing losses, investors tend to sell off stocks, which leads to further price declines and forms a negative feedback loop. In other words, market environments influence investors' risk preferences and decision-making behaviours, amplifying or dampening the impact of social media users' sentiment across different market phases.

Similarly, data biases and limitations in sentiment analysis may also be magnified or obscured under varying market conditions [10]. For instance, sentiment analysis models may become more susceptible to extreme emotions and noisy data in extremely optimistic or pessimistic market environments, as different market situations often render sentiment labels less robust. Additionally, interpretations of individual stocks or industries may be constrained by data collection methods and the precision of algorithmic models, with varying degrees of noise interference and emotional polarisation across different environments [11].

In summary, data biases, limitations in sentiment analysis, and applicability challenges across different market environments are key concerns when studying the impact of social media users' sentiment on financial markets. Researchers must consider the above-mentioned factors to accurately uncover the relationship between social media users' sentiment and financial markets. Hence, the findings can provide valuable insights for market stability and development.

6 Conclusion

This paper examines the mechanisms of sentiment generation, market reactions, and their differential manifestations across various market environments to unveil the impact of social media sentiment on financial markets. The findings indicate that social media is a rapid information dissemination channel. It significantly influences investors' risk preferences and trading behaviours through sentiment amplification and filtering. Meanwhile, data collection and text analysis methods are crucial for capturing sentiment, yet their limitations cannot be overlooked. Multiple dimensions must be reviewed, such as data cleaning, model selection, and algorithm applicability. Comprehensive analysis reveals that market conditions (e.g., bull and bear markets) can further amplify or suppress the effects of social sentiment. Therefore, researchers must integrate market phases with sentiment characteristics in empirical tests to uncover the dynamic relationship between sentiment and market prices.

Based on the above analysis, future research may seek more precise data processing and sentiment measurement methods, leveraging artificial intelligence and big data technologies

to enhance real-time sentiment capture across multiple languages and platforms. Regulators and market participants should consider social media's potential influence on market volatility and investment decisions. They should prudently assess sentiment-driven trading risks while establishing robust public opinion monitoring and risk prevention mechanisms. Future studies could further explore the patterns of sentiment propagation across different institutional frameworks or financial products. These studies may provide more comprehensive decision-making support for financial markets' stability and healthy development.

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