

SOCIAL MEDIA SENTIMENT AND ITS EFFECTS ON CRYPTOCURRENCY PRICE VOLATILITY

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ABSTRACT

Purpose- Following its introduction in 2008, cryptocurrencies have attracted great deal of attention from the investors. Cryptocurrency market have grown rapidly in terms of transaction volumes and number of investors involved with the launch of different kinds of alternative coins (altcoins). Cryptocurrency markets show some differences from the stock market with less institutional investor involvement. With the high proportion of retail investors in the market, we assume sentiment would be one of the leading forces that can accelerate cryptocurrency price movements in both directions that leads to higher volatilities. In this study, we try to shed a light on social media sentiment and its effect on cryptocurrency price volatility for 9 different cryptocurrencies, namely Bitcoin, Ethereum, Ripple, Binance Coin, Dogecoin, Solana, Cardano, Litecoin, Avax.

Methodology- The study uses Google search volume index and number of tweets weekly collected from Twitter between the dates January 2020 to March 2023 as investor attention measures to attract social media sentiment in addition to economic policy uncertainty index (EPU), CBOE S&P 500 implied volatility index (VIX) and macro and micro indexes constituted by using the Google search volume indexes for micro and macro fears and taking the weekly sum of those indexes. We investigated investor attention measures and mentioned indexes' impact on cryptocurrency volatility by using seemingly unrelated regression.

Findings- The analysis reveals that google search volume index has a significant positive impact on volatility of cryptocurrencies in addition to economic policy uncertainty index and micro pessimism measures. Number of tweets data has no significant impact on volatility in contrast to Google search volume index.

Conclusion- Based upon the analysis, it may be concluded that google search volume index has better captured investor attention and might give an insight regarding cryptocurrency volatilities where number of tweets collected from Twitter has no significant impact on volatilities.

Keywords: Cryptocurrency, investor attention, social media sentiment, Google Search Volume Index, Uncertainty Index

JEL Codes: G10, G14, L86

1. INTRODUCTION

Cryptocurrencies were first launched in 2008. Cryptocurrencies' decentralized nature enables peer-to-peer payments without the need for financial intermediaries. Cryptocurrency records are kept on a decentralized ledger, where an automated algorithm governs the issuance rate of new coins. Following the Bitcoin launch in 2009, the price steeply increased.

The significant rise in Bitcoin's value, followed by launching a wide range of alternative coins (altcoins) attracted more and more investors to the market and vast majority of transactions make cryptocurrency market deserve closer examination. As of 2024, there are approximately 13,217 cryptocurrencies listed globally, due to the fact that many of them are inactive or have minimal value. The total market capitalization of the cryptocurrency market fluctuates, with current estimates around \$1.32 trillion. In addition to Bitcoin and Ethereum, which dominate market share, there are many other smaller cryptocurrencies that less significantly contribute to the overall value.

Attention is a scarce resource (Kahneman, 1973), and investors experience attention overload when many events wait for their focus, making it harder to concentrate on any single one. Whether attention has an impact, positive or negative, on cryptocurrency markets is unclear.

Cryptocurrencies, while sharing some similarities with stock markets, have different characteristics, particularly regarding the types of investors involved. Unlike equity markets that have substantial number of institutional investors, crypto markets attract more retail investors (Bialkowski, 2020). This unique characteristic of cryptocurrency markets raises the question of how investor attention impacts price volatility.

As their popularity increased, cryptocurrencies have become a focal point for both investors and academic researchers, with "What drives Bitcoin?" being a prominent question. We propose that investor sentiment influences cryptocurrency prices for several reasons.

First, the unique market dynamics favour retail investors, who often make trading decisions based on sentiment rather than sophisticated valuations used by institutional investors. This sentiment-driven approach has the potential to significantly amplify price movements in both upward and downward directions.

Second, given the complexity and risks associated with cryptocurrencies, we expect a "flight-to-quality" behaviour during heightened market sentiment, leading investors to shift towards less risky assets. Previous studies support this view, suggesting that cryptocurrencies do not serve as a hedge during market downturns (Klein et al., 2018).

Finally, the relatively new nature of cryptocurrencies fosters emotional investment decisions, with some fearing missing out while others view them as speculative bubbles. This environment likely fuels sentiment-driven trading, often overshadowing rational decision-making.

Given these dynamics, it is essential to explore how investor behaviour influences cryptocurrency volatility. The main purpose of this thesis is to investigate the impacts of different investor attention measures and their relationship with cryptocurrency volatility. We use twitter sentiment as number of tweets as a measure of twitter sentiment. We analyse the effects of Google Search Volume Index and twitter sentiment at the same time. We believe we better capture the investor attention while considering both Google and Twitter sentiments.

We also follow the work of Burggraf et al. (2020) by constructing investor pessimism index (IPI) by using the Google Search Volume indexes for micro and macro fears, and taking the weekly average of those indexes, we constitute macro and micro indices. Macro and micro index make us measure both investors' individual, household-level concerns as well as concerns related to the general economic status on the volatility of the nine cryptocurrencies, namely Bitcoin, Ethereum, XRP, BNB, ADA, DOGE, SOL, LITECOIN and AVAX.

Our work also incorporates two more measures of market uncertainty. First, we include the economic policy uncertainty (EPU) index as Baker, Bloom, and Davis (2016). This measure is based on the frequency of newspaper articles containing terms relating to a) uncertainty, b) economy, and c) policy.

Finally, we include the CBOE S&P500 implied volatility index (VIX) as an indicator of financial market uncertainty. This "fear index" has a well-documented negative relationship with stock market returns along with a positive relationship with realized volatility. A similar relationship is found for Bitcoin (Bouri et al., 2017) and other cryptocurrencies (Akyildirim, Corbet, Lucey, Sensoy, & Yarovaya, 2020) during periods of high financial market uncertainty.

2. LITERATURE REVIEW

Research on social media sentiment and its impact on cryptocurrency volatility has gained attention in recent years, as these markets are highly influenced by public sentiment and attention-driven factors. Numerous studies explore how online activity, such as Google search volumes, Twitter mentions, and other social media metrics, can serve as indicators of market movements. For instance, studies like those by Shen et al. (2019) and Mai et al. (2018) indicate that higher search volumes and tweet frequencies correlate with increased volatility and price shifts in cryptocurrencies. Similarly, findings by Smales (2019) highlight the predictive power of Economic Policy Uncertainty (EPU) indices on asset volatility, with particular relevance in the context of emerging and speculative markets. Micro-level sentiments, such as fear and greed indices, also emerge as significant predictors, as demonstrated by Balcilar et al. (2017), suggesting that investor psychology deeply affects crypto market behaviour. These studies collectively emphasize the complex role of digital attention and sentiment metrics in cryptocurrency markets, complementing the current research by offering insights into how specific attention-driven metrics contribute to market fluctuations. Similarly, Demir et al. (2018) show that EPU predicts Bitcoin returns, suggesting that cryptocurrency markets react strongly to global uncertainty. Bouri et al. (2020) and Burggraf et al. (2020) also examine Bitcoin's role as an asset class in periods of macroeconomic turbulence, indicating that while Bitcoin often serves as a diversifier, its performance as a risk hedge is limited.

Research utilizing Google Search Volume Index (GSVI) as a measure of investor attention has consistently highlighted its significant impact on cryptocurrency volatility and price movements. Studies have shown that increased search volume often correlates with heightened volatility in cryptocurrency markets, suggesting that spikes in investor interest can lead to more significant price fluctuations. For example, Jiang and Li (2021) found that heightened attention correlates with both increased trading volume and volatility. Similarly, Kristoufek (2018) demonstrated the predictive power of GSVI on cryptocurrency prices, reinforcing the idea that investor attention plays a critical role in market dynamics. Dyhrberg and Duffy (2018) highlighted the influence of investor sentiment on Bitcoin price dynamics, while Yousaf and Bukhari (2020) indicated that heightened sentiment directly contributes to increased price volatility. Collectively, these findings underscore the importance of investor attention in understanding cryptocurrency market behavior.

Additionally, Bouri et al. (2017) and Akyildirim et al. (2020) confirm that VIX, the "fear index" representing S&P 500 volatility expectations, is positively correlated with cryptocurrency volatility. This finding highlights the interconnectedness of cryptocurrencies with traditional financial markets, where heightened volatility in equities often spills over into digital assets, increasing their risk profile during turbulent times.

3. DATA AND METHODOLOGY

In this study weekly data is collected starting from 12 January 2020 until 3 March 2023.

To examine the effects of investor sentiment on cryptocurrency volatility, we use following volatility measure:

Return : $R_t = \ln(P_t) - \ln(P_{t-1})$

Vol_t = $|R_t|$

Where P_t represents the cryptocurrency price at the end of week t , R_t is the return calculated as weekly price changes. Vol₁ is the first volatility measure which is simply the absolute return.

For Volatility:

$$|R_t| = \beta_0 + \beta_1 GSV_{i,t} + \beta_2 \text{numberoftweets}_{i,t} + \beta_3 \overline{EPU}_{i,t} + \beta_4 \Delta \overline{EPU}_{i,t} + \beta_5 VIX \max_{i,t} + \beta_6 \Delta VIX \max_{i,t} + \beta_7 \text{macro}_{i,t} + \beta_8 \text{micro}_{i,t} + \beta_9 \text{feargreed}_{i,t} + \varepsilon_{i,t}$$

GSV denotes weekly Google Search Volume Index for the specific cryptocurrency, number of tweets measure is the weekly sum of number of tweets for each cryptocurrency. EPU is the weekly economic policy uncertainty index where Δ EPU is the weekly difference of Economic policy uncertainty index. VIX max is the weekly maximum value of CBOE S&P500 implied volatility index (VIX) where Δ VIX max is the weekly difference of VIX max. We also include fear greed index in the model to help better understand investor behaviour. We also follow the work of Burggraf et al. (2020) by constructing investor pessimism index (IPI) by using the Google Search Volume indices for micro and macro fears, and taking the weekly sum of those words' Google search volume indices, we constitute macro and micro indices.

4. FINDINGS

In this study, seemingly unrelated regression (SUR) is used to define the relationship between social media sentiment and cryptocurrency volatility. Below the tables, we explained the relationship among variables.

5. CONCLUSION

The SURMG regression results reveal significant relationships between specific attention and sentiment indicators and cryptocurrency volatility. Specifically, Google search volume (lgsv) and weekly economic policy uncertainty (lweeklyepuavg) positively impact volatility, suggesting that heightened attention and uncertainty correlate with market fluctuations. Micro-level pessimism (Imicropessimism) also shows a positive, significant effect, indicating that individual investor concerns contribute to increased volatility. In contrast, Twitter activity (Numberoftweets) and other sentiment measures show non-significant effects, highlighting that not all attention metrics equally influence market movements. These findings underscore the complex role of sentiment and attention in driving cryptocurrency volatility.

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