Cryptocurrency in the Light of Sentiments : A Bibliometric Approach

Diya Sharma [1]
Renu Ghosh [2]
Chandra Shekhar Sharma [3]

Abstract

Purpose : Cryptocurrency has drawn interest from academia and business, particularly amid notable spikes in the price of Bitcoin. The presence of cryptocurrencies and their technology-focused investments are intimately related to investor behavior. Due to its unpredictability, mood has a greater impact on Bitcoin investing than technical factors. The purpose of this study was to perform a bibliometric review in this field.

Methodology : Using VOSviewer software, this article attempted to do a bibliometric study of papers on sentiments and cryptocurrencies included in the Scopus database. The study complied with the PRISMA framework, which is the recommended practice for systematic reviews.

Findings : The findings showed that this field is seeing a massive increase in research activity. A total of 483 distinct authors wrote 151 articles. Studies that examined changes in the Bitcoin industry have received the attention they deserve in finance publications. Three connected clusters were discovered by co-citation analysis, indicating that studies are looking at how cryptocurrencies work as financial market investments using social media sentiments.

Practical Implications : The study on cryptocurrency sentiments offered valuable insights for investors, policymakers, and the market. It informed decision-making on investments, risk management, and regulations, providing a foundation for practical tools in the dynamic cryptocurrency market. These insights will contribute to a resilient and sustainable ecosystem, guiding public awareness for responsible cryptocurrency use.

Originality : To the best of our knowledge, this work is the first in this developing field to do a bibliometric literature evaluation on Scopus articles.

Keywords : **cryptocurrency, sentiments, bibliometric, behavioral finance, PRISMA**

JEL Classification Codes : G11, G15, G41, O3

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[1] *Research Scholar,* Department of Management Studies, Netaji Subhas University of Technology, Azad Hind Fauj Marg, Dwarka Sector-3, Dwarka, Delhi - 110 078. (Email : diya.sharma.phd21@nsut.ac.in) & [1] *Assistant Professor,* Dyal Singh College (M), University of Delhi, Lodhi Road, Pragati Vihar, New Delhi - 110 003.
(Email : diyasharma.commerce@dsc.du.ac.in)
[2] *Assistant Professor (Corresponding Author),* Department of Management Studies, Netaji Subhas University of Technology, Azad Hind Fauj Marg, Dwarka Sector-3, Dwarka, Delhi - 110 078. (Email : renu.ghosh@nsut.ac.in)
[3] *Professor (Retd.),* Shri Ram College of Commerce, University of Delhi, Maurice Nagar, Roop Nagar, New Delhi - 110 007. (Email : cssharma.srcc@gmail.com)

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Since cryptocurrencies have grown so much in the past 10 years, academics and businesses alike have become quite interested in them, particularly after Bitcoin values reached $19,891 in 2017 (Narayanaswamy & Karthika, 2018). It stimulates the curiosity of the researchers and presents a novel debate point. The rational investors' competition to diversify and optimize the statistical aspects of their portfolios to influence prices is the foundation of the classical finance theory (CFT). Investor sentiment and the offset desires of irrational investors are disregarded when discussing asset pricing models (Baker & Wurgler, 2006; Ding et al., 2019). Irrational investors trade against rational arbitrageurs in an attempt to halt the basic price-setting process. Against CFT, Naik and Padhi (2016) contended that "noisy traders" are isolated from relevant and thorough information. Because noise signals are the primary cause of variations in asset prices and price movements, noise traders base their investing decisions on them. Their beliefs, hence, cause noise to drive fluctuations in market prices (Hussain et al., 2020; Verma & Verma, 2007). There will be less trading of specific assets if all investors evaluate market movements sensibly and responsibly (Salamat et al., 2020).

There are no clear rules for entering or exiting the decentralized cryptocurrency. Investor behavior is directly linked to technology-based investment and a lack of a defined reason for being (Geng et al., 2021; Shahzad et al., 2019). The impact of investor attitude on investment risks and future cash flows cannot be supported by technical data (Baker & Wurgler, 2007). Investors who utilize cryptocurrencies to make money may make more money faster at the risk of losing it all. Due to its unpredictable and erratic nature, cryptocurrency investment has a greater impact on investor sentiment than fundamentals (Karim et al., 2022). Investors choose the riskiest cryptocurrencies due to their optimistic tendencies, but the opposite is also true (Bouri et al., 2020), which can result in losses of money. Consequently, conducting sentiment analysis on cryptocurrencies is crucial. In order to ensure consistency and relevance in information across many studies, a literature review is necessary to assess current research in light of new developments.

In every discipline, a thorough review of the literature is required. Methods like (a) Systematic Review (Malik & Kaur, 2021; Mohan & Bohra, 2023), (b) Bibliometric Review (Lohan et al., 2023), and (c) Retrospective Review (Kini & Basri, 2022; Ledwani et al., 2022; Raut & Das, 2015; Singh & Bhar, 2015) are among the available ones. There is a purpose for every review technique. For example, systematic reviews involve an in-depth investigation of the conceptual framework of the papers being reviewed. However, the bibliometric analysis offers features, concept evolution trends, or thematic maps. Bibliometric analysis is used to understand the patterns that have evolved in a particular field and assess the current status of research in order to forecast future trends.

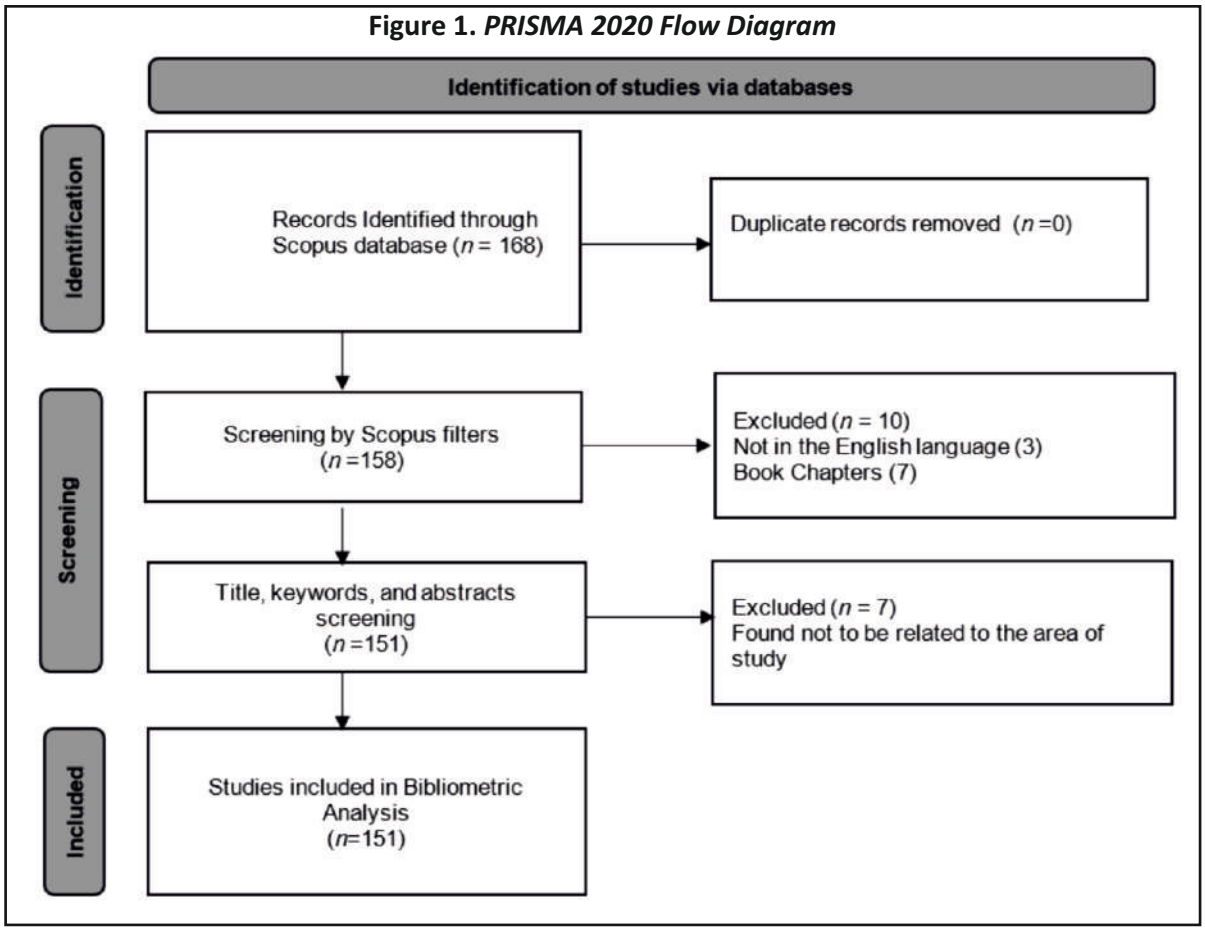
Through bibliometric analysis of relevant Scopus articles, this study attempts to fill a vacuum in the literature. Compared to WOS, Scopus has a wider selection of papers on many topics. It provides academicians with a better way to choose journals matched with the most relevant areas in the review domain (Paul et al., 2021). A collection of publications from reputable journals is available on Scopus, especially on emerging topics. To gain a thorough grasp of the literature, it is, therefore, essential to conduct a review that is concentrated on Scopus articles. This study uses a comprehensive approach by using VOS Viewer to do bibliometric analysis. Science mapping and performance analysis are employed. This application of bibliometrics sets our work apart. It makes a significant contribution to the developing fields of sentiment analysis and cryptocurrencies. We claim that this is the first publication in this developing subject to conduct a bibliometric literature evaluation on Scopus articles. Previous assessments of the literature have either included just Web of Science articles or addressed the subject matter in brief as a sub-section of the overall study (Almeida & Gonçalves, 2023; Ballis & Verousis, 2022). This paper makes an effort to close the gaps. In order to help academicians better comprehend the body of research that is currently accessible and to offer industry stakeholders useful insights, this study takes a comprehensive approach to elucidate the complex relationship between attitudes and cryptocurrencies.

Methodology

Performance analysis and science mapping are the two major approaches used in bibliometric analyses to study a particular scientific subject using bibliographic data (Cobo et al., 2011; van Raan, 2005). They are frequently used to evaluate the progress of a particular scientific topic (Liao et al., 2018). Therefore, by serving as a powerful tool to examine citations, geographic distribution, word frequency, and co-citations, bibliometric analyses give researchers a chance to go further into a particular topic of study. This study deploys the PRISMA framework to identify the documents for analysis. The proposed framework (Figure 1) was adopted to ensure transparency and completeness in reporting (Welch et al., 2012).

To eliminate any potential researcher bias, before this systematic review, a keyword search of the literature was conducted in the Scopus database. The keywords used were TITLE-ABS-KEY, "Cryptocurrency AND Sentiment," and "Cryptocurrency AND sentiments." This only looked for these terms in the article's abstract, title, and keywords. The first selection included 168 documents. Book chapters and non-English articles were not included in the selected documents. Conference papers and publications in peer-reviewed journals made up the final data set for analysis. During the manual screening, studies that were deemed irrelevant to the cryptocurrency space based on sentiments were likewise disregarded. We carefully examined each of the first search's results to make sure there were no possible differences. Because the field of study is still in its infancy, all studies published up until April 2022 are included, and there is no temporal filter.

Figure 1. ***PRISMA 2020 Flow Diagram***



To see the selection procedure, please refer to Figure 1. Finally, the selected 151 articles underwent bibliometric analysis. To evaluate publication distribution by nation, organization, journal, individual author, and networks arising from co-occurrence, Van Eck and Waltman's (2010) VOSviewer application was utilized.

Analysis and Results

Number of Articles Published

Figure 2 presents the publication trend, showing how the yearly number of scientific articles in the cryptocurrency sector has developed in relation to attitudes. Overall study trends appear to be trending upward, especially after 2017 saw a sharp surge in the price of Bitcoin. A total of 80% of all articles published in 2021 were published as of the end of the second quarter of 2022 (n = 36). It is clear from the pattern that scholars are becoming more interested in this field of study.

Major Authors

The top authors, according to total citations, are shown in Table 1. A total of 483 distinct authors were working in this field of study. The two authors whose work has been mentioned the most are Corbet S. and Hu Y. Four peer-reviewed papers by Corbet S. have been published in various journals. They examined (a) how variations in macroeconomic news affect Bitcoin returns (Corbet et al., 2020a), (b) if Bitcoin serves as a safe haven (Corbet, Hou, et al., 2020), and (c) the financial market volatility spillover effect (Corbet et al., 2020b). The last two are joint ventures with Hu Y., who also contributed to a study on Bitcoin price prediction (Serafini et al., 2020).

Figure 2. ***Number of Articles Published Each Year***

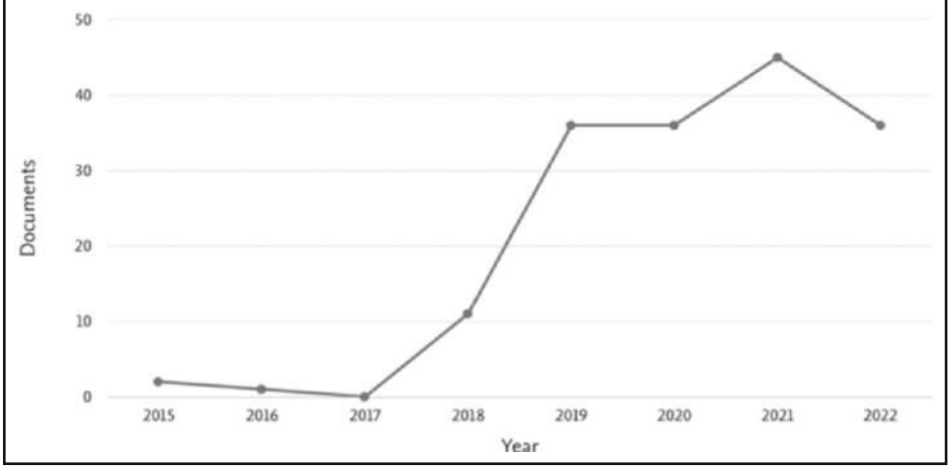


Table 1. ***Major Authors as per Maximum Total Citations***

Cites	Authors	Articles
162	Corbet S.	4
137	Hu Y.	3

128	Hou Y.G.	2
128	Oxley L.	2
102	Larkin C.	2
33	Zhang Y.	2
25	Huynh T.L.D.	2
20	Mbarki I.	2
20	Naeem M.A.	2

Note. Cites refer to total citations; articles refer to the total number of articles published by each author.

Major Articles

Table 2 displays the articles with the greatest potential impact. The basic literature for the investigation of Bitcoin in the context of feelings is available in articles by Polasik et al. (2015) and Garcia and Schweitzer (2015). Polasik et al. (2015) published this paper, which has received 166 citations overall. Their research looked at how Bitcoin's features for investment and payments affect online sales. The findings indicated that the popularity, newspaper coverage, and transaction volume of Bitcoin affected its returns. Garcia and Schweitzer (2015) published an article, "Social Signals and Algorithmic Trading of Bitcoin," with a total of 90 citations that integrated multiple data sources in algorithmic trading design. The analysis took into account transaction volume, Bitcoin adoption, and USD volume and pricing. It also contained information search, opinion polarization, word-of-mouth volume, and emotional valence from tweets about Bitcoin over three years. By examining price swings (Li et al., 2019), volatility spillover (Corbet et al., 2021), connections to the stock market (López-Cabarcos et al., 2021), and the COVID-19 scenario (Corbet, Hou, et al., 2020), articles in this subject seek to understand the function of attitudes in the cryptocurrency market.

Table 2. ***Major Articles on Cryptocurrency in the Field***

References	Cites	Title of Articles
Polasik et al. (2015)	166	Price Fluctuations and the Use of Bitcoin: An Empirical Inquiry
Garcia & Schweitzer (2015)	90	Social Signals and Algorithmic Trading of Bitcoin
Corbet, Hou, et al. (2020)	68	Any Port in a Storm: Cryptocurrency Safe-Havens During the COVID-19 Pandemic
Corbet et al. (2021)	60	Pandemic-Related Financial Market Volatility Spillovers: Evidence from the Chinese COVID-19 Epicenter
Kraaijeveld & De Smedt (2020)	60	The Predictive Power of Public Twitter Sentiment for Forecasting Cryptocurrency Prices
López-Cabarcos et al. (2021)	36	Bitcoin Volatility, Stock Market and Investor Sentiment. Are They Connected?
Li et al. (2019)	35	Sentiment-based Prediction of Alternative Cryptocurrency Price Fluctuations Using Gradient Boosting Tree Model
Valencia et al. (2019)	35	Price Movement Prediction of Cryptocurrencies Using Sentiment Analysis and Machine Learning
Corbet et al. (2020a)	34	The Impact of Macroeconomic News on Bitcoin Returns
Chu et al. (2019)	32	The Adaptive Market Hypothesis in the High-Frequency Cryptocurrency Market

Note. Cites refer to total citations.

Major Journals

The *International Journal of Electronic Commerce* is the most-cited journal in the Bitcoin space based on sentiment analysis. However, *Finance Research Letters* still holds the record for the most published articles, with seven, followed by the *International Review of Financial Analysis* and *Royal Society Open Science*. In order to publish their study in a reputable journal and have an impact, we can concentrate on the journals listed in Table 3 that have the highest number of citations or publications.

Major Countries and Institutions

The United Kingdom is publishing a maximum number of articles with 464 total citations, followed by Ireland with 255 total citations. The United States produces the most publications. Nicolaus Copernicus University, Poland; the Polish Bank Association; and the University of Leicester are three institutions that have been able to

Table 3. ***Major Journals Publishing in the Field***

Cites	Journals	Articles
166	*International Journal of Electronic Commerce*	1
100	*Royal Society Open Science*	4
91	*Finance Research Letters*	7
74	*Economics Letters*	2
73	*International Review of Economics and Finance*	2
65	*International Review of Financial Analysis*	3
60	*Journal of International Financial Markets, Institutions and Money*	1
41	*Journal of Behavioral and Experimental Finance*	2
35	*Entropy*	1
35	*European Journal of Finance*	3

Note. Cites refer to total citations; articles refer to the total number of articles published by each journal.

Table 4. ***Major Countries and Organizations that are Publishing in the Field***

Cites	Country	Articles	Cites	Organizations	Articles
464	United Kingdom	20	166	Nicolaus Copernicus University, Poland	1
255	Ireland	10	166	Polish Bank Association, United Kingdom	1
207	United States	26	166	University of Leicester, United Kingdom	1
202	Poland	4	162	Dublin City University, Ireland	4
182	New Zealand	7	138	Trinity College Dublin, Ireland	3
116	India	21	128	University of Waikato, New Zealand	3
79	Spain	5	90	Chair of Systems Design, Switzerland	1
50	Italy	11	68	University of Bath, United Kingdom	1
48	Vietnam	6	68	Johns Hopkins University, United States	1
41	France	7	60	University of Edinburgh, United Kingdom	1

Note. Cites refer to total citations; articles refer to the total number of articles published by each country/organization.

create maximum impact by citations (166). In contrast, Dublin City University, Ireland, publishes a maximum number of articles. The details of the same are presented in Table 4.

Thematic Representation

Table 5 displays the 857 keywords that were found from the analysis of 151 articles. Different terms that have appeared in the dataset at least seven times are represented by a co-occurrence network visualization in Figure 3. Every hue denotes a group of related themes. With thick lines indicating Bitcoin, investments, COVID-19,

Table 5. ***Most Occurred Keywords***

Keyword	Occurrences
Cryptocurrency	85
Bitcoin	70
Sentiment Analysis	62
Social Networking (Online)	36
Forecasting	34
Electronic Money	28
Investments	27
Social Media	24
Blockchain	21

Figure 3. ***Co-Occurrence Network of Keywords***

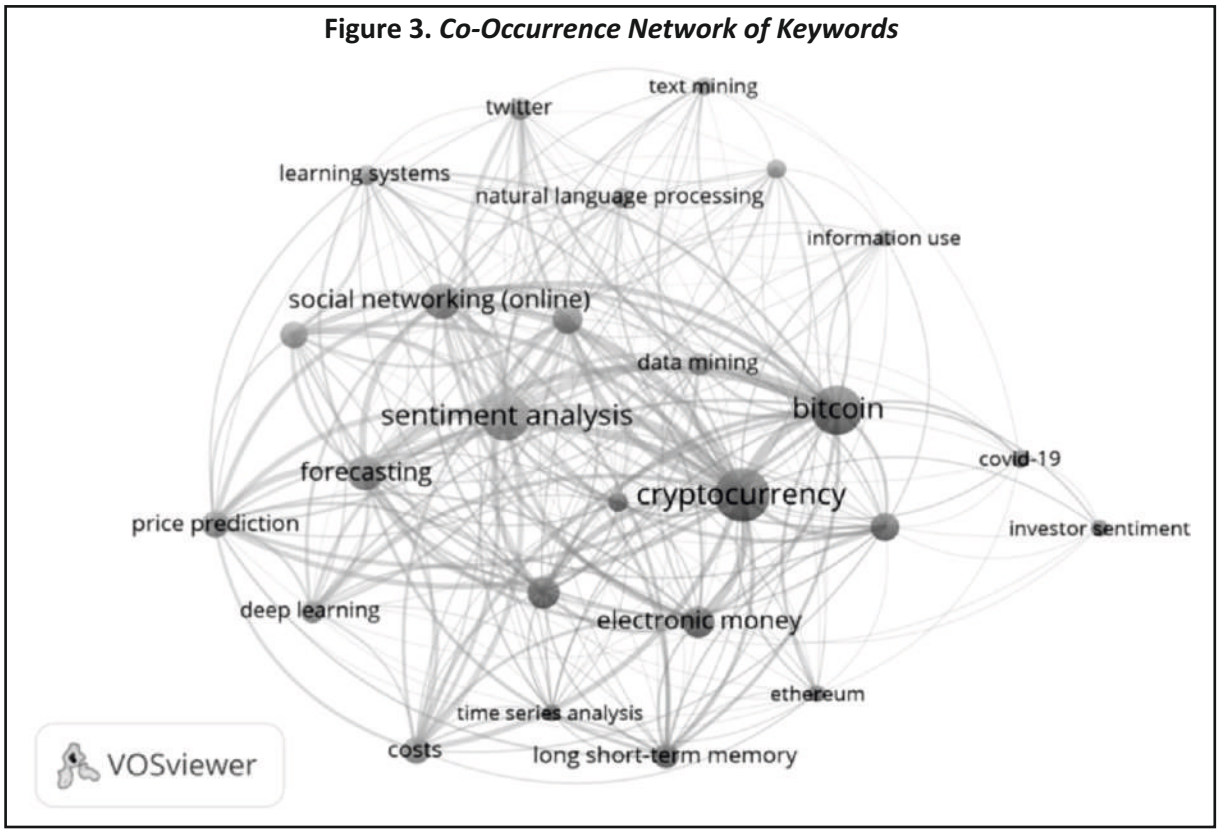
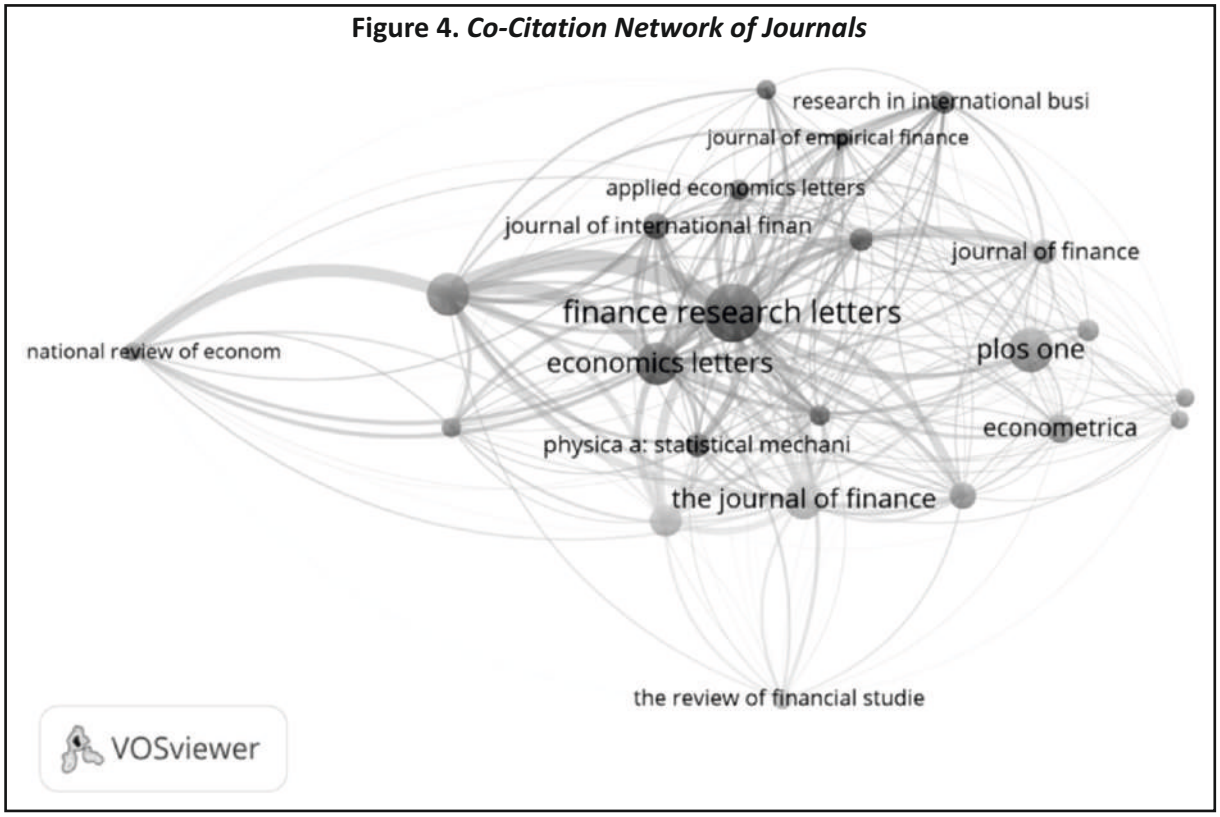


Figure 4. *Co-Citation Network of Journals*



sentiment analysis, and social networking (online), the first thematic cluster contains a Cryptocurrency node. The latter two keywords connect with the other two clusters. It is clear from examining the keywords that the network discusses research on cryptocurrencies, particularly Bitcoin, and their potential use as investments for both COVID and regular investors. The second cluster is made up of phrases such as text mining, machine learning, data mining, and Twitter. These keywords reflect different approaches to studying cryptocurrency using public opinion. Finally, the third cluster is linked to several cryptocurrency forecasts, including forecasts concerning volume and volatility, associations with different costs, and price predictions. We infer that there is considerable interconnectivity among all of the clusters. The fact that certain terms are less common could mean that there is more room for these kinds of studies to grow in the future.

Figure 4 presents the co-citation of journals. Financial and economics-related journals, such as the *Journal of Empirical Finance* and *Economics Letters*, are included in the first cluster. The *Finance Research Letters* is the most well-known. Journals that are transdisciplinary or connected to computer systems are examples of additional clusters. The majority of the journals that were selected to publish cryptocurrency in light of sentiments have to do with finance, economics, or the application of machine learning, which suggests that ML (machine learning techniques) techniques are widely used in the new financial development of digital currency.

Recent Research Trends

Table 6 lists the most popular and current subjects in Bitcoin study in relation to attitudes, and it can point researchers in the right route in the future. As a representation of the field's recent development, it includes a list of every issue that has been explored in 2022.

Table 6. ***Recent Publication Trends in the Field***

Citations	Objectives
Gill et al. (2023)	Assessing the worldwide cryptocurrency industry's effectiveness in light of the efficient market theory.
Hassan et al. (2022)	Determining the opinion of netizens regarding cryptocurrencies by applying emotion theory.
Huynh (2023)	Assessing the correlation between fluctuations in Elon Musk's tone and the price movement of Bitcoin.
Hasan et al. (2022)	Examining the relationship between changes in Elon Musk's sentiments and the price and volatility of Bitcoin.
Ngo & Nguyen (2022)	Analyzing the relationship between cryptocurrency movements and sentiment on Twitter using a convolution neural network.
Ye et al. (2022)	Determining the behavior of six cryptocurrencies as a result of fear and hope of COVID-19.
Anamika & Subramaniam (2022)	Exploring the relationship between news headlines and the crypto market.
Parekh et al. (2022)	Forecasting the values of cryptocurrencies by analyzing their interdependence with other cryptocurrencies and market sentiment.
Zhang & Zhang (2022)	Determining cryptocurrency market fluctuations by analyzing the sentiment of issuers.
Corbet et al. (2022)	Examining the driving role of investor attention in DeFi.
Ortu et al. (2022)	Comparing four deep learning algorithms to assess the predictive capability of cryptocurrency price fluctuations.
Anbaee Farimani et al. (2022)	Examining the relationship between technical indicators and news sentiment to predict financial market prices.
Abdul-Rahim et al. (2022)	Analyzing the comovement motivations of cryptocurrencies and the G7 stock market.
Mahdi & Al-Abdulla (2022)	Analyzing the effects of COVID-19-related news on the cryptocurrency and gold markets.
Trigka et al. (2022)	Examining the role of Twitter user's profile in predicting cryptocurrency's popularity.
Chen et al. (2022)	Assessing the impact of lockdown policies on the price of Bitcoin.
Kalariya et al. (2022)	Identifying stochastic behavior in price prediction models through the implementation of randomization.
Caferra (2022)	Exploring the relationship between sentiments-returns relationship in the cryptocurrency market and stock market.
Bahamazava & Nanda (2022)	Identifying significant themes concerning the motivations and obstacles encountered by consumers of the DarkNet market.
Chursook et al. (2022)	Forecasting the performance of an initial coin offering by analyzing market sentiment and expert ratings.
Kim et al. (2022)	Analyzing the behavior of the cryptocurrency market with the HM model.
Bianchi et al. (2023)	Comparing cryptocurrency returns to those of conventional asset classes by examining the correlation between a set of market risk factors, sentiment variables, and cryptocurrency-specific predictors.
Coulter (2022)	Exploring the relationship between international news events and prices of Bitcoin.
Aslam et al. (2022)	Predicting the prices of cryptocurrencies through sentiment analysis and emotion detection using Twitter data.
Chopra & Saldi (2022)	Examining the enduring and hedging capabilities of Bitcoin before COVID-19 to determine its effectiveness and security.
Narayanaswamy & Karthika (2018)	Examining the digital cryptocurrencies focusing on their inception, characteristics, associated risks, and global acceptance, which are derived from media reports.

Practical Implications

This study has practical importance for investors, market participants, and policymakers. Individuals and organizations will be able to make decisions about managing risks, strategies for investment, and regulatory structures. Their decisions will be better informed after they have gained an understanding of the influence that sentiments have on the crypto market. This will also help to increase investor trust and develop practical plans to deal with the volatile cryptocurrency market. Once people understand the role of sentiments, they will make smart and responsible use of cryptocurrency.

Conclusion, Limitations of the Study, and the Way Forward

The findings in this study suggest that, during the recent five years (2017–2022), the academic community has shown a great deal of interest in this important issue. The significant rise in publications noted during this time indicates a marked increase in interest in the intricate connection between sentiment and cryptocurrencies. Since this is the first bibliometric research article on cryptocurrency in the light of sentiments, this paper has a novel contribution. The selection of documents for analysis has resulted in various restrictions for this work. Sometimes relevant studies are missing, even if the database of choice (Scopus) gathers the majority of the best publications in this field of study.

Furthermore, some of the scanned publications might not have contained the selected keywords, which could have influenced the research's findings differently. This is a young field with little research; thus, there is a lot of opportunity to explore new directions. This study seeks to shed light on the subject and inspire future scholars to pursue similar studies. There is a lot of room for research on the subject of cryptocurrencies in light of sentiments because this topic is still relatively new. Future researchers can concentrate on focusing on performing studies on other currencies, such as Ethereum and Tether. These new cryptocurrencies are developing extremely rapidly, and the majority of studies in the literature focus on Bitcoin. There is a shortfall of research on blockchain-based tokens (NFTs and DeFi tokens) that are being traded. Since there is now little study available, future studies can look into the trading techniques and market consequences of these tokens. To develop new sentiment indicators, researchers can combine diverse market metrics, social media, and macroeconomic elements using machine learning algorithms. Future researchers can also do meta-analyses on this subject. Scholars may choose to look at the ongoing debate concerning whether sentiment is a significant indicator of cryptocurrency prices (Fang et al., 2020; Gaies et al., 2021; Naeem et al., 2021).

Authors' Contribution

Dr. Renu Ghosh and Diya Sharma completed the research article's design and concept development. Diya Sharma found concepts and codes linked to the study's outline by using keywords to help her search through reputable research articles. Chandra Shekhar Sharma and Renu Ghosh oversaw the project and confirmed the analytical techniques used in creating the text after conferring with Diya Sharma, one of the other two authors.

Conflict of Interest

The authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript.

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About the Authors

Diya Sharma is an Assistant Professor at the Department of Commerce, Dyal Singh College, University of Delhi, India. She is also a Research Scholar at the Department of Management Studies, Netaji Subhas University of Technology, New Delhi. Her area of study is finance.

Dr. Renu Ghosh is an Assistant Professor at the Department of Management Studies, NSUT. She was awarded a Ph.D. from the University of Delhi. Her interests include capital market operations, investment management, strategic corporate finance, and behavioral finance.

Prof. Chandra Shekhar Sharma served as a Professor at the Department of Commerce, Shri Ram College of Commerce, University of Delhi. His areas of expertise are finance, organizational behavior, and research methodology.