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CRYPTOCURRENCY AND STOCK MARKET RESEARCH: A BIBLIOMETRIC ANALYSIS

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ABSTRACT
Based on the 566 research publications that were obtained from the Scopus database, this study analyses the advancements and trends in cryptocurrency and stock market research. The results show that there was a gradual increase in academic interest in this field from 2013 to 2023. Several publications in this area were published after 2018. Together with publication trends, the citation trend improved. China, the United States, and India are the top three contributors. Following 2018, a lot of institutes started publishing literature in this area. Using bibliometric methods and techniques, it has been shown that this area is experiencing an expansion in research. This work provides a foundation for future research in this field and aids the academic community in identifying the progress of research in the fields of cryptocurrencies and stock markets.

KEYWORDS: *Bibliometrics Analysis; Cryptocurrency; Bitcoin; Stock market; Financial market*

1. INTRODUCTION
Cryptocurrency is the most ground-breaking and fascinating advancement in the area of digital payments. The popularity of cryptocurrencies has increased recently (Manahov & Urquhart, 2021). The cryptocurrency market has rapidly grown into significant component of the global financial system and a new asset class similar to stocks. Bitcoin was first introduced by Satoshi Nakamoto in a white paper titled "Bitcoin: A Peer-to-Peer Electronic Cash System" in 2008 (Zade et al., 2019). Blockchain-based P2P electronic payment system proposed by Nakamoto (2008) profoundly changed the nature of electronic payments. As Bitcoin- the first crypto-currency- being decentralised and not governed by any central bank, unlike other conventional currencies, it quickly acquired popularity and investors' attention. The popularity of bitcoin inspired other crypto-entrepreneurs to create their own currencies. Many altcoins emerged following the advent of bitcoin. Etheruem, Tether, Litecoin, Dash, Ripple, Cardano, etc. are important altcoins.

Scholars have paid close attention to the cryptocurrency market due to its rapid growth and popularity. At the moment, cryptocurrency research is primarily focused on disciplines such as computer science, economics, business, and finance. In the area of finance, many studies have been conducted on the volatility of cryptocurrencies (Ahmed, 2021; Attarzadeh & Balcilar, 2022; Benhamed et al., 2023; Bouri et al., 2019; Gopane, 2021; Leirvik, 2022; Yaya et al., 2021; Zhang et al., 2022). Cryptocurrencies are emerging as a new type of investment asset (Srinivasan et al., 2022), but in the academic community, there is still no definition that makes clear if Bitcoin is a currency or just an asset (Poyser, 2017). The majority of researchers agree that Bitcoin is merely a commodity now; nevertheless, a very few of them think it will replace real currency in the forthcoming future. Some researchers believe that it resembles a speculative investment (Yermack, 2013). Studies were also done to comprehend the price determinants of cryptocurrencies. It may be determined by a variety of factors, including demand, supply, attractiveness, technological drivers, and macro-financial developments (Khursheed et al., 2020; Van Wijk, 2013; Kristoufek, 2013; Bouoiyour & Selmi, 2015). Behavioural finance perspective of cryptocurrency investors also studied by various academicians in recent times (Al-mansour, 2020; Fonseca et al., 2020; Gusev, 2018; Subramaniam & Chakraborty, 2020). Studies by Van Wijk (2013), Corbet (2018), Handika et al. (2019), Gil-Alana et al. (2020), Gozbasi et al. (2021), Lahiani et al. (2021), Hachicha (2021), Ha & Nham (2022), and Ghorbel et al. (2022) found differential dependency and independence between stock markets and the cryptocurrency market. Although there is much literature covering the many facets of cryptocurrencies, understanding of their effect on the financial market is relatively scattered.

This study examines the evolution of cryptocurrencies and financial market research using bibliometric techniques. Based on the available literature, this study examines the advancements and trends in stock market and cryptocurrency research. Bibliometric analysis is a comprehensive statistical, mathematical, and philological method that quantitatively analyses the trends and advancements in a particular research area. It is more comprehensive and efficient way to track and analyse the progress in a particular area of research. This method eliminates the errors and omissions in the traditional qualitative method. This method has theoretical and practical relevance in identifying research hotspots and themes (Yue et al., 2021).

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The current bibliometric research attempts to track the trends in publications and citations in cryptocurrency and stock market research from 2013 to 2023 by assessing the most contributing authors, affiliations, journals, productive nations, network analysis and mapping of thematic evolution

To achieve the objectives of the study, The following research questions are addressed in this paper:

1. What are the publishing trends for cryptocurrency and stock market research?
2. Which of the countries, institutions, journals, and authors made significant contributions to cryptocurrencies and stock market research, and what are the significant studies?
3. What are the emerging themes in the domain of cryptocurrencies and stock market research?

A total of 566 samples (spanning the years 2013 to 2023) were chosen from the Scopus database to answer these research questions.

2. METHODOLOGY

2.1 Research Method

This study examines the evolution of cryptocurrencies and financial market research using bibliometric analysis. Bibliometric analysis is a statistical assessment of published research articles, books, papers, proceedings, etc., and it is an efficient technique to gauge the impact of publications, authors, or affiliations in the scientific community. Bibliometric analysis enables quantitative examination of research trends and advancements in a specific field, done using comprehensive statistical, mathematical, and philological methods.

2.2 Database

This study analyses literature data obtained from the Scopus database on February 23, 2023. Scopus is an abstract and citation database that was launched in 2004. Scopus includes scholarly literature across a wide variety of disciplines. Scopus covers more than 25,000 active titles from 7,000 publishers- all rigorously vetted and chosen by an independent review board.

2.3 Search Terms and Inclusion/Exclusion Criteria

Keyword selection is important to obtain the most relevant literature samples. As the paper focuses on cryptocurrency and stock market research, two different groups of keywords are used as shown in Table 1. For this analysis, only journal articles were taken into account; book chapters and conference proceedings were excluded. Only the final articles are considered for the analysis; all other articles written in languages other than English are excluded. Finally, 566 papers from 2013 to 2023 were selected for this research on February 23, 2023.

Table 1. Search Terms

Keywords for “Cryptocurrency”	"Cryptocurrency" OR "Bitcoin" OR "Digital currency" OR "Virtual currency" OR "Ethereum" OR "Tether"
Keywords for “Stock market”	"Stock market" OR "Stock exchange" OR "Stock market indices" OR "Financial market" OR "Global financial market"

3. DATA ANALYSIS AND DISCUSSION

Bibliometric analysis was performed using several tools and softwares including MS Excel And Bilioshiny. Biblioshiny is the web interface for Bibliometrix. It aids scholars in making simple use of key features of Bibliometrix, like importing data, converting it into data frames, collecting data using dimensions, and data filtering. It also enables analytics and visualisations for various level metrics, including authors, sources, and clustering analysis.

3.1 Analysis of the Overall Trend in Publications and Citations

The final dataset included 566 articles published between 2013 and 2023 across 249 journals, indicating that cryptocurrency and stock market research is a relatively recent research trend. There were very few papers published in this domain prior to 2018. The academic papers about cryptocurrency and stock market firstly appeared in 2013. In 2014 there were no papers published in this domain. It is only after 2018 that the research trends indicate progress. After 2018, there was a major increase in research and publications in this domain. Table 2 shows the total number of papers published from 2013 to 2023. Most papers were published in 2022. The annual growth rate in research and publication is 40.97%.

Table 2. Annual Scientific Production

Year	Articles
2013	1
2014	0
2015	6
2016	4
2017	5
2018	21
2019	62
2020	106
2021	142
2022	188
2023	31

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Figure 1. shows the mean citations per year. Even though the number of publications has shown a significant increase after 2018, the average citation seems to be declining after a skyrocketing increase during the years 2015 and 2016. In terms of publication, the most successful year was 2022, but in the case of average citations, the most successful year was 2016. After 2016, the mean citation gradually falls, reaching its lowest level in 2022 and 2023.

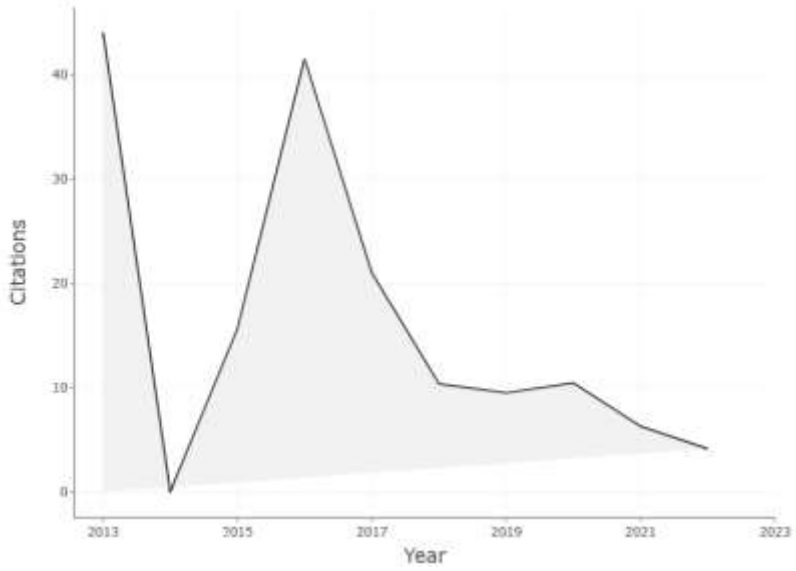


Figure 1. Average Citation Per Year.

3.2 Most Contributing Countries

Table 3 lists the top ten most productive countries, and figure 2 shows the countries' production over time. Around 50 articles were published throughout the study period in the top five nations on the list. The findings indicate that China, with 203 articles, has had an exceptional output, followed by the United States, with 95 publications. India is in third place with 62 publications, but it is not included in the top cited countries. France, Tunisia, Brazil, and Poland are included in the top ten publishing countries, but in the case of citation, all of these countries are not in the top ten.

Table 3. Top ten publishing countries

Country	Total Publication
CHINA	203
USA	95
INDIA	62
UK	62
FRANCE	55
SPAIN	46
TUNISIA	45
BRAZIL	40
TURKEY	40
POLAND	39

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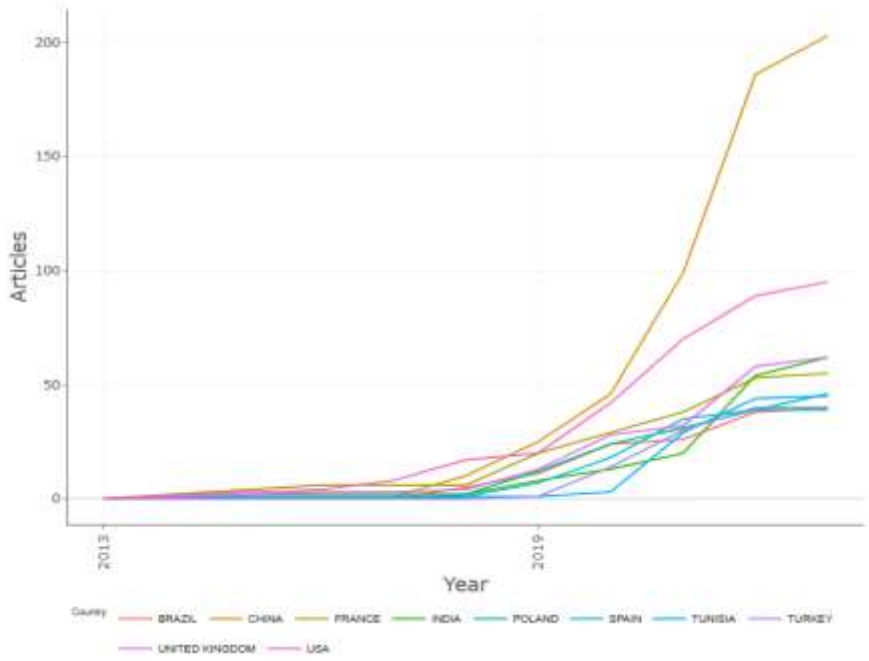


Figure 2. Countries' production over time

Table 4 shows the most-cited countries. China was one of the top publishing nations, but when it comes to citations, it is only in second place. Ireland received the most citations, despite not being among the top 10 publishing nations, according to the data. Despite not producing many more articles, countries like Lebanon, the Czech Republic, Malaysia, and Korea are among the most-cited countries.

Table 4. Most Cited Countries

Country	TC	Average Article Citations
IRELAND	1236	95.08
CHINA	802	10.69
UNITED KINGDOM	658	34.63
LEBANON	623	155.75
CZECH REPUBLIC	481	120.25
USA	437	14.57
MALAYSIA	403	33.58
KOREA	396	19.80
SPAIN	357	23.80
TURKEY	342	22.80

3.3 Most Relevant Affiliations

The top 10 highly productive institutions are shown in Table 5. It is apparent that most of the institutions had more than eight publications, whereas the top six institutions had more than ten publications. The University of Economics, Ho Chi Minh City, emerged as the most productive organisation with 15 publications, followed by Trinity College, Dublin, with 13 publications.

Table 5. Top Ten Highly Productive Institutions

Affiliation	Articles
UNIVERSITY OF ECONOMICS HO CHI MINH CITY	15
TRINITY COLLEGE DUBLIN	13
UNIVERSITY OF SFAX	11
DUBLIN CITY UNIVERSITY	10
NANJING UNIVERSITY OF INFORMATION SCIENCE AND TECHNOLOGY	10
UNIVERSITY OF WAIKATO	10
MONTPELLIER BUSINESS SCHOOL	9
CENTRAL SOUTH UNIVERSITY	8
CHARLES UNIVERSITY	8
POZNAN UNIVERSITY OF ECONOMICS AND BUSINESS	8

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Figure 3 shows the affiliations' production over time. Since 2018, every institution has consistently published articles. During the period of 2013–2017, there were only a few publications from the institutions. Institutions started to produce more research articles on this topic after 2018, which marked a significant growth in the research trend in this domain.

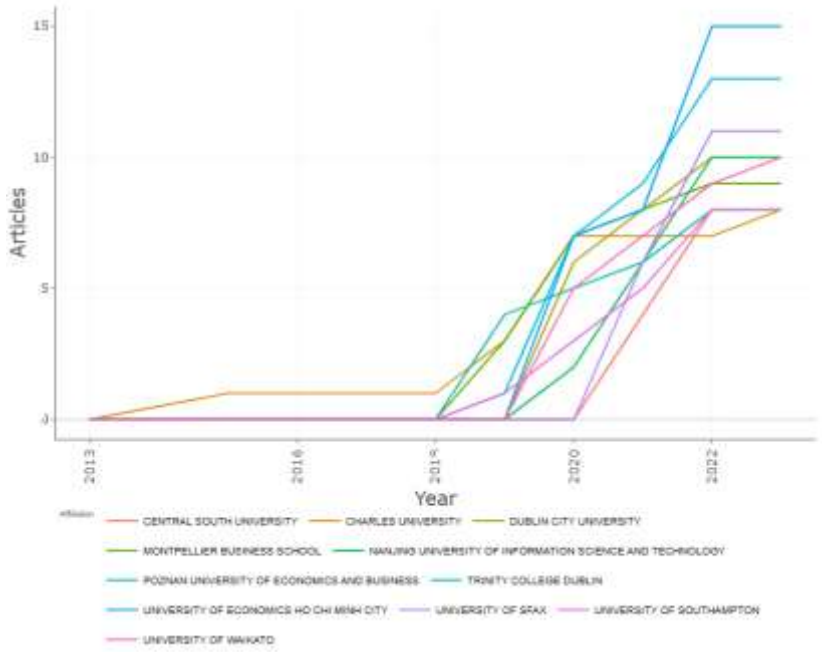


Figure 3. Affiliations' production over time

3.4 Most Relevant Authors

The top ten writers who have made a major contribution to the fields of bitcoin and stock market research are shown in Table 6, and the author impact is shown in Table 7. S. Corbet is the most significant author in terms of total publications, h index, g index, and m index. S. Corbet made a contribution by writing 12 research publications, and E. Bourie came in second with eleven. 10 papers each were supplied by L. Kristoufek, B. Lucey, and L. Yarovaya. L. Kristoufek stands out among the top authors with 1723 total citations. and B. Lucey has 1028 citations. When citations are taken into account, S. Corbet and E. Bourie, who have the most articles published, come in third and fourth place, respectively.

Table 6. Top Ten Authors

Authors	NP	Articles Fractionalized
CORBET S	12	2.83
BOURI E	11	2.82
KRISTOUFEK L	10	5.23
LUCEY B	10	2.63
YAROVAYA L	10	2.95
WANG Y	8	2.87
JERIBI A	6	2.25
MATKOVSKYY R	6	2.75
ROUBAUD D	6	1.40
SHAHZAD SJH	6	1.52

Table 7. Author Impact

Element	h_index	g_index	m_index	TC	NP	PY_start
CORBET S	11	12	2.75	849	12	2020
BOURI E	10	11	2	949	11	2019
LUCEY B	10	10	2	1028	10	2019
KRISTOUFEK L	9	10	0.818	1723	10	2013
YAROVAYA L	9	10	2.25	302	10	2020
ROUBAUD D	6	6	1.2	834	6	2019
BEKIROS S	5	5	1	368	5	2019
LIVIERIS IE	5	5	1.25	107	5	2020
MATKOVSKYY R	5	6	1	128	6	2019
NAEEM MA	5	5	1.25	85	5	2020

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Figure 4 shows the progression of the research publications by the most important authors. The cluster map's circles stand for the number of articles, and the colour stands for the volume of citations obtained over the course of the year. This would demonstrate the production of the most significant publications in 2020.

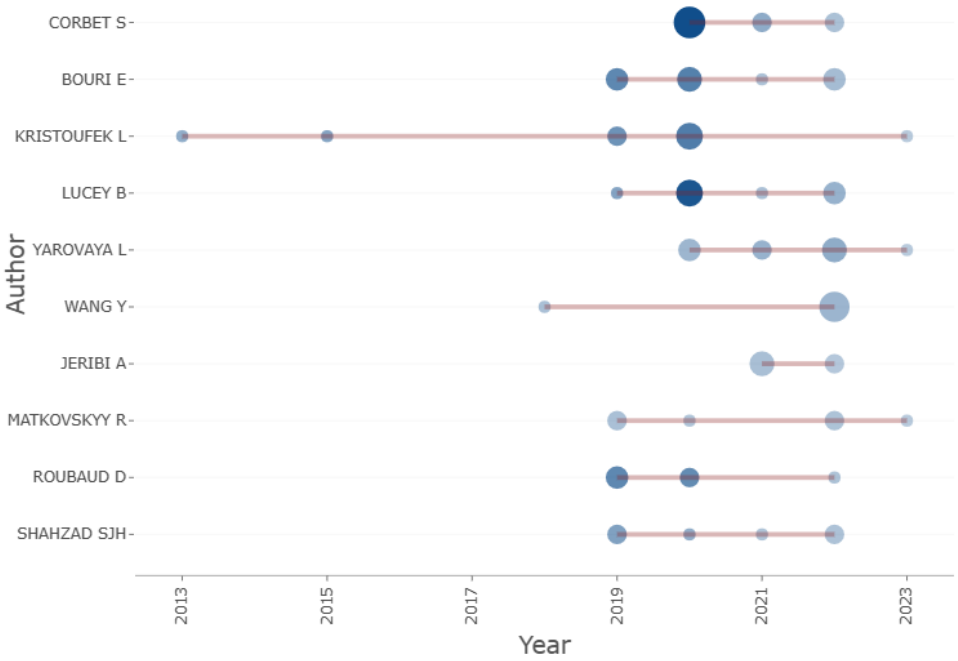


Figure 4. Top Authors' Production Over Time

3.5 Most Relevant Source

The top ten research journals for stock market and cryptocurrency research are shown in Table 8. It demonstrates that all major journals published more than ten papers. With 38 articles, the journal "Finanace Research Letters" tops the table, followed by "Physica A: Statistical Mechanics and its Applications," which has 30 publications.

Table 8. Top Ten Journals

Sources	Articles
FINANCE RESEARCH LETTERS	38
PHYSICA A: STATISTICAL MECHANICS AND ITS APPLICATIONS	30
RESEARCH IN INTERNATIONAL BUSINESS AND FINANCE	18
RESOURCES POLICY	18
APPLIED ECONOMICS LETTERS	17
INTERNATIONAL REVIEW OF FINANCIAL ANALYSIS	15
APPLIED ECONOMICS	12
NORTH AMERICAN JOURNAL OF ECONOMICS AND FINANCE	12
QUARTERLY REVIEW OF ECONOMICS AND FINANCE	11
TECHNOLOGICAL FORECASTING AND SOCIAL CHANGE	11

3.6 Most Relevant Research Papers

Table 9 gives the details of most cited research papers. "Bitcoin, gold and the dollar- A GARCH volatility analysis" (Dyhrberg, 2016) published in Finance Research Letters is the most cited article, with 703 citations. This study investigates the potential of bitcoin as a financial asset. The asymmetric GARCH demonstrated that bitcoin may be advantageous for risk-averse investors in anticipation of market downturns and excellent for risk management. Since it may be classified as something between gold and the US dollar on a scale from pure medium of exchange advantages to pure store of value advantages, bitcoin has a position on the financial markets and in portfolio management overall. "What are the main drivers of the bitcoin price? Evidence from wavelet coherence analysis" (Kristoufek, 2015) published in PLoS ONE is the second most cited article with a total citation of 467. This study looked at many factors that could affect Bitcoin price, including fundamental, speculative, and technical factors. It also looked at the possible impact of the Chinese market. Using a continuous wavelets framework to investigate the evolution of relationships in both the time and frequency domains, it is discovered that Bitcoin is a unique asset with characteristics of both a conventional financial asset and a speculative one.

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Table 9. Top Ten Global Cited papers

Title	Year	Author	Journal	Total Citations
Bitcoin, gold and the dollar - A GARCH volatility analysis	2016	A. H. Dyhrberg	Finance Research Letters	703
What are the main drivers of the bitcoin price? Evidence from wavelet coherence analysis	2015	L. Kristoufek	PLoS ONE	467
BitCoin meets Google Trends and Wikipedia: Quantifying the relationship between phenomena of the Internet era	2013	L. Kristoufek	Scientific Reports	440
Hedging capabilities of bitcoin. Is it the virtual gold?	2016	A. H. Dyhrberg	Finance Research Letters	434
The contagion effects of the COVID-19 pandemic: Evidence from gold and cryptocurrencies	2020	S. Corbet	Finance Research Letters	391
Bitcoin is not the New Gold – A comparison of volatility, correlation, and portfolio performance	2018	T. Klein	International Review of Financial Analysis	353
Coronavirus (COVID-19) — An epidemic or pandemic for financial markets	2020	M. Ali	Journal of Behavioral and Experimental Finance	347
Toward blockchain-based accounting and assurance	2017	J. Dai	Journal of Information Systems	278
Is Bitcoin a better safe-haven investment than gold and commodities?	2019	S. J. H. Shahzad	International Review of Financial Analysis	271
Portfolio diversification with virtual currency: Evidence from bitcoin	2019	K. Guesmi	International Review of Financial Analysis	269

3.7 Network of keywords

The keyword co-occurrence network in the research domain is depicted in Figure 5. Keywords like financial market, Bitcoin, investments, forecasting, and cryptocurrency are included in the first cluster. The second cluster, which is highlighted in blue, includes important keywords like stock market, financial market, currency, investments, and so forth.

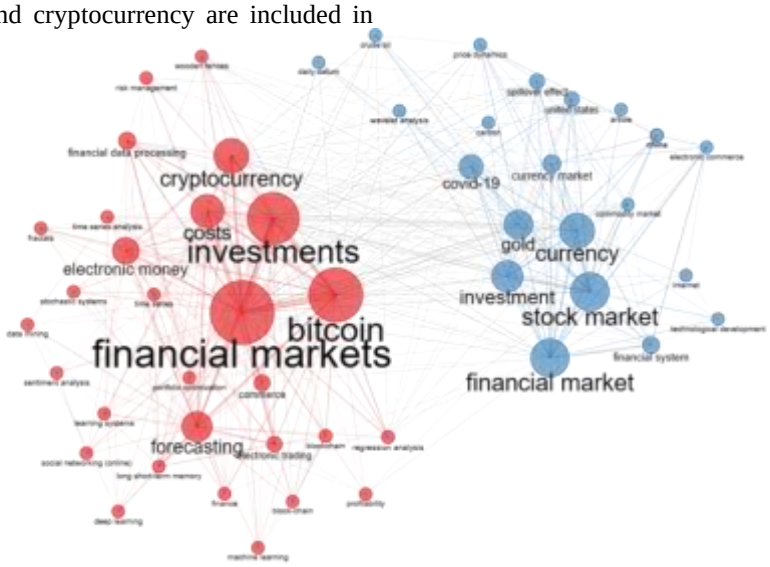


Figure 5. Co-Occurrence Network

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3.8 Thematic Map

Figure 6 shows Thematic map showing clusters and the Keywords identified by the co-occurrence network. The centrality axis on the X-axis indicates how significant a theme is. The density, which represents the Y-axis and represents the theme's development, is a measure of the internal strength of a cluster network. The first quadrant accordingly identifies motor themes. Well-developed and significant themes for study field structure are motor themes. Investments, bitcoin, and financial markets are key terms in the motor theme. highly developed, isolated themes with little significance are plotted in the second quadrant. Risk, psychology, gambling, blockchain, and electronic trading are coming under these niche themes. Emerging or declining themes, which are peripheral and poorly developed, are seen in the third quadrant. Financial markets, stock markets, and currencies are coming under the third quadrant. Basic and transversal themes, which are broad concepts that go across various fields of study, are found in the fourth quadrant.

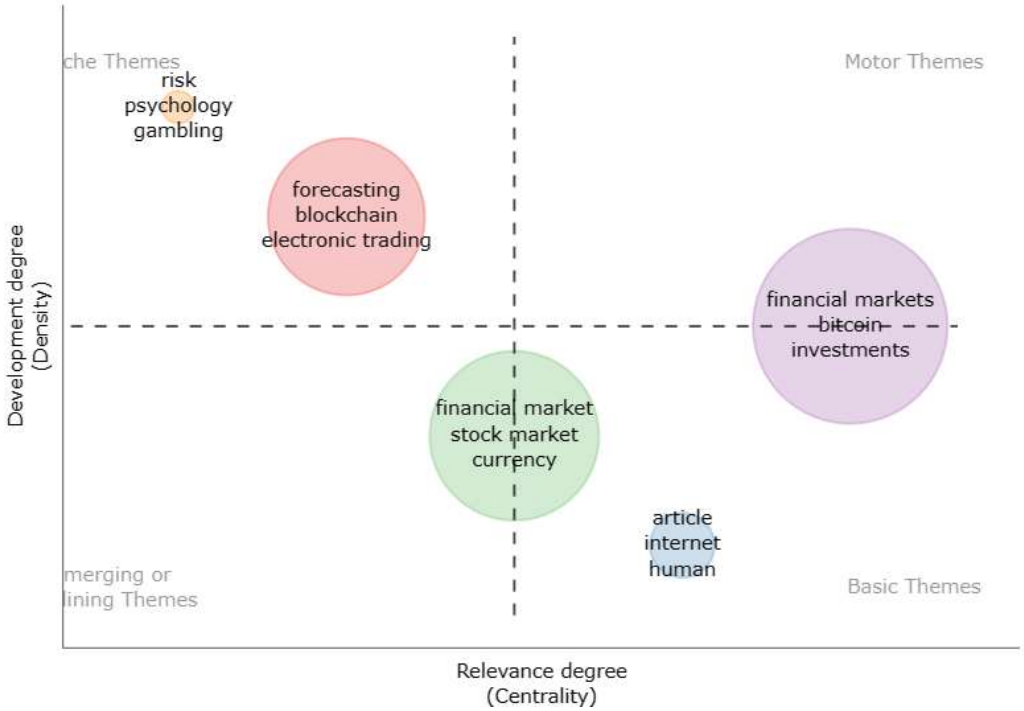


Figure 6. Thematic map of research trends

4. LIMITATIONS OF THE STUDY

In this study, literature samples were taken from a single database, i.e., Scopus. A future study can expand it to include samples from other databases like Web of Science for comparison and comprehensiveness. There may be omissions in the data due to the failure to use specific keywords. Future studies can expand the data samples by including additional keywords.

5. CONCLUSION

This paper's major objective was to look at how cryptocurrency and financial market research have progressed. This paper examines the developments and trends in stock market and cryptocurrency research based on the 566 research publications retrieved from the Scopus database. This study area's publication trend indicates an upward trend. After 2018, there were numerous papers published in this field. The citation trend improved in tandem with publication trends. The top three contributors are China, the United States, and India. After 2018, a number of institutions started to publish articles on this topic. The expanding research trend in this field has been demonstrated using a variety of bibliometric techniques and methods. This paper helps the academic community identify the research progress in cryptocurrency and stock market research and ensures a basis for future research in this area. The study's findings help scholars comprehend the current limitations and scope of this domain of study. With the help of this study, researchers in the field of cryptocurrency and stock market can develop strategies that are specific to the subjects that are now trending. For the purpose of identifying research gaps and fresh perspectives, they can also identify the most significant publications, authors, and journals in this field. Identification of influential institutions and scholars in this field may be useful to researchers. Researchers will be benefited by crucial information on prominent and influential works that may be viewed as the cornerstone of this research field. This knowledge will be useful to upcoming researchers. Findings indicate that from 2013 to 2023, academic interest in this subject area gradually rose.

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