Mapping global research on cryptocurrency: A bibliometric analysis ⊘

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Mapping Global Research on Cryptocurrency: A Bibliometric Analysis

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Abstract. Over the past decade, researchers have noticed immense interest in cryptocurrencies. The effects of cryptocurrency-based research on the Scopus database must be examined in this area. This study uses a method that combines bibliometrics and content analysis to find the countries, publications, authors, and articles that talk about cryptocurrency and how it might be used between 2013 and 2022. A totally of 1370 different articles were then included in the bibliometric study. The literature on cryptocurrencies is constantly evolving. Development continued for the first five years, 2013–2017, with fewer than 15 articles per year. However, starting in 2018, it skyrocketed, peaking in 2022 with a total of 458 articles in Scopus. The US was the most prolific country in cryptocurrency research during this period. With six papers, Giulia C. Fanti from CMU in Philadelphia, USA, became a prolific author. The Ho Chi Minh City University of Economics in Vietnam has written 21 articles about cryptocurrency and has become a well-known research partner. Elie Bouri from Lebanese American University, Beirut, Lebanon, is the most prolific author in cryptocurrency research from 2013-2022, with 15 articles in the Scopus database. Not only is he prolific, but he is also the most influential author, with 823 citations in four years. Until 2020, bitcoin-related research dominated, followed by blockchain research. Nevertheless, in 2021, cryptocurrency research related to blockchain will dominate. This indicates that research related to cryptocurrency is evolving toward its security.

Keywords: Bibliometric, Cryptocurrency, Bitcoin, Blockchain

INTRODUCTION

Cryptocurrency is a digital or virtual currency that uses cryptography to make sure that transactions are safe and that new entities are made in a controlled way [1]. It has become a subject of more interest and research in recent years. The first decentralized cryptocurrency, Bitcoin, was made in 2009, giving rise to cryptocurrencies. Since then, numerous cryptocurrencies have emerged, including Ethereum, Ripple, and Litecoin. The cryptocurrency works on a decentralized network and uses blockchain technology, a distributed ledger system that keeps track of transactions and ensures they are valid and honest. Blockchain is a way to transfer and store cryptocurrencies that is safe and open to everyone. This makes it a possible alternative to traditional financial systems [2].

Research on cryptocurrencies covers many topics, such as developing and improving cryptocurrency technology [3], figuring out how cryptocurrencies might affect society and the economy [4], and looking into the legal and

regulatory consequences [5]. Researchers have looked at how secure, and private the cryptocurrency is, how well its decentralized network works, and how scalable solutions can help it grow. Additionally, there is growing interest in using cryptocurrency for micropayments, digital identities, and smart contracts. Researchers have looked at the pros and cons of cryptocurrency as a medium of exchange and a place to store value to see how it might affect society and the economy. Some benefits are lower transaction fees, faster cross-border transfers, and less reliance on traditional financial intermediaries [6]. On the other hand, there are worries over the absence of regulation and the possibility of criminal actions such as tax evasion and the laundering of illicit funds [7].

Cryptocurrency research looks at many things, from how they work technically to how they might affect society and the economy. Governments worldwide have taken different approaches to regulate cryptocurrency [8]–[10], with some countries outright banning it and others embracing it as a legitimate financial instrument. Researchers have examined the effects of different regulatory approaches and the possibility of making rules the same everywhere. This study's results will significantly impact how cryptocurrencies are made and used in the future.

Over the last decade, researchers have noticed immense interest in cryptocurrencies. The research in this area needs to be examined to see what impact cryptocurrency-based studies have on the Scopus database. One of the most common ways to find out is through bibliometric analysis, which looks at both the quality and quantity of the impact of published works [11]–[13]. Bibliometrics is a branch of science that deals with various ways of indexing and examining scientific data. The total number of publications, the number of citations, the institutions involved, the country where the research was done, and the influence of the journals where the work was published are all significant numbers. Therefore, this research aims to identify the most prominent nations, publications, authors, and articles that discuss cryptocurrency and how it might be utilized between the years 2013 and 2022.

METHODS

This research uses a method that combines bibliometrics techniques and content analysis [14]. Current research uses bibliometrics to identify the most critical issues in cryptocurrency. This was done with Biblioshiny and Scival [15]–[18]. The articles collected from the Scopus database range from 2013 to 2002. The articles were found when the database using "cryptocurrency" as a search term. Then, duplicates were removed, and articles, journals, and papers from conferences that met the criteria were retrieved.

A totally of 1370 different articles were then included in the bibliometric study. First, the number of citations and publications from this time was examined. A citation analysis was also done to determine which articles were most important to this study. The second step was to look at the most productive countries and affiliations. The third step was to look at the most prolific authors and sources. Lastly, the Elsevier Fingerprint Engine (Scival) was used to look at keywords and find research trends over the past year [16].

RESULTS AND DISCUSSION

Descriptive analysis

The first publication on this subject was in 2013. For this study, 1370 papers from 727 sources, written by 3344 authors, were examined. There is a total of 13,626, with an average of 11.3. The literature on cryptocurrencies is constantly evolving. The development was prolonged in the first five years, 2013–2017, with less than 15 articles per year. However, starting in 2018, it skyrocketed, peaking in 2022 with a total of 458 articles in Scopus. This demonstrates how far this science has progressed in the last five years.

Figure 1 shows the growth of cryptocurrency-related research from 2018 to 2022. In 2018, 103 documents were found in Scopus, quite a change from only 14 documents in the previous year. Then it surged in 2019 with 210 papers, in 2020 with 244 documents, in 2021 with 319 documents, and in 2022 with 457 documents by the year's conclusion. Furthermore, 2020 was the year with the highest citations, with 2103, 3803, and 3491 citations, respectively, showing that the research on cryptocurrencies has a tremendous impact and contributes to science worldwide.
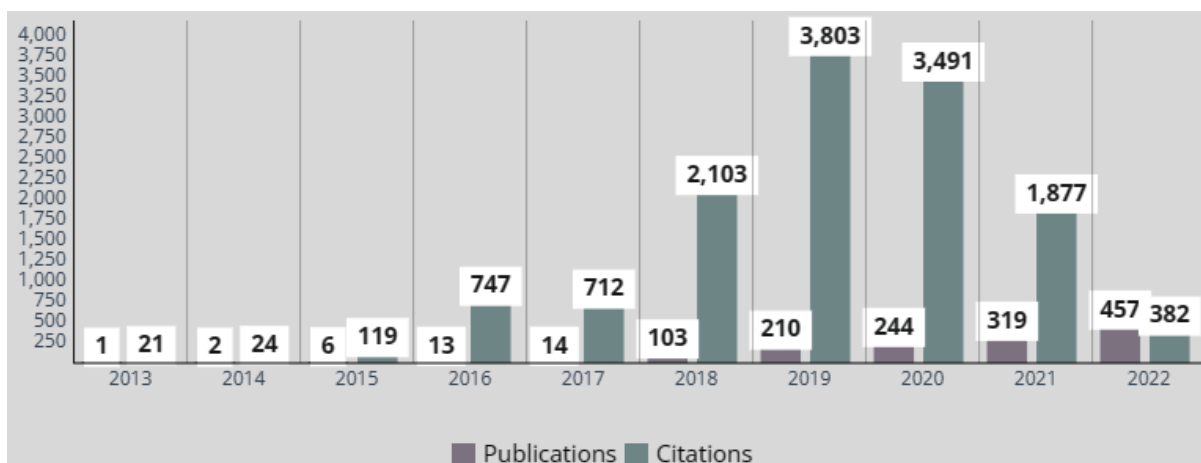
FIGURE 1. Publications and citation trends related to Cryptocurrency from 2013 to 2022

Antonio Teti of the University of G. D'Annunzio di Chieti-Pescara, Italy, was the first author to discover an article during this period in his study on Bitcoin as a cryptocurrency. This article was published in Mondo Digitale, Volume 12, June 2013 [19]. Teti explained that the development of virtual currencies could set the stage for a monetary revolution. The trigger was the need to be able to use a payment system based on virtual currencies. Hong et al.'s study on P2P network connectivity for cryptocurrencies in 2022 was the most recent article from this period. This research connects a working Bitcoin prototype to the Bitcoin mainnet to test and improve their engine's performance and to see how accurate and cost-effective their connectivity estimation engine is. This article was in the December 2022 issue of Computer Networks, Volume 219 [20]. It was cited seven times in Scopus.

Top Ten Most Prolific Countries and Affiliations

Table 1 shows the ten most prolific countries publishing literature on cryptocurrencies. Of the big three, the US leads with 236 total publications (2,699 citations), followed by China (180 publications and 2,335 citations) and the UK (144 publications with 3,386 citations).

The US was the most prolific country in cryptocurrency research during this period. Giulia C. Fanti from CMU, Philadelphia, USA, became the most productive author with six documents. Her best research looked at how cryptocurrencies are routed in payment channel networks. It was cited 55 times on Scopus and presented at the 17th USENIX Symposium on Networked Systems Design and Implementation, 2020. This was not the most popular article in the country. Nonetheless, Adam S. Hayes' study from the University of Wisconsin-Madison in the United States became the most-cited article. Hayes' study on the performance of cryptocurrencies from 2017 got much attention because it was cited 180 times on Scopus. This article was published in Telematics and Computer Science, Volume 34, November 2017 [21].

As for the most prolific partners in cryptocurrency research, the University of Economics Ho Chi Minh City, Vietnam, has authored 21 articles, followed by University College London, UK, with 20 articles, and Trinity College Dublin, with 17 articles in scope. Surprisingly, the US, as the most productive country in this study, is not among the top three most productive subsidiaries. This is interesting because the Ho Chi Minh City University of Economics in Vietnam has become a well-known cryptocurrency research partner. The University of Economics Ho Chi Minh City (UEH) is a public university in Ho Chi Minh City, Vietnam. It was founded in 1995 and is one of the best universities in Vietnam. It offers bachelor's and master's degrees in economics, business administration, and other related fields. Brian Lucey from the Institute of Business Research made a significant contribution with his eight articles and thus made an excellent contribution to the UEH.

Katsiampa et al. (2019), who looked into the conditional volatility dynamics of the major cryptocurrencies and volatility equal movements, wrote this person's most-read piece. Research shows that the interdependence of the cryptocurrency market is further shown by conditional correlations that change over time, with our chosen cryptocurrencies having strong positive correlations. This article had a significant impact on research about cryptocurrencies. It was cited 112 times on Scopus and published in the September 2019 Journal of International Financial Markets, Institutions, and Money, Volume 62 [22].

TABLE 1. Top Ten Most Prolific Countries and Affiliations Related to Cryptocurrency from 2013 to 2022

No.	Top Country	NP	TC	Top Affiliation	NP	TC
1	United States	236	1570	University of Economics Ho Chi Minh City, Vietnam	21	671
2	China	180	1591	University College London, UK	20	503
3	United Kingdom	144	2113	Trinity College Dublin, Ireland	17	737
4	India	109	505	Dublin City University, Ireland	16	609
5	Russian Federation	69	11	Chinese Academy of Sciences, China	14	576
6	Australia	62	221	Montpellier Business School, France	13	795
7	South	61	700	DCU Business School, Ireland	13	606
8	Germany	59	289	University of Chinese Academy of Sciences, China	13	467
9	Turkey	52	269	Lebanese American University, Lebanon	13	96
10	Italy	49	503	Bina Nusantara University, Indonesia	13	7

Top Ten Most Prolific Authors and Sources

Elie Bouri from Lebanese American University, Beirut, Lebanon, is the most prolific author in cryptocurrency research from 2013-2022, with 15 articles in the Scopus database. Not only is he prolific, but he is also the most influential author, with 823 citations in four years. His research on cryptocurrency markets, published in the International Review of Financial Analysis, Volume 63, May 2019, was highly appreciated by other researchers [23]. Researchers from Lebanon, China, and the United Kingdom collaborated to conduct this study. This study contributes to the rising amount of empirical analysis of the bitcoin industry. It does this by figuring out for the first time how the six most essential cryptocurrencies affect each other. This gives us a better grasp of how the various cryptocurrencies interact.

In the same period, Shaen Corbet from DCU Business School in Dublin, Ireland, was ranked second on the list of the top 10 most prolific researchers in cryptocurrency. One of his most-read articles looks at how the major cryptocurrencies' volatility changes and how those changes are similar. It has been cited 112 times on Scopus. This study is a three-country study, Ireland, the UK, and Australia, and was published in the Journal of International Financial Markets, Institutions, and Money, Volume 62, September 2019 [22].

Among the top ten most prolific sources, Finance Research Letters is the most prolific journal, with 69 documents in Scopus and a total of 1974 citations from 2019–2022. Finance Research Letters was published by Elsevier and is ranked in the Scimago quartile one based on Scopus data as of April 2022. Bouri et al. (2019) determined in their research whether one cryptocurrency's explosiveness can lead to another cryptocurrency's explosiveness is the most cited in this journal. The results showed that co-explosive behavior can go in more than one direction and does not always lead from larger markets to smaller and younger markets. This study was published in Volume 29, June 2019, and cited 145 in Scopus. Here is the full table of the ten most authors and sources.

TABLE 2. Top Ten Most Prolific Authors and Sources Related to Cryptocurrency from 2013 to 2022

No.	Top Country	NP	TC	Top Affiliation	NP	TC
1	United States	236	1570	University of Economics Ho Chi Minh City, Vietnam	21	671
2	China	180	1591	University College London, UK	20	503
3	United Kingdom	144	2113	Trinity College Dublin, Ireland	17	737
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Top Ten Highest Cited Documents and Keyphrases

How vital and influential an article is in the scientific community can be judged by how many times it is cited. Generally, articles cited are more critical, helpful, and reliable than those cited less often. When a researcher cites an article, they say they agree with the article's findings and appreciate what the article has added to the field. A high number of citations may indicate that the article significantly impacted the field and was widely recognized and used by other researchers.

In addition, the number of citations can also affect the visibility and recognition of the authors. An article with many citations is more likely to be found by other researchers and added to searches and databases. This can give the authors more opportunities, such as invitations to conferences, chances to work with other researchers, and more

attention to their work. Therefore, the number of citations can signal the quality and importance of a scientific article and is often taken into account when evaluating a researcher's productivity, impact, and success.

TABLE 3. Top Ten Highest Cited Documents Related to Cryptocurrency from 2013 to 2022

Rank	Title	Authors	TC	Findings
1	"Negative bubbles and shocks in cryptocurrency markets"	Fry et al. (2016)	250	The paper talks about how both outside and inside events affect cryptocurrency markets differently. It also talks about how important it is for economists to make tools that help them keep an eye on financial stability and support economic policies. Future work in economic physics should help us understand complex sociotechnical systems better and lead to the creation of new ways to manage money [24].
2	"The technology and economic determinants of cryptocurrency exchange rates: The case of Bitcoin"	Li et al. (2017)	247	The study results are essential for investment managers and government officials working in the new cryptocurrency markets. The article gives a complete framework for evaluating cryptocurrencies and stresses the need to examine technical and economic issues [25].
3	"Dynamic connectedness and integration in cryptocurrency markets"	Ji et al. (2019)	239	This study comprehensively analyzes the spillover effects of six major cryptocurrencies. The results show that Bitcoin and Litecoin dominate in transmitting returns and volatility spillovers, while Ethereum is a recipient of these spillovers. The results also show that the level of integration of the cryptocurrency market system is affected by things like trading volume, investment substitution, and uncertainty [26].
4	"Volatility connectedness in the cryptocurrency market: Is Bitcoin a dominant cryptocurrency?"	Yi et al. (2018)	186	This study highlights the interconnected volatility of eight cryptocurrencies and their impact on the market. The results show that overall volatility-relatedness changes over time and rises when the economy is unstable. Small-cap cryptocurrencies are more likely to experience volatility shocks than large-cap cryptocurrencies. The study also shows that MAID is the biggest trigger of volatility shocks in the market and that Bitcoin, while necessary, does not dominate the entire market [27].
5	"Cryptocurrency value formation: An empirical study leading to a cost of production model for valuing bitcoin"	Adam S. Hayes (2017)	181	The results of this study show that relative differences in production costs are only a tiny part of what makes cryptocurrencies perform differently from each other. Bitcoin is considered the most stable digital currency, while all other altcoins are less valuable. Also interesting is that production costs will go up overnight if the reward for a Bitcoin block is cut [21].
6	"A novel cryptocurrency price trend forecasting model based on LightGBM"	Sun et al. (2020)	146	The goal of this paper was to make a list of the most important cryptocurrencies and use the LightGBM algorithm to predict how the prices of cryptocurrencies will change in the future. The results showed that the LightGBM model is better suited for medium-term (2-week) predictions and that the higher the overall strength of a cryptocurrency, the better the prediction performance [28].
7	"Co-explosivity in the cryptocurrency market"	Bouri et al. (2019)	146	The study examines the price explosiveness of seven major cryptocurrencies using the Phillips et al. (2015) method and data from January 1, 2013, to June 30, 2018. The results show that all seven cryptocurrencies had multiple periods of explosiveness, with Bitcoin being the most likely to have the explosiveness that lasted for a long time [29].
8	"Cryptocurrency: A new investment opportunity?"	Lee et al. (2018)	146	In short, this study looked into the possibility of investing in cryptocurrencies as a different asset type and found that diversification has benefits. The results showed that the CRIX and cryptocurrencies have consistently low correlations with traditional assets and higher average daily returns [30].
9	"Predicting fluctuations in cryptocurrency transactions based on user comments and replies"	Kim et al. (2016)	145	This paper proposes using information from online communities as a source for cryptocurrency research. The proposed method for predicting the price and trading volume of cryptocurrencies based on user comments and responses in online communities could make cryptocurrencies easier to understand and more accessible as they get better and more applications are made [31].
10	"Trading and arbitrage in cryptocurrency markets"	Makarov et al. (2020)	144	The study finds significant differences between the prices of cryptocurrencies on different exchanges. These differences are more noticeable between exchanges in different countries than between exchanges in the same country. The results show that capital controls and a lack of regulatory oversight over crypto exchanges are the main drivers of market segmentation [32].

Table 3 shows the ten most essential articles about cryptocurrency based on how many times they have been cited in Scopus. Fry et al. (2016) ranked first in their study of negative bubbles in the cryptocurrency market with

250 citations. Their research adds to the growing discussion about how cryptocurrency markets work and how different digital currencies compete. This article came out in the October 2016 issue of Volume 47 of the International Review of Financial Analysis [24].

In second place are Li et al. (2017), who examined bitcoin as a technology and the economic determinants of cryptocurrency exchange rates. This article got enough attention to be published in Decision Support Systems, Volume 95, March 2017 [25]. It was cited 247 times on Scopus. The results showed that the Bitcoin exchange rate changes based on the economy and the market. The long-term bitcoin exchange rate has become more sensitive to economic fundamentals and less sensitive to technological factors since Mt. Gox was shut down. It also said that mining technology significantly affected the Bitcoin exchange price and that mining difficulties were becoming less important.

Table 3 shows that Bitcoin significantly affects cryptocurrency, so its role is studied a lot. Bitcoin, the first and most well-known cryptocurrency, often has a significant effect on the cryptocurrency market as a whole. One reason is that Bitcoin's market cap is much larger than other cryptocurrencies, which means that a change in the price of Bitcoin can significantly affect the overall value of the cryptocurrency market. Additionally, many other cryptocurrencies are often valued in terms of bitcoin, so changes in the value of bitcoin can directly impact the value of those other cryptocurrencies. Another reason is that Bitcoin is often viewed as a barometer of the overall health of the cryptocurrency market. When Bitcoin performs well, it often signals confidence in the broader market, which bodes well for other cryptocurrencies. On the other hand, when Bitcoin prices go down, it can hurt the rest of the market.

We used keywords based on Elsevier's Fingerprint in SciVal to capture trends in cryptocurrency research in Scopus in this period. Text mining by the Elsevier fingerprinting engine finds a document's title, abstract, and author keywords. A list of common keywords is made by comparing keywords to a single thesaurus that covers all fields.

FIGURE 2. Keyphrases Trends Related to Cryptocurrency from 2013 to 2022
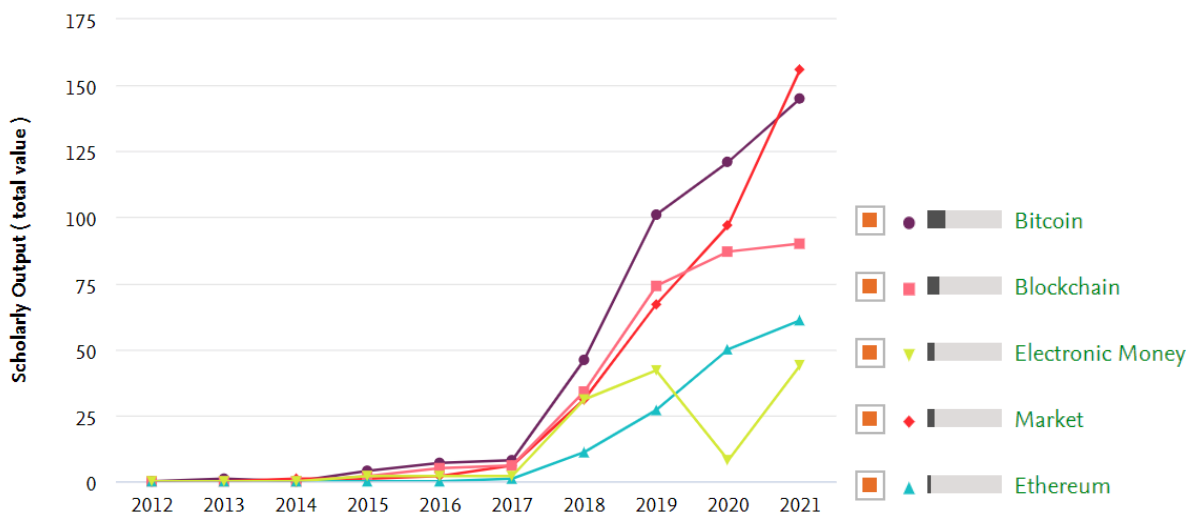

FIGURE 3. Keyphrases trends Year by Year Related to Cryptocurrency from 2013 to 2022

Figure 2 and 3 shows the word cloud of cryptocurrency-related keywords from the research period. The term "cryptocurrency" is the primary term that comes up the most. This is because this research is closely related to this term. At the same time, other terms like bitcoin, blockchain, electronic money, and market follow closely. There was little research related to cryptocurrency in the early phases of this research in 2012–2017. However, since 2018, it has begun to proliferate. Until 2020, bitcoin-related research dominated, followed by blockchain. Nevertheless, in 2021, cryptocurrency research related to blockchain will dominate. This indicates that research related to cryptocurrency is evolving toward its security.

CONCLUSIONS

The literature on cryptocurrencies has experienced significant growth in recent years, with the number of articles and authors in the field increasing dramatically. In 2018, there was a notable increase in the number of articles published, which reached its peak in 2022 with 458 articles in Scopus. The US was the most active country in cryptocurrency research, while the University of Economics Ho Chi Minh City and University College London were the most productive institutions. Elie Bouri from Lebanese American University was the most prolific and influential author with 15 articles and 823 citations. The primary term in this research is "cryptocurrency", with other terms such as bitcoin, blockchain, and electronic money following closely. Research related to cryptocurrencies has evolved to focus more on security, particularly blockchain. The Finance Research Letters journal was the most prolific source in this field.

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