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Driving Research Towards Excellence

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#### **BIBLIOMETRIC ANALYSIS ON BITCOIN 2015-2020**

## Nurazlina Abdul Rashid<sup>1</sup>, Fazillah Bosli<sup>2</sup>, Amirah Hazwani Abdul Rahim<sup>3</sup>, Kartini Kasim<sup>4</sup>, Fathiyah Ahmad @Ahmad Jali<sup>5</sup>

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This paper analyzes and reports on various types of bitcoin-related published works. This study used a bibliometric analysis, to analyze the evolution of bitcoin research by examining document profile and research trend. Based on the keyword search result, this study had analyzed finalized 1,680 documents from the Scopus database online as of Feb 2021. This study reported that the standard bibliometric indicator to identify research activity on bitcoin between the years 2015 and 2020. The analysis was carried out using Microsoft Excel, Harzing's Publish and Perish software, and the biblioshiny of R studio. From its inception in 2008, Bitcoin has garnered a lot of attention from the academic world, both in the West and East. Within a decade, many academic publications have been produced over Bitcoin. Our findings will give vital insights into improving the Bitcoin's inclusivity and global reach.

Keywords: Bibliometric, Bitcoin, Biblioshiny, Document profile, Trend

#### 1. Introduction

Bitcoin, Litecoin, Peercoin, Auroracoin, Dogecoin, and Ripple are only a few of the digital currencies that have arisen in the last decade. Bitcoin is the most well-known of them, both in terms of its remarkable price growth and price instability (P. Ciaian, et.al, 2016). Bitcoin is the first open-source digital money that is not issued and supervised by a central bank or other authority since it is managed by an open-source software algorithm that uses the global Internet network to both generate Bitcoins and record and validate their transactions.

There are over 2000 cryptocurrencies as of February 2019, with a total market capitalization of \$131.8 billion and daily transactions exceeding \$24 billion Coinmarketcap (2019). Despite the large number of cryptocoins, Bitcoin constitutes half of the market. Bitcoin was introduced in 2008 by Satoshi Nakamoto, which is a pseudonym of an author or group of authors whose identity is shrouded in mysteries. Buchholz et al. (2012) find that the significant factor of Bitcoin price movements can be explained by interactions between its supply and demand. The demand of Bitcoin is mainly determined by transaction demand as a medium of exchange for goods and services. Urquhart (2019) concludes that Bitcoin is yet to become an efficient market, but with times, it can be improved towards becoming an efficient market.

#### 2. Methods

This bibliometric study had gained access to the Scopus scientific database to analyze academic publications which had used the word bitcoin in their title. This study had analyzed all types of documents in the Scopus database for the period of 5 years, from 2015 to 2020. As one of the largest archive of abstracts and citations of peer-reviewed literature; it contains over 23.452 peer-reviewed journals, over 25,100 titles, 294 trade publications, around 852 book series, over 9.8 million conference papers, and around 78 million records from a variety areas of knowledge. With a vast collection of publications, Scopus database can provide a comprehensive overview of the today's research output. Apart from that, it has been recognized as one of the major sources of relevant information by the international scientific community.

This study used bibliometric analysis, to explain the distribution patterns of research articles within specific topics and time periods, as well as quantitative and statistical analysis (Mart-Parreo, Méndez-Ibáez, & Alonso-Arroyo, 2016). The process implied identifying specific keywords for search purposes. In this study, the term "bitcoin" was used when querying the Scopus database for information solely on articles titles. The search was conducted on February 23, 2021. The boundaries of the search specified results involved articles published from the year 2015 to 2020. Previously a bibliometric analysis on bitcoin was conducted by Guo et al. (2020) which had covered documents on bitcoin in the Web of Science and Scopus for a period from January 2008 until June 2018., while Merediz-Solà, et al., (2019) covered the year 2012 until January 2019 from Web of Science database. This study fills the gap to study bibliometric analysis on bitcoin covered the year 2015 to 2020. These studies have different goals and questions.

From our search, Scopus returned 1680 document results and these documents were solely retrieved using the "bitcoin" term. We analyzed the results in a variety of ways in order to provide feedback in response to our research objective. Some results were obtained directly from Scopus via the search results function, while others were inserted manually or exported to a new Excel file. Information such as percentages were analyzed from the file created for all of the results; Harzing's Publish and Perish software was used to calculate the citation metrics. We also used biblioshinny of R studio to generate image to help with data interpretation.

We hope that by publishing this paper, we can make a meaningful contribution by providing meaningful insights into the trends in bitcoin publication. These findings can be used to guide future studies and discussions to further enrich and develop this field of study. Figure 1 shows a diagram of the search strategy. All the documents were subjected to bibliometric analysis. This study used; Microsoft Excel to calculate the frequencies and percentages of the published materials. Description of retrieved literature, a total of 1680 documents were identified from the Scopus database based on the document type and source type. The document type could either be a journal article, conference paper, book chapter, review, note, short survey, editorial, book, erratum, letter or conference review.



Figure 1. Flow diagram of the search strategy Source: Zakaria et al. (2020)

#### 3. Results and Analysis

This study will address the question of the evolution of bitcoin research and trends in its dissemination using a two-part data set.; part 1: document profiles (document type, source type, languages used for bitcoin research publication, and subject area), and part 2: research trends (year of publication, most productive author, and source growth).

#### Part 1: To Analyze the Evolution of Bitcoin Research by Examining Document Profile

As can be seen from the table 1, the article of document type shows the highest number of publications on bitcoin research (n=874; 52.02%) followed by conference paper (n=676; 40.24%), book chapter (n=52; 3.10%), review (n=28; 1.67%), note (n=19; 1.13%) and other types of documents represented less than 1% of the publication such as short survey, editorial, book, erratum, letter, and conference review. Table 2 presents the data based on document source type to identify where the bitcoin document had been published. Journal representing (n=937; 55.77%) of the total publication, followed by

conference proceeding (n= 484; 28.81%), book series (n=209; 12.44%), book (n=39; 2.32%) and trade journal shows the least frequent source type were only (n=11; 0.65%). As shown in Table 3, English contributed the greatest number of languages used for bitcoin research publication (n=1641; 97.56%). The rest of the publications used other ten languages, such as Chinese, German, Turkish, Portuguese, Russian, Spanish, French, Croatian, Italian, and Slovenian, each represented less than 1% of the total publication, respectively. Table 4 provides the results of publication based on 22 subject areas. The data shown, nearly half of the total publications came from the area of computer science (n=896; 53.33%). This was followed by Economics, Econometrics and Finance (n=473; 28.15%), Engineering (n= 348; 20.71%), and Mathematics (n=335; 19.94%). The subject areas of Chemical Engineering, Earth and Planetary Sciences, Health Professions, and Neuroscience each accounted for less than 10 publications, respectively.

Document Type	ТР	%
Article	874	52.02
Conference Paper	676	40.24
Book Chapter	52	3.10
Review	28	1.67
Note	19	1.13
Short Survey	8	0.48
Editorial	6	0.36
Book	5	0.30
Erratum	5	0.30
Letter	5	0.30
Conference Review	2	0.12

Table 1: Document	Туре
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Table 2: Source Type

Source Type	ТР	%
Journal	937	55.77
Conference Proceeding	484	28.81
Book Series	209	12.44
Book	39	2.32
Trade Journal	11	0.65

Language	TP	%
English	1641	97.56
Chinese	11	0.65
German	7	0.42
Turkish	6	0.36
Portuguese	5	0.30
Russian	4	0.24
Spanish	3	0.18
French	2	0.12
Croatian	1	0.06
Italian	1	0.06
Slovenian	1	0.06

Table 3: Languages Used for Bitcoin Research Publication

## Table 4: Subject Area

Subject Area	TP	%
Agricultural and Biological Sciences	15	0.89
Arts and Humanities	28	1.67
Biochemistry, Genetics and Molecular Biology	22	1.31
Business, Management and Accounting	281	16.73
Chemical Engineering	4	0.24
Chemistry	11	0.65
Computer Science	896	53.33
Decision Sciences	204	12.14
Earth and Planetary Sciences	6	0.36
Economics, Econometrics and Finance	473	28.15
Energy	37	2.20
Engineering	348	20.71
Environmental Science	23	1.37
Health Professions	2	0.12
Materials Science	38	2.26
Mathematics	335	19.94
Medicine	25	1.49
Multidisciplinary	39	2.32
Neuroscience	1	0.06
Physics and Astronomy	93	5.54
Psychology	15	0.89
Social Sciences	206	12.26

#### Part 2: To Analyze the Evolution of Bitcoin Research by Examining Research Trends.

Year	TP	%
2020	475	28.27
2019	459	27.32
2018	316	18.81
2017	188	11.19
2016	112	6.67
2015	130	7.74





Figure 2: Source Growth

Table 6: Most Productive Author

Author's Name	Affiliation	Country	TP	NCP	TC	C/P	C/CP	h	g
Bouri, E.	Lebanese American University,	Lebanon	24	23	1395	58.13	60.65	16	24
Roubaud, D.	Montpellier Business School,	France	18	18	1356	75.33	75.33	15	18
Bartoletti, M.	Università degli Studi di Cagliari,	Italy	13	12	182	14.00	15.17	8	13
Gupta, R.	Universiteit van Pretoria,	South Africa	12	11	696	58.00	63.27	9	12
Corbet, S.	Dublin City University,	Ireland	10	10	268	26.80	26.80	6	10
Kang, S.H.	Pusan National University,	South Korea	10	10	123	12.30	12.30	7	10

Table 5 indicates the summary statistics on the annual publication of bitcoin research from the period of 2015 to 2020 and it shows a trend of an increased publications. Total publication in the year 2020 is the highest publication (n = 475; 28.27%) followed by 2019 (n = 459; 27.32%) and other years are less than 400 in total publications. Figure 2 shows the source growth in the publication of bitcoin from the top five sources. This study uses the loess smoothing technique that is the locally weighted smoothing use regression analysis to demonstrate the smooth line with the help of a time plot. There has been a significant growth in publications by finance research letters from 2016 to 2019. Lecture Notes in Computer Science represents the primary source of bitcoin literature in artificial intelligence and bioinformatics. Economic letters have an increasing trend from 2015 to 2018, but there is a decreasing trend in the publications from 2019 onwards. Physic A: Statistical Mechanics and Its Applications and ACM International Conference Proceeding series have significant growth for the past three years 2016 to 2019. The productive authors based on publications number are shown in Table 6. This study used Harzing's Publish and Perish software to calculate the citation metrics. Bouri, E from Lebanese American University, Lebanon had the most publications with 24 papers with h-index is 16 and g-index is 24 and followed by Roubaud, D. affiliated with Montpellier Business School, France (18 publications, h-index = 15 and g-index = 18). The third most productive author with 13 publications was Bartoletti, M. from Università Degli Studi di Cagliari, Italy, followed by Gupta, R. from Universiteit van Pretoria South Africa total publication is 12. The rest of the authors from a different country mostly had 10 publications with g-index is 10.

#### 4. Conclusion

This study attempts to provide a bibliometric review to gain an overview of the evolution used for bitcoin research. Based on the Scopus database from 2015 to 2020 by using the keyword "Bitcoin", the trend of publication regarding this topic is increasing every year. The number of publications in 2020 is 475 which is more than double if compared to 130 in 2015. This study also reveals that the subject areas mostly covered in Bitcoin research is Computer Science. We propose that the research on Bitcoin research should be conducted in other developing countries and other potential topics worth exploring include machine learning and cryptocurrencies.

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#### References

Ahmi, A., & Mohamad, R. (2019). Bibliometric analysis of global scientific literature on web accessibility. *International Journal of Recent Technology and Engineering*, 7(6), 250–258.

- Ahmi, A., & Mohd Nasir, M. H. (2019). Examining the trend of the research on extensible business reporting language (XBRL): A bibliometric review. *International Journal of Innovation, Creativity and Change*, 5(2), 1145–1167.
- Aria, M., & Cuccurullo, C. (2017). bibliometrix: An R-tool for comprehensive science mapping analysis. *Journal of informetrics*, 11(4), 959-975.
- Urquhart, "The inefficiency of Bitcoin," *Econ. Lett.*, vol. 148, pp. 80–82, 2016, doi: 10.1016/j.econlet.2016.09.019.
- Buchholz, M., J. Delaney, J. Warren, and J. Parker. 2012. "Bits and Bets, Information, Price Volatility, and Demand for BitCoin, Economics 312." www.bitcointrad ing.com/pdf/bitsandbets.pdf.
- Ciaian, P., Rajcaniova, M., & Kancs, D. A. (2016). The economics of BitCoin price formation. *Applied Economics*, *48*(19), 1799-1815.
- Coinmarket (2019). Crypto-Currency Market Capitalizations. https:// coinmarketcap.com/currencies/. Accessed: 2019-02-20.
- Guo, X., & Donev, P. (2020). Bibliometrics and network analysis of cryptocurrency research. *Journal* of Systems Science and Complexity, 1-26. doi: <u>10.1007/s11424-020-9094-z</u>
- Martí-Parreño, J., Méndez-Ibáñez, E., & Alonso-Arroyo, A. (2016). The use of gamification in education: a bibliometric and text mining analysis. *Journal of computer assisted learning*, *32*(6), 663-676.
- Merediz-Solà, I., & Bariviera, A. F. (2019). A bibliometric analysis of bitcoin scientific production. *Research in International Business and Finance*, 50, 294-305. <u>https://doi.org/10.1016/j.ribaf.2019.06.008</u>
- P. Ciaian, M. Rajcaniova, and d'Artis A. Kancs, "The digital agenda of virtual currencies:
- Can BitCoin become a global currency?," *Inf. Syst. E-bus. Manag.*, vol. 14, no. 4, pp. 883919, 2016, doi: 10.1007/s10257-016-0304-0.
- Zakaria, R., Ahmi, A., Ahmad, A. H., & Othman, Z. (2020) Worldwide melatonin research: A bibliometric analysis of the published literature between 2015 and 2019, *Chronobiology International*, 38(1), 27-37.





