

# A Systematic Review on Bitcoin Research

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Bitcoin is one type of payment instrument that was created and developed not under any authority. The use of Bitcoin is growing from year to year with a high exchange value. Even in 2018, the value of Bitcoin reached USD 19,783.06 per 1 (one) Bitcoin, which is fluctuating because the number of Bitcoin is limited, which only reaches a maximum of 21 million (twenty-one million). Against the popularity of Bitcoin, Bank Indonesia issued a statement that Bitcoin is not a legal means of payment and the risk of use will be borne by the user. This study aims to determine the development map and trend of Bitcoin published by well-known journals in the fields of economics and finance. The data analyzed were more than 1166 Google Scholar indexed research publications. The export data was then processed and analyzed using the R Biblioshiny application program to find out the bibliometric map of Bitcoin development. The results showed that in the motor themes or driving themes quadrant, the emerging themes are Blockchain, Money, Digital, Cryptocurrencies, Financial, and Risk. Finally, the basic and transversal themes quadrant is represented by the themes Bitcoin, Volatility, and Markets.

**Keywords:** Bitcoin, Text Mining, R

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Received: 17 November 2023

Accepted: 11 December 2023

Published: 31 December 2023

Citation:

(2023) A Systematic Review on  
Bitcoin Research.

Islamic Finance and Technology.  
1.1.

## INTRODUCTION

The development of the internet and technology in the world is growing very rapidly in various ways, especially in the financial sector and its products. The development of financial technology basically has the aim of making it easier for people to use financial products and facilitate transactions. Financial technology is also beneficial because it has a flexible nature because there are few regulations that cover it so it is not rigid like other conventional businesses. The development of technology is also present in terms of existing payment instruments that aim to facilitate the public in their use.

Money as a means of payment was originally created from a system of exchanging goods for goods known as the barter system in primitive times. Then as the conditions of society increased, the barter system of goods became increasingly difficult to use due to inappropriate exchange patterns. In the end, the community agreed to use a medium of exchange to be used in trade with different forms that apply in certain areas only according to the needs of each country (Solikin and Suseno, 2002).

Money as a medium of exchange has a specific object value that can be used to pay for goods and services, but defining money solely as currency is too simplistic for economists because many things can be used as money, for example checks and savings in a broad sense. So there is no single, absolutely correct definition of money or yard money, even for economists (Mishkin, 2008). Economists say that The pieces of this paper have value because everyone thinks they have value (Friedman, M. and Friedman, 1980). Therefore, the history of money is recognized because everyone thinks money functions as a medium of exchange.

Payment instruments are known in the form of cash and non-cash (Bank Indonesia, 2011). Non-cash payment instruments are one of the products of the development of financial technology itself and can be in the form of electronic money and virtual money. The difference between electronic and virtual money is the creation and recording of transactions. Electronic money transactions are recorded on a central server that can be regulated by Bank Indonesia and are server and chip-based (such as Flazz BCA, Brizzi BRI, eMoney Mandiri, TapCash BNI, and so on), while virtual money such as Bitcoin, Litecoin, and Ethereum, the entire system is based on blocks or blockchain and transactions are recorded on the blockchain decentralized network, so everyone can access this

block chain and people can connect around the world. Bank Indonesia also said that electronic money does not include virtual money (BI Regulation, 2016).

The blockchain network is one part of financial technology. Blockchain encompasses all cryptocurrency transactions, and the most prominent one is Bitcoin. Blockchain is a public record that exists only in the digital world so the person who owns it does not get physical money or coins. People can earn cryptocurrency in the digital world either by receiving, trading, or mining. There is no central bank in Blockchain because transactions are managed by the users who have created the record (Fleming, 2017).

Bitcoin in this case uses P2P technology (peer-to-peer technology) without a central authority. Therefore, functions such as issuance, transaction processing and verification are carried out collectively by the network without supervision from a central institution. P2P is a computer network model consisting of two or more computers, where each station or computer contained in the network environment can share with each other. This network makes it easy for users to transact directly without requiring the services of a third party such as a bank (Salsabila, 2018). The algorithms, computer programs, and user communities that enable cryptocurrency systems such as Bitcoin to be developed and operated now serve as platforms to support evolving commercial relationships and activities in addition to the economic value exchange functions offered by the digital original. The platform currency applications offered by Bitcoin and other cryptocurrency systems enable the creation, operation, and management of a distributed cryptographic ledger system of transactions that is global in nature and allows all nodes in the network to share transaction history information accumulated over time (Matsuura, 2016). Therefore, this is an advantage for the community where everyone can have their own blockchain record without any agency or individual controlling it.

The individual or entity that controls Bitcoin stores Bitcoin using a wallet. Wallets are applications that provide the primary user interface. It controls all user access to funds, manages keys and addresses, tracks balances, creates and signs transactions. The wallet contains only keys, the coins remain recorded in the blockchain on the Bitcoin network. Users control coins on the network by signing transactions with the keys in the wallet (Antonopoulos, 2017).

In the case of increasing use of virtual money due to the ease of transactions available, Bank

Indonesia as the central bank in Indonesia which has the authority to regulate the use of these means of payment then issued a statement, namely the Statement of Bank Indonesia Regarding Bitcoin and Other Virtual Currency in 2014 with No. 16/6/Dkom which basically states that Bitcoin and other virtual currencies are not legal tender in Indonesia, and the risk of their use is borne by the user. There is also a statement in Law No. 7 Year 2011 on Currency that Indonesia only recognizes Rupiah as legal tender. Bank Indonesia then made another press statement in 2018 with the title "Bank Indonesia Warns All Parties Not to Sell, Buy or Trade Virtual Currency" with No. 20/4/DKom, that Bank Indonesia emphasized that as the payment system authority, Bank Indonesia prohibits the use and implementation of Bitcoin and other forms of virtual currency in Indonesia.

## LITERATURE REVIEW

Bank Indonesia then further clarifies the definition of virtual money in the explanation of Article 34 letter a of BI Regulation 18/2016, namely what is meant by virtual money is digital money issued by parties other than monetary authorities obtained by *mining*, purchasing, or transferring *rewards*, including Bitcoin, BlackCoin, Dash, Dogecoin, Litecoin, Namecoin, Nxt, Peercoin, Primecoin, Ripple, and Ven. Not included in the definition of virtual money is electronic money.

Bitcoin was created by Satoshi Nakamoto in 2009. Satoshi Nakamoto is the pseudonym of the creator of Bitcoin. The concept of Bitcoin itself is much different from *fiat currency*. Bitcoin is a form of digital product that is only traded via the internet and there is no physical form, such as paper money or metal money.

In general, currencies are issued by state financial institutions such as state banks. This causes the currency to be centralized. Unlike currencies in general, Bitcoin is not issued by any institution in the world and this causes Bitcoin to be decentralized. At the time Bitcoin was created, Satoshi had designed in such a way about how it worked and the amount of Bitcoin availability in the world, which was 21 million Bitcoin.

Bitcoin, which in this case is categorized as virtual money, has several general characteristics, namely:

### 1. *Blockchain*

The *blockchain* system was introduced alongside the creation of Bitcoin in 2009. The *blockchain* is the

basis of all Bitcoin transactions ever executed. Every *node* (user's computer) has a complete copy of the *blockchain* which is downloaded automatically when a user joins the Bitcoin network. The *blockchain* has complete information about addresses and balances from the first transaction ever made to the most recently completed block. *Blockchain* can be referred to as a public record meaning that it is easy to view the transactions pertaining to a particular Bitcoin tool. Bitcoin in this case stands on a *trustless* mechanism across the network, users can trust the public record system stored worldwide on decentralized nodes without having to establish and maintain trust with the counterparties (other people) or third-party intermediaries (such as banks) (Swan, 2015). Bitcoin transactions are added to the *blockchain* permanently and can be accessed by anyone.

### 2. *Peer-to-peer (P2P)*

The implementation of the P2P network in Bitcoin means that it creates a structure where there is no centralized server, all members of the network are equal. Because it does not have a central bank, Bitcoin also relies on this P2P network to run its system. With P2P, member users will be provided with information in the form of all the same Bitcoin transactions on all computers belonging to Bitcoin users around the world (Wijaya, 2016). Therefore, the entire history of Bitcoin transactions will be publicly available. It is also necessary to validate transactions to prevent *double spending* in the absence of a central authority.

### 3. Decentralization

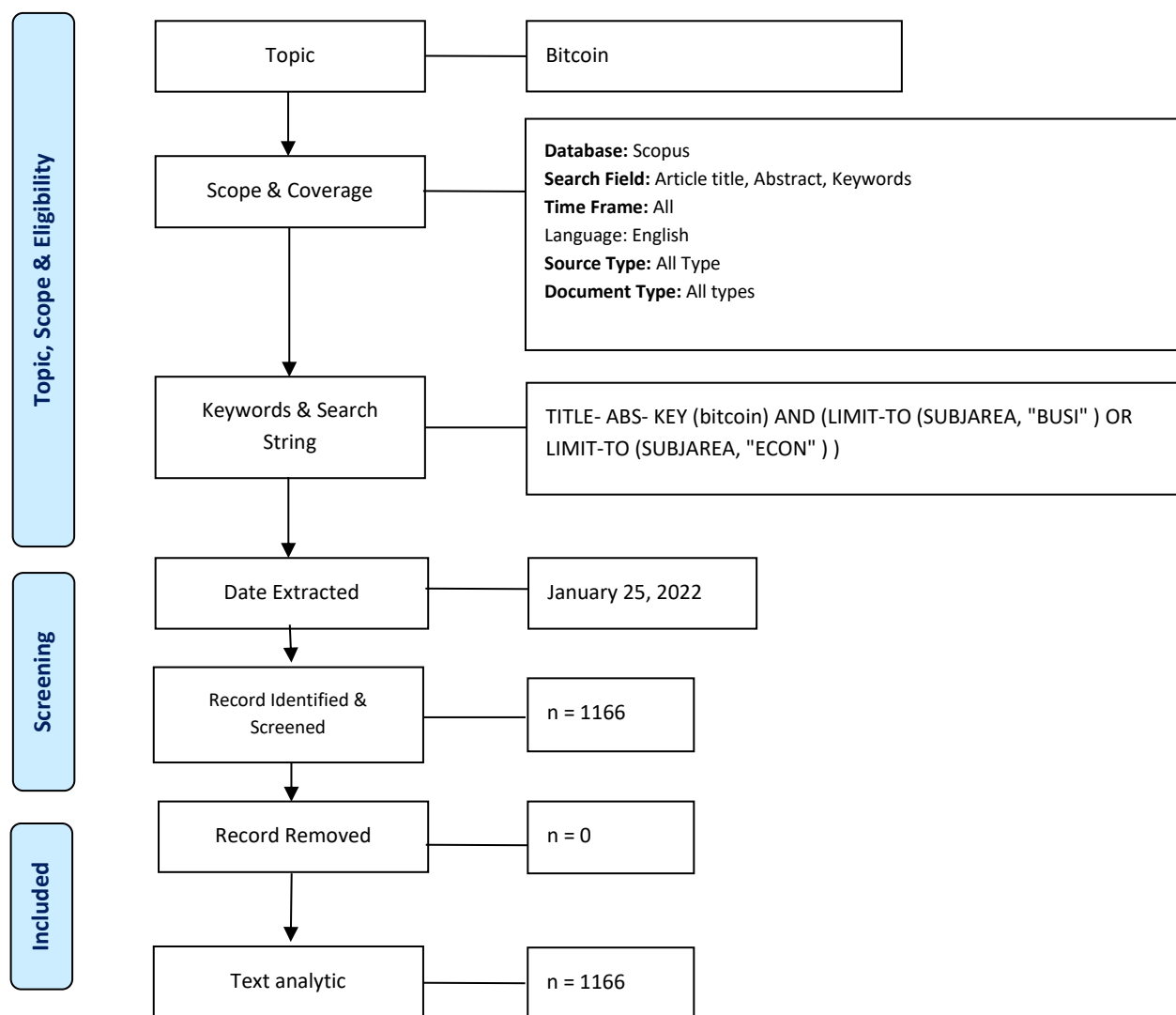
As virtual money, Bitcoin has a different transaction concept from other currencies. Most currencies have a type of transaction called a *triangle type of transaction*, where banks have an important role to play as intermediaries between parties. The *triangle* transaction type is usually referred to as centralization where banks play a role in financial intermediaries. While the concept of decentralization owned by Bitcoin as virtual money only requires two parties who agree with each other without intermediaries of other parties (Tampi, 2017). The development of digital transactions has been very developed such as the use of *Visa, MasterCard, Paypal, and Western Union* which are managed by third parties to perform customer data management functions. However, with the concept of decentralization in Bitcoin, it then allows transactions carried out by users to not depend on third parties. This is possible because bitcoin uses *peer-to-peer* network technology in managing every transaction that occurs (Mulyanto, 2015).

#### 4. Anonymity

Bitcoin users in this case can take steps to better protect user identity, users can avoid disclosing any identifying information related to their identity. So in its use, Bitcoin users can not provide any information about their data so that even though all transactions in Bitcoin can be seen by every user member, but due to the anonymity of the users cannot

clarify who the transaction belongs to and who it was sent to. This then makes Bitcoin users abuse the system which by its anonymity can make crimes such as buying and selling drugs, money laundering, and other actions smooth and unidentified.

## RESEARCH METHOD



**Figure 1:** Flow diagram of the search strategy

The review process was conducted on January 25, 2022. Figure 1, illustrates the three steps in identifying research documents, namely eligibility, screening, and inclusion, involved in the systematic review process. The keywords that will be used in this study try to answer the research questions above. Some general statistics of the data set are presented to get an overview of research related to good governance. All articles that met the search query were evaluated from the aspect of text analysis.

Then the research documents were analyzed using bibioshiny software, a free software supported by

the R environment ((CRAN, The Comprehensive R Archive Network, <https://cran.r-project.org/>) which provides a set of tools for quantitative research in bibliometrics and scientometrics (Aria & Cucurrolo, 2017). In the bibliometric literature, the greatest attention has been on the construction of bibliometric maps. Research related to the effect of differences on similarity measures (Ahlgren et al., 2003), and they were tested with different mapping techniques (Boyack et al., 2005). Next, a text analysis of bibliometrix mapping results related to "word" will be conducted.

## RESULT AND DISCUSSION

### Text Analysis

Text analysis was conducted using R-studio and biblioshiny software developed by Massimo Aria and Corrado Cuccurullo from the University of Naples and Luigi Vanvitelli from the University of Campania (Italy). Text analysis is carried out by analyzing more deeply on searches related to words that often appear in the Bitcoin theme. This is intended to add references that can be done by the government in tackling economic problems based on existing research from all over the world.

To explore the results of the meta-analysis, this section will present a visual mapping graph of 1166 documents related to Bitcoin. The results of the keyword mapping analysis become the basis for mapping together important or unique terms contained in a particular document. Mapping is a process that allows one to recognize knowledge elements and their configurations, dynamics, interdependencies, and interactions.

### Most Relevant Words

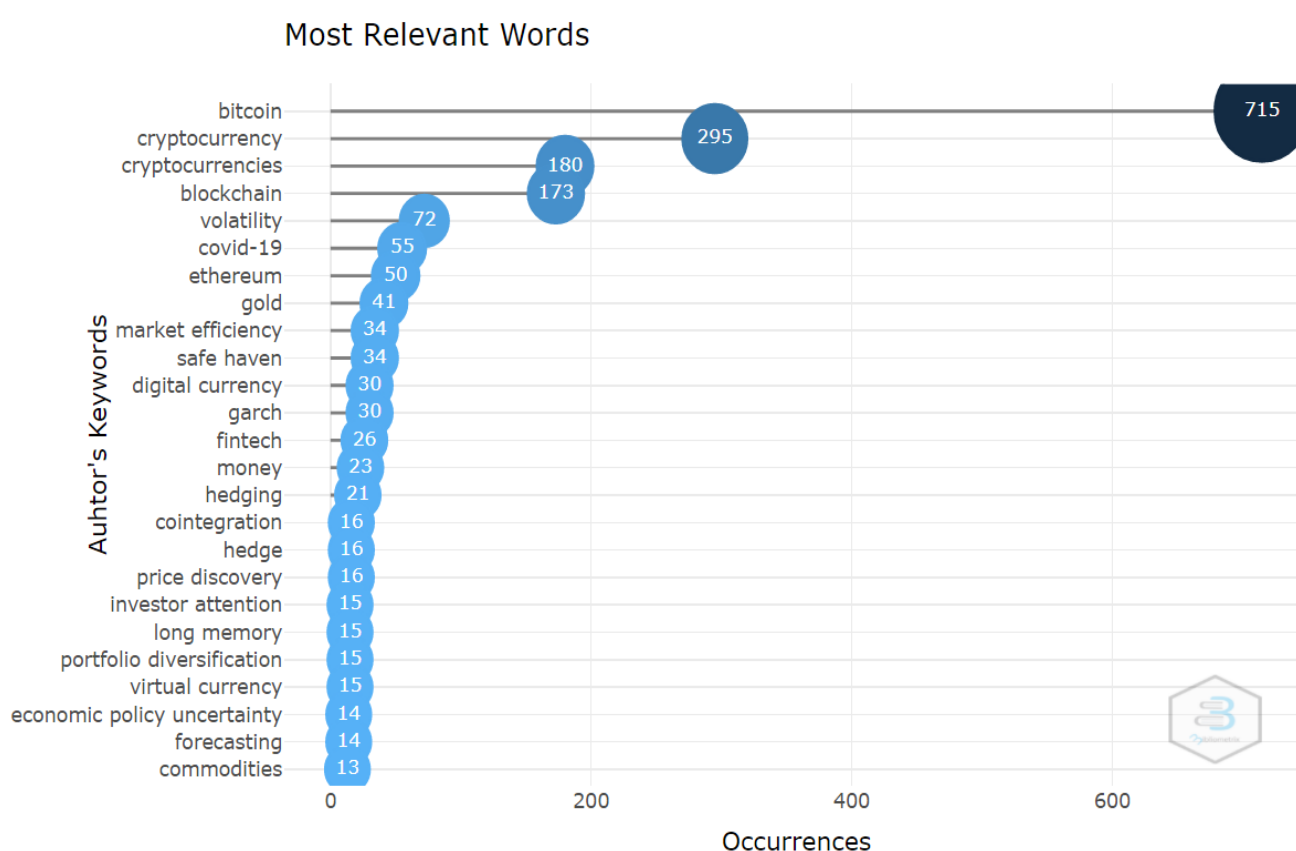


Figure 2: Most Relevant Words

The most relevant word analysis was performed on the keywords of each document, where there were several words with a quantity of occurrences between 0 and 715 occurrences. The figure above shows the 25 most relevant words used in the research collection related to the keyword "Bitcoin".

The top word with the highest quantity of occurrences and most relevant to the Bitcoin keyword is the word bitcoin itself, with the highest quantity of occurrences of 715 times. The second most relevant word related to the Bitcoin theme is the word cryptocurrency with 295 occurrences. Furthermore, the

third and fourth most relevant words related to the theme of Bitcoin with the appearance of words as many as 180 and 173 times are the words cryptocurrencies and blockchain.

Research entitled Intraday patterns of price clustering in Bitcoin (Ma & Tanizaki, 2022). In this study, an investigation was conducted into the phenomenon of price clustering in Bitcoin (BTC) denominated in Japanese yen (JPY). It answers two questions using tick-by-tick data. The first is whether price clustering exists in BTC/JPY transactions, and the other is how the scale of price clustering varies



throughout the trading day. With the help of statistical measures, the last two digits of the BTC price were found to cluster on numbers ending with '00'. Additionally, the scale of BTC/JPY clustering at '00' tends to decrease at certain hourly intervals. This study contributes to the emerging literature on price clustering and investor behavior.

### Word Cloud

Next, the relevant words in the research related to the Bitcoin theme will be displayed on the document

title in the form of a word cloud. Word cloud is a description of words that often appear in the collection of paper data studied with keywords from the title with the theme "Bitcoin". Word cloud displays a picture of words displayed with various sizes according to the quantity of the word that appears. In terms of placement, word clouds tend to be random but the dominating words are placed in the center so that they are more visible with a relatively larger size. In this research, the results of the word cloud are obtained based on the analysis of document titles.



Figure 3: Word Cloud

Based on the image of the results of the analysis of document titles, it is found that the most dominant words are related to Bitcoin, namely bitcoin, cryptocurrency, market, blockchain. Most of the current research on Bitcoin discusses "bitcoin". Research conducted on Bitcoin includes Does monetary policy fuel bitcoin demand? Event-study evidence from emerging markets (Marmora, 2022), Information spillover effects from media coverage to the crude oil, gold, and Bitcoin markets during the COVID-19 pandemic: Evidence from the time and

frequency domains (Zhang, Et al., 2022), and Bitcoin-specific fear sentiment matters in the COVID-19 outbreak (Polat, Et al., 2021).

### WordTree Map

Furthermore, relevant words in the research related to the Bitcoin theme will be displayed in the document abstract in the form of a word tree map. The Word Tree Map displays words that appear frequently in boxes similar to regions or areas on a map, where the more the word appears, the larger the square area.

Tree

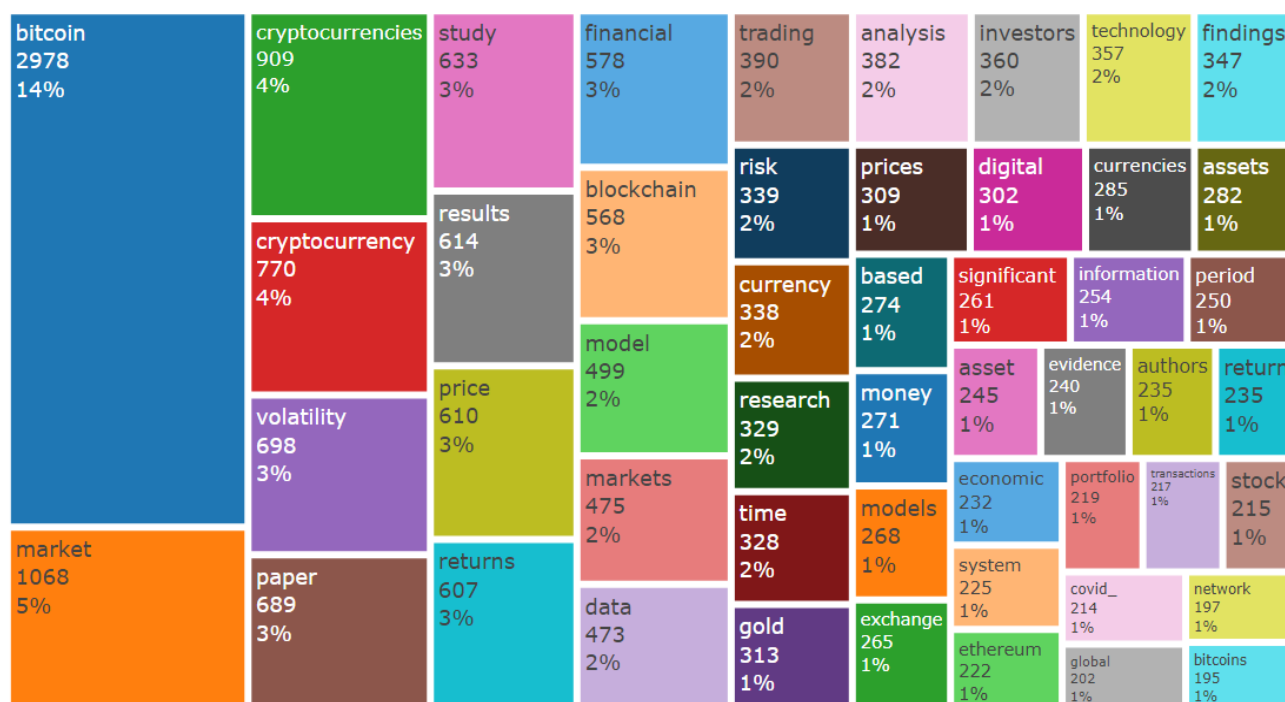


Figure 4: Word Tree Map

Based on the image of the results of the analysis of document abstracts, it is found that the most dominant words for research on the theme of Bitcoin are bitcoin, market, cryptocurrencies, volatility. Most of the research related to the Bitcoin theme currently discusses "bitcoin".

Research conducted on Bitcoin includes Bitcoin's value proposition: shorting expansionary monetary policies (Morillon, 2021) which discusses that professionals and academics alike have polarized opinions on the purpose of Bitcoin and its fundamental value. This paper aims to describe the unique features of Bitcoin that make it an attractive asset and propose a new way to consider Bitcoin and its fundamental value. In this paper the author discusses the defining features of Bitcoin that make it a unique asset. The author argues that Bitcoin should not be considered as a single-purpose asset only, but rather as a new digital financial asset that serves several functions, at least in part. The author discusses Bitcoin's role in the traditional financial system, compares Bitcoin to gold, considers the implications of continued expansionary policies on Bitcoin and discusses the impact of the emergence of cryptocurrencies as a new asset class on public policy. In addition to serving as a means of

payment (at least partially) and a means of diversification, part of Bitcoin's value proposition comes from its value as a short position on modern expansionary monetary policy. Indeed, Bitcoin's value will increase if expansionary monetary policy is maintained, which is a tool for shorting this policy, which should be considered in future attempts to value Bitcoin.

Bitcoin is used for various purposes, including peer-to-peer transactions, as a store of value, investment, and in some cases as a means of remittance or international money transfer. It has gained attention as a potential alternative to traditional fiat currencies and has spurred the development of thousands of other cryptocurrencies (altcoins), each with its own features and use cases.

The adoption and regulatory landscape of Bitcoin continues to evolve, with some countries embracing it as a legitimate form of payment or investment, while others impose restrictions or regulations due to concerns about its use in illicit activities or its impact on financial stability.

## Word Dynamic

## Word Growth

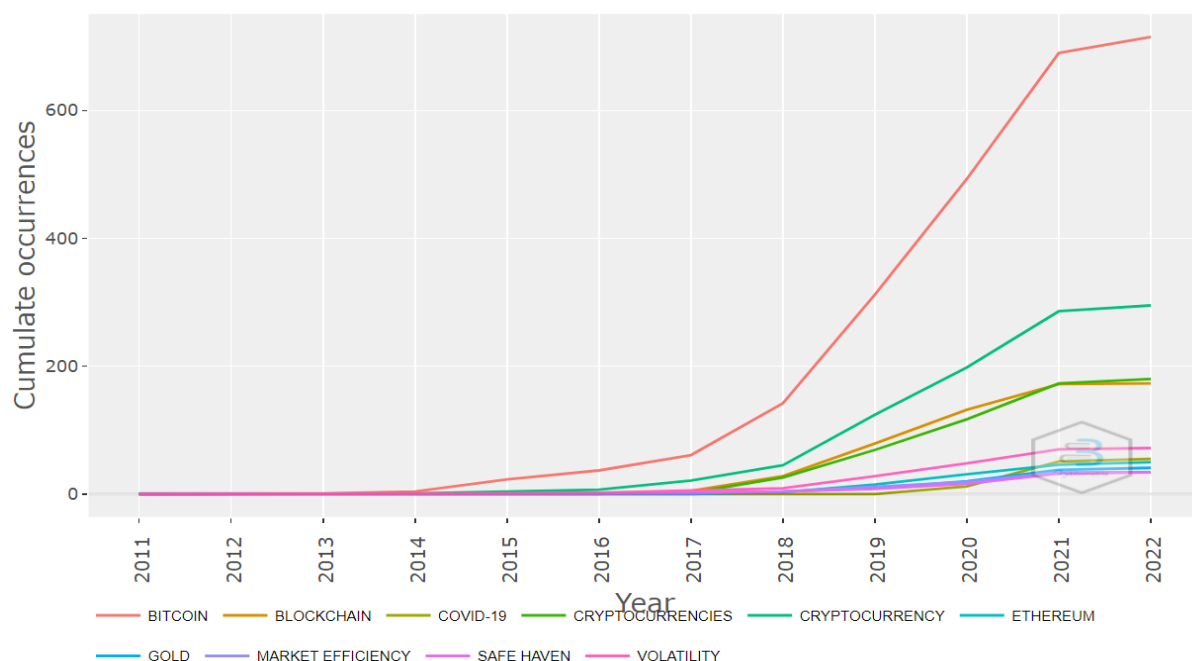


Figure 5: Word Dynamic

Based on the image of the analysis results of document keywords, in research with the theme of Bitcoin, the words that often appear are also described in the form of a development curve for each year with the annual occurrence value. Where the results show the average quantity of occurrence of these keywords in the data collection studied in research on the theme of Bitcoin each year. Figure 5 shows that the majority of

words that appear frequently and began to develop since 2011, and continue to increase until 2021. From the figure above, it can be concluded that the research with the most significant increase in occurrence is keywords related to Bitcoin and has a very significant potential to continue to grow.

### Trending Topics

## Trend Topics

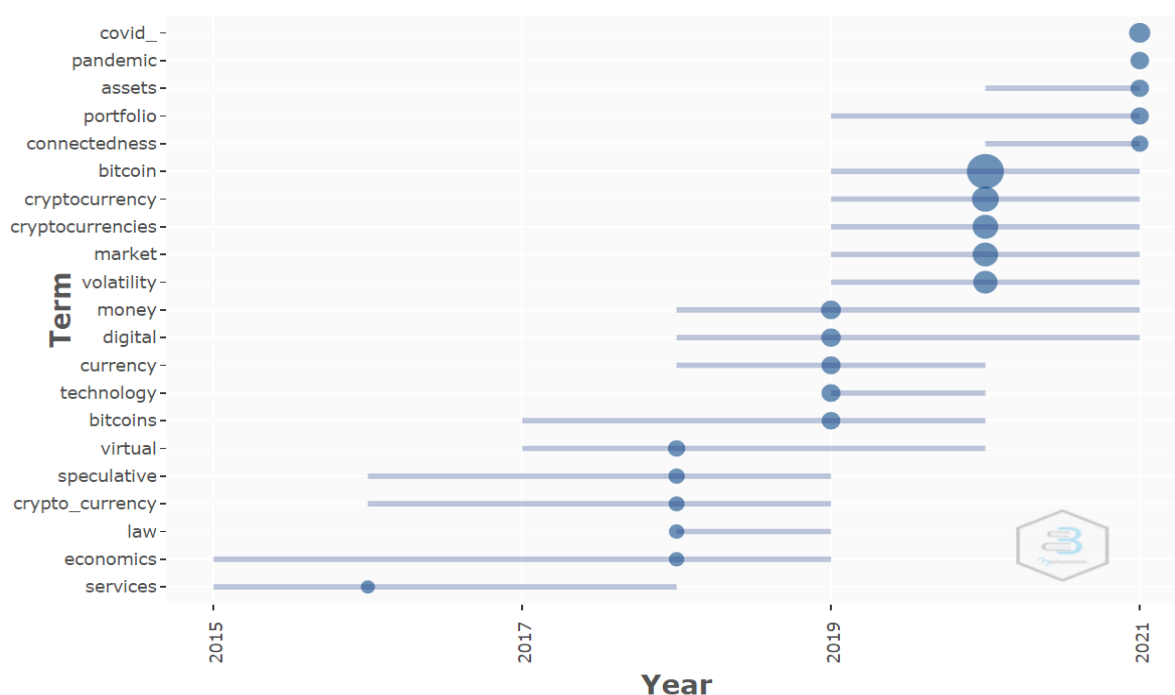


Figure 6: Trends in Topics



Based on the image of the results of the analysis of document titles in research on the theme of Bitcoin, topic trends are also an important part of this research. Where the figure above displays an overview of the development of Bitcoin-related topics over time with a division per year, so that it is known what topics have been used for a long time and what topics have been used recently. This topic trend also considers the frequency value of each word shown by the log axis.

Thus, in addition to looking at annual trends, topic occurrence is also adjusted by the frequency of the quantity of words appearing in Bitcoin-related research themes. The higher it is, the more the word is used, and the more to the right, the more recently the word is used. The development of the Bitcoin theme began to experience a significant increase since 2015.

Based on the data description above, the most recent and most used topics related to the Bitcoin theme are covid, pandemic, assets, portfolio, connectedness. The word covid was most widely used in 2021 because the covid theme is closely related to the current state of world public health. The journal entitled "COVID-19 pandemic and economic policy

uncertainty: The first test on the hedging and safe haven properties of cryptocurrencies" written by Mokni, Et al. (2022). This study examines the role of the top 5 cryptocurrencies and gold as hedges and safe havens against economic policy uncertainty (EPU) before and during the ongoing COVID-19 crisis. We use the GARCH model for the main analysis and the safe haven index (SHI) for robustness. Our findings suggest that gold and cryptocurrencies cannot act as strong hedges or safe havens against the EPU before and during the COVID-19 pandemic. However, we find that SHIs exhibit negative returns and increased volatility during COVID-19 and confirm that cryptocurrencies generally act as a weak safe haven. Gold was classified as a weak safe haven asset during the entire period and was more likely a safe haven asset before the health crisis but lost its safe haven property during the COVID-19 crisis. Our findings provide useful information for investors interested in the cryptocurrency market and safe haven assets when building asset portfolios.

### Co-occurrence Network

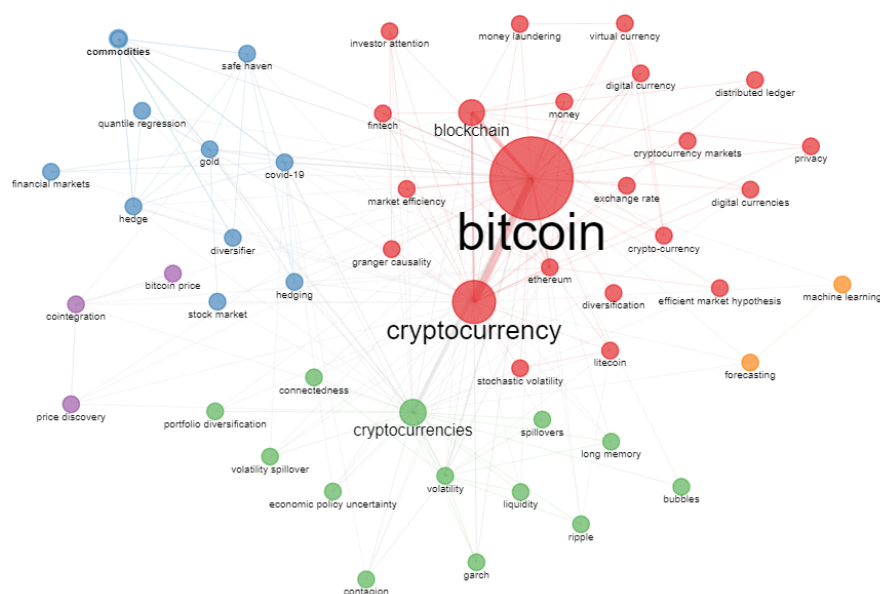


Figure 7: Co-occurrence Network

The co-occurrence network displays words related to the keywords of documents related to the Bitcoin theme, in the form of colored clusters by considering the relationship between one word and another. Some keywords that often appear in research

on the theme of Bitcoin are divided into 5 clusters, namely:

- Cluster 1 in red consists of the keywords: Bitcoin, Cryptocurrency, Investor Attention, Money Laundering, Virtual Currency, Fintech, Blockchain, Money, Digital Currency,

- Cluster 2 in green consists of the keywords: Cryptocurrencies, Connectedness, Portfolio Diversification, Volatility Spillover, Economic Policy Uncertainty, Contagion, Garch, Volatility, Liquidity, Ripple, Spillovers, Long Memory, Bubbles.

- Cluster 3 in purple consists of the keywords: Bitcoin Price, Cointegration, Price Discovery.
- Cluster 4 in blue consists of the keywords: Commodities, Safe Haven, Quantile Regression, Gold, Financial Markets, Hedge, Covid-19, Diversifier, Hedging, Stock Market.
- Cluster 5 in orange consists of the keywords: Machine Learning, Forecasting.

### Thematic Map

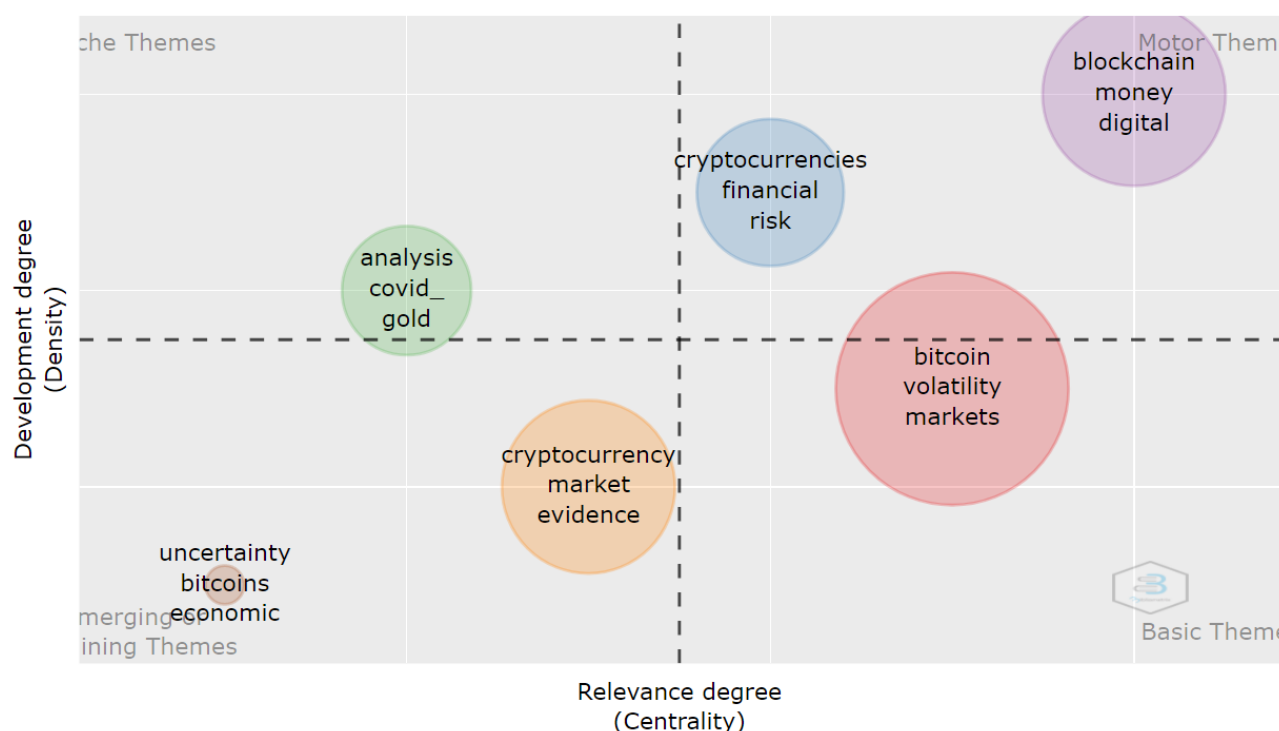


Figure 8: Thematic Map

This research will also analyze thematic maps that appear based on density and centrality which are analyzed based on document titles with the Bitcoin research theme which is divided into 4 quadrants. These results are obtained from a semi-automatic algorithm by reviewing the titles of all references to the object of research.

The upper left quadrant represents *highly developed and isolated themes*. The quadrant shows themes that are specific and rarely researched, but highly developed, which is indicated by high density but low centrality. The themes in this quadrant are Analysis, Covid, Gold. While the lower left quadrant is *emerging or declining themes*, this quadrant shows themes that have long been used but are experiencing an increasing or decreasing trend with low density and centrality. The themes in this quadrant are Cryptocurrency, Market, Evidence,

Uncertainty, Bitcoins, Economic. Looking at developments with the Bitcoin sub-theme in recent years, the trend of words contained in this quadrant has increased.

While the upper right quadrant is a *motor theme* or driving theme characterized by high density and centrality, so it needs to be developed and is important to be studied in further research. The themes that appear in this quadrant are Blockchain, Money, Digital, Cryptocurrencies, Financial, Risk. Finally, the bottom right quadrant is *basic and transversal themes* characterized by high centrality but low density. These themes are important to include in the research as they are common topics that are commonly used. The themes that appear in this quadrant are Bitcoin, Volatility, Markets.

## Thematic Evolution

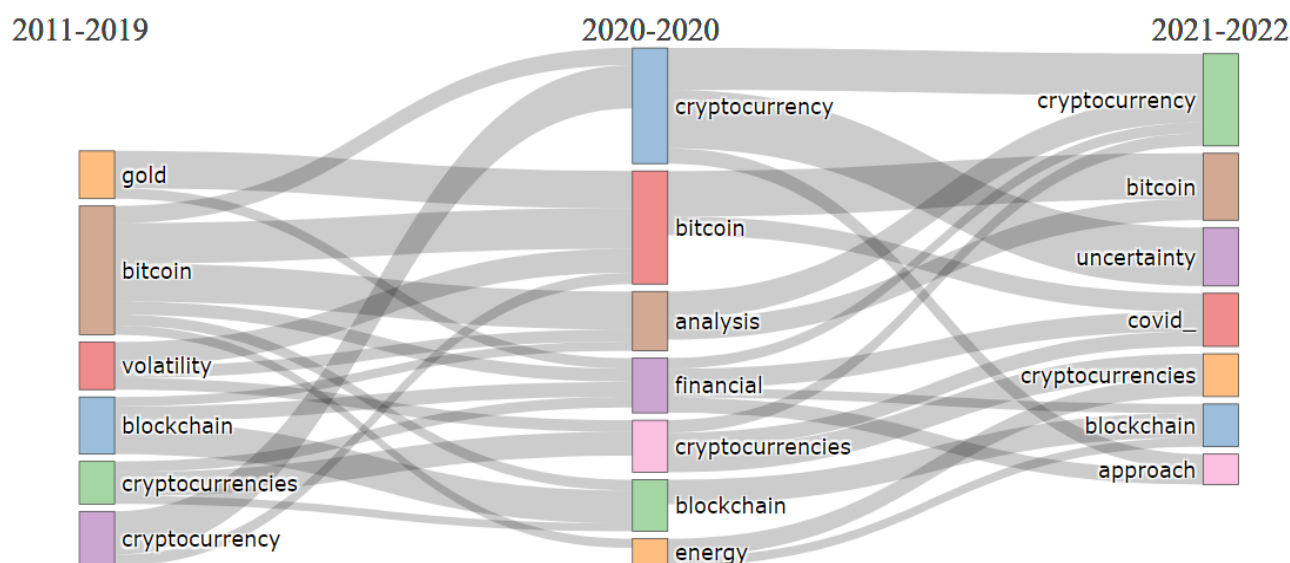


Figure 9: Thematic Evolution

The themes used in the papers that are the object of research continue to change, especially from recently published papers when compared to papers that have been published for a long time. The figure above shows the evolution analyzed by theme with Bitcoin-related research consisting of themes depicted by rectangles with the larger size, the more widely used. Although the theme of this research is Bitcoin, the data obtained shows that there are several sub-themes that are widely used.

Thematic Evolution is divided into 3 sections. Where the left side shows some of the most widely used themes from 2011 to 2019, there are 6 themes listed with different sizes depending on the quantity of use of the theme. The "bitcoin" theme ranks first, followed by the "blockchain" theme.

The second or middle section shows the most frequently used themes in the period between 2020-2020. There are 7 themes, of which 3 are evolutions of themes that appeared in the previous period: "cryptocurrency", "bitcoin", "cryptocurrencies" which are extensions of some of the themes shown by the colorful grooves.

The last or right section shows the widely used themes from 2021-2022. There are 7 themes, of which there are 3 evolutionary themes from the previous period namely "cryptocurrency", "bitcoin", "cryptocurrencies" which are extensions of some of the themes shown by the colorful grooves.

## CONCLUSION

This research attempts to evaluate topics on Bitcoin using text analysis from 2011-2022. The conceptual structure of R 'Biblioshiny' provides key research networks and themes. We have identified two research networks in Bitcoin literature using co-occurrence network. These research networks are "bitcoin" and "cryptocurrency". Combining these two research networks will address many environmental issues.

Furthermore, in the conceptual structure, this study has deployed thematic maps to place themes and subthemes on the graph and divide them into four clusters (dropping or emerging themes, basic themes, highly developed and isolated themes, motor themes). The quadrant of highly developed and isolated themes is represented by the themes Analysis, Covid-19 pandemic, Gold.

Furthermore, themes that are in the emerging or declining themes quadrant are Cryptocurrency, Market, Evidence, Uncertainty, Bitcoins, Economic. In the motor themes or driving themes quadrant, the emerging themes are Blockchain, Money, Digital, Cryptocurrencies, Financial, Risk. Finally, the basic and transversal themes quadrant is represented by the themes Bitcoin, Volatility, Markets.

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