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EVOLUTION OF THE DECENTRALIZED CRYPTOCURRENCY: CASE STUDY OF SHIBA INU COIN

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Bitcoin and Ethereum have been the market leaders in the decentralized market for many years. Shiba Inu, on the other hand, has developed a destructive technology that has altered the working principles of previous coins. As an Ethereum-based alternative to Dogecoin (DOGE), the most popular meme coin, this cryptocurrency is designed to compete. The token differs from Bitcoin in that it was designed to be scarce because it was designed to be abundant, with a total supply of approximately one quadrillion. The token ecosystem also helps projects like Shibaswap, a decentralized exchange platform, and a non-fungible tokens (NFT) art incubator. Over time, the value of the coin has skyrocketed. However, like other cryptocurrencies, their market remains extremely volatile due to fluctuating market prices and the large number of people who own the tokens. The Shiba Inu Coin, one of the newest and fastest-growing cryptocurrencies in recent years, will be the focus of the research article, which will examine the evolution of decentralized cryptocurrency. The study focuses on price, distribution, mass acceptance, and government regulations as factors in its growth. The paper delves into the current literature on decentralized cryptocurrency and its applications in the business world. The study's methods and data are discussed in the next stage, which aims to understand how cryptocurrencies have evolved over time.

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CHAPTER 1

INTRODUCTION

The cryptocurrency market has been evolving erratically and unpredictably during its short lifespan. Since the first public release of the first form of cryptocurrency, Bitcoin, in January 2009, at least 550 others have been invented and released into the market. Most of these digital currencies have experienced either limited success or total failure. Research focusing on the issue is still limited. Most of the existing research on the market focuses solely on Bitcoin. The diverse cryptocurrency market is still under-researched, including its fast-paced growth, technological progression, and continued government regulation. Even though the fast evolution experienced in the sector may be a challenge to researchers, there is still a need to examine the cryptocurrency market thoroughly. The research article will analyze the evolution of decentralized cryptocurrency, focusing mainly on the Shiba Inu Coin, one of the latest and fastest-growing cryptocurrencies in the recent period. The study focus on its growth based on price, distribution, mass acceptance, and government regulations. The paper provides a detailed discussion of current literature on decentralized cryptocurrency and its use in the business sector. The next stage discusses the methods and data used in the study to understand how cryptocurrencies have evolved over time.

CHAPTER 2

LITERATURE REVIEW

Prior to examining decentralized technology from an evolution perspective, it is prudent to first develop a broad conceptual understanding of the cryptocurrency and blockchain technology in order to develop a transdisciplinary understanding of the concepts then and further uncover and gain a more conscious understanding of how Shiba Inu is positively impacting the world.

Blockchain technologies and decentralized cryptocurrency have become a widely researched area in recent years. The latter, in particular, has risen in its supremacy in the last decade, allowing people to move away from the traditional mode of payment or financial transactions. Past and present research can provide an in-depth understanding of decentralized cryptocurrency as the technology has been implemented more, is optimizing the world, and trading.

A decentralized transaction system is not a new concept. Only recent technological advancements, such as the use of peer-to-peer networks and cryptographic methods, have allowed the idea to be conceptualized (Glaser and Bezzenberger, 2015). The invention and development of cryptographic currencies can be credited for many of these technological advancements. Bitcoin was the first cryptocurrency, proposed and explained in a technical paper published in 2008. The following year, Satoshi Nakamoto, who may be a pseudonym for an individual or group, put the paper into action and conceptualized the idea. Bitcoin, according to Nakamoto, is a decentralized payment system that is closely linked to its underlying currency (Glaser and Bezzenberger, 2015). The digital currency is supported by a network of users who are the primary contributors to the security and operation of the system. Client software on the

users' local computers is used to carry out these operations.

By solving complex cryptographic problems, the network nodes formed by connecting the computers conduct a process of verifying various transactions in a block. Although it is difficult to fake the computation time required to solve the problems of the transactions in the set, they are simple to verify. As a result, if the entire network is not compromised, the process of verifying the transactions contained in a block is considered secure. (Bradbury, 2013). The method of proving a transaction's validity is known as 'proof of work.' The transaction blocks are usually collected on a Blockchain, which is a public ledger. The Blockchain is stored locally on each network participant's computer. The proof-of-work concept's algorithm is designed in such a way that blocks are developed in about ten minutes. A Bitcoin is a single block of data. The user who solves the computational problem receives a Bitcoin reward. The process of creating blocks is known as 'mining.' However, due to some flaws in the PoW approach, researchers have proposed alternative methods of transaction authentication, such as voting and proof-of-stake (Zhang& Song, 2014).

Some of the most important characteristics of cryptocurrency make it possible for the underlying technology to replace existing payment and transaction systems. Cryptocurrencies, for example, are more appealing than traditional transaction infrastructure because of their security, transaction speed, and scalability (Karame et al., 2012). Furthermore, Barber et al. (2012) argue that cryptocurrency's low entry barriers and low transaction costs may increase its appeal to customers. These low entry costs and barriers lay the groundwork for introducing and expanding global financial inclusion, emphasizing the importance of making these changes.

Furthermore, the network's decentralized nature on continuous development reduces the number of possible central points of failure, resulting in increased customer confidence in such a

system. However, these issues of confidence and trust raise other issues that have yet to be resolved. As a result, more research is needed to determine whether decentralized systems can become superior to centralized systems, even in a few aspects.

As Bitcoin's price and market capitalization skyrocketed, the cryptocurrency community began to develop alternative currencies, a large ecosystem of third-party deposit accounts, and exchange platforms. In addition, many Bitcoin-based derivatives and other Bitcoin-related trading practices have emerged. Alternative cryptocurrencies, known as 'Altcoins,' were created using the Bitcoin codebase. However, there are some differences between the two cryptocurrency architectures in terms of hashing algorithms. Some Bitcoin exchange platforms already have architecture that allows them to support advanced financial functions like equity financing, derivatives, and margin trading. These abilities, however, are still rudimentary. Due to the regulatory obscurity and pseudonymous nature of the majority of the cryptocurrency world, most financial institutions and serious investors have been hesitant to engage in the market or invest.

As a result of these developments, the leading Bitcoin transaction companies are attempting to provide services that are fully compliant with the law, moving away from the radical idea of a fully decentralized transaction system. For example, FIDOR Bank AG in Germany and Circle in the United States both have Bitcoin bank accounts. CoinDesk, on the other hand, works with other companies to make Bitcoin payments easier for consumers. Other recent developments in the cryptocurrency market, however, are moving in a different direction. These advancements aim to create systems and protocols that will decentralize rather than centralize the majority of today's financial infrastructure.

CHAPTER 3

BACKGROUND IN DECENTRALIZED CRYPTOCURRENCY

From Cryptocurrencies to Decentralized Consensus Systems

Cryptocurrencies do not have the flexibility and capabilities required to enable various intricate financial functions on their own. As a result, it is natural for cryptocurrency supporters to advocate for the decentralization of other, more complex applications (Fairfield, 2014). Following the decentralization of these critical systems, they will be combined with the cost-efficiency, speed, and security associated with cryptocurrencies to create a more efficient system known as decentralized consensus systems. These systems differ from cryptocurrencies in a variety of ways. For example, the DCS will allow the user to create and exchange various types of assets with a diverse set of properties. Cryptocurrencies, on the other hand, are one-dimensional, allowing only one asset, the currency, to be created and exchanged.

Smart contracts are assets that consist of dynamic properties. The concept of smart contracts was proposed and developed first by (Szabo 1997). The researcher's initial definition is broad and may include various types of automatic and, in some cases, intellectual properties. Some properties, however, such as coupon payment, hard-coded links to data, and automatic dividends, are dynamic.

Since 2012, various developers have created some decentralized consensus systems, which are commonly referred to as 'Crypto 2.0' (Brokaw, 2014) or 'Bitcoin 2.0.' (Evans, 2014). Both of these DCSs have organizational structures and technical approaches that are similar or very different. Broad categories have emerged from a technical standpoint. The first group employs independent cryptographic systems and unique Blockchain implementations, whereas the second group has established a second or third level from Bitcoin or any other form of

alternative coin. In contrast, for-profit and non-profit organizations distinguish the sector from an organizational standpoint. Both groups are constantly working to develop and improve their respective systems. The decentralized and peer-to-peer nature of DCSs appears to resonate with project developers and supporting communities. As a result, the majority of developments use open-source licensing and generally allow for community commitments and interactions during the development process. The structures of these communities, on the other hand, appear to be diverse. Some are closed in nature, while others are open and flat. Other communities take a mixed approach.

Furthermore, the systems differ in the manner in which the network's native currency is distributed. Profit-seeking organizations and firms typically initiate crowd sales, which are analogous to selling stock on the stock exchange. On the other hand, some systems that appear to value decentralization and openness distribute the currency by destroying Bitcoins. This procedure entails transferring Bitcoins to a public address, which frequently lacks a private key. As a result, the process effectively annihilates Bitcoins. The Master Protocol is the first of its kind, allowing for the creation and exchange of highly advanced financial contracts and assets. Willet Jr et al. (2013) define the Master Protocol as a layer between Bitcoin and other market currencies.

Despite the fact that some implementations, such as Colored Coins (Assia et al., 2012) and Krellenstein (2014), are built on Bitcoins, the majority of new implementations rely on distinct decentralized consensus networks. Ethereum, Nxt, and Bitshares are examples of systems that use separate decentralized networks (Franco, 2014). These systems, however, continue to rely on Bitcoin-like features, such as the Blockchain concept and peer-to-peer networks. As a result, they use cryptographic principles such as proof-of-work, proof-of-stake,

and voting to ensure the network's collective security (Antonopoulos, 2014; Swanson, 2014). These infrastructures are frequently referred to as 'Metacoins'.

Ripple is an example of an implementation that is based on a for-profit organization. Despite the fact that Ripple employs a decentralized transaction system with pseudonymous nature, it has several distinguishing features that set it apart from other systems. The currency, for example, does not adhere to Bitcoin's cryptographic principles. It is based on a system known as the 'consensus process.' Before a transaction can take place, a group of servers must reach an agreement, according to Schwarz et al. (2014). Each of these servers is a separate entity that runs the Ripple Serve software, which is different from the Ripple Client software in that it allows users to send and receive funds.

Centralized and Decentralized Exchanges

A centralized exchange, also known as a custodial exchange, holds the assets of users in their collective wallets. As evidenced by the high number of cryptocurrency hacks, these wallets are vulnerable to attack. Users must send their assets to a deposit wallet that is specially curated for a specific user in order to trade on a centralized exchange (Victor & Weintraud, 2021). The wallet then transfers the assets to the main wallet and registers the funds collected for use in exchange. Until the user decides to withdraw their assets, all of these transactions take place outside of the Blockchain. The system then returns the assets to the user's wallet.

A decentralized exchange (DEX), on the other hand, is commonly regarded as a smart contract that allows the non-custodial exchange of cryptographic assets. Users who send assets to the smart contract can trade within it and, if desired, withdraw from it. Various forms of decentralized exchanges have been proposed in recent years, and some have been developed and implemented.

Types of Decentralized Exchanges

There are two main variants of decentralized exchanges: Automated Market Markers (AMM) and Limited Order Books (LOB).

Limit Order Book-based Decentralized Exchanges

In a LOB-based decentralized exchange, users exchange assets with each other through an order book. As makers, they put orders to the order book in an offer to trade an asset at a specific cost and volume. On the other hand, when the users fill the order, whether automatically or explicitly, they are called takers. The management of the order books occurs either on-chain or off-chain. However, the actual trade settlements occur on-chain (Victor & Weintraud, 2021). IDEX and EtherDelta are some of the most popular LOB-based decentralized exchanges. They both operate on the Ethereum blockchain. Management of their order books occurs off-chain, requiring an independent service where users interact. However, the users can still withdraw their assets whenever they want through direct interaction with the smart contract. In EtherDelta's case, users can send exchange instructions to the smart contract itself, while IDEX requires a different account to issue trade instructions to the smart contract. Both decentralized exchanges change exchange fees which are about 0.3 percent of the total traded amount (Victor & Weintraud, 2021). EtherDelta charges only the taker, whereas IDEX divides the charges between the taker and the maker. Moreover, the traders are required to cover the transaction fees. Thus, the total exchange fees are usually more than 0.3 percent.

Automated Market Maker Decentralized Exchanges

This type of decentralized exchange, including Kyber and Uniswap, have very significant differences with the Limit order Boks DEX. Users trade against a liquidity reserve or pool rather than a peer-to-peer platform. On Uniswap, each pool or contract contains funds of a token and

Ethereum. The DEX is made of a pricing mechanism referred to as a 'constant product market maker' formula. The price of assets is determined by the percentage of token and Ethereum funds contained in reserve concerning the pool's total liquidity, which is always stable during an exchange. Liquidity providers ensure that the reserve is full by contributing equal amounts of Ethereum and tokens. Even though AMM DEX has begun gaining popularity in the recent past, LOB-based DEX is still the most widely used type of decentralized exchange.

The introduction of Ethereum in 2013 sparked the second Blockchain wave [17]. Ethereum comprises a distributed computing environment as well as the Solidity programming language (Wood, 2014). Solidity addressed several flaws in Bitcoin's programming language, including its lack of Turing-completeness This has allowed for the development of a variety of decentralized applications (Dapps) and "smart contracts," which are computational agreements between parties that can be self-executed and self-enforced.

Dapps have been used in a variety of industries, most notably finance [Casino et al., 2019). As an example, consider banking services or cryptocurrency payments, both of which have resulted in the rise of Decentralized Finance (DeFi), a type of finance that does not rely on central financial intermediaries to obtain crypto-savings, crypto-loans, or trade with them. Aside from finance, we can mention IoT, which uses Blockchain as a standard communication layer, and supply chains, which facilitate traceability and disintermediation (Wang, 2019).

The most important way that Blockchain and smart contracts have impacted the context of this article is by enabling new types of decentralized governance, such as Decentralized Autonomous Organizations (DAOs), in which decision-making is distributed or delegated away from a central authority.

Decentralized Autonomous Organization (DAO)

A decentralized autonomous organization (DAO) is a blockchain-based system that allows people to coordinate and self-govern themselves via a set of self-executing rules placed on a public blockchain, and whose governance is decentralized and independent of central control (Faqir-Rhazoui, 2021) DAOs are organizations in the sense that they mediate the interactions of a group of people, typically an open community that members can join. Some DAOs are token holders of a specific token that allows DAO participation, similar to how corporation shares work.

DAOs are considered autonomous because, unless explicitly stated otherwise in their code, they are independent of their founders. Their operations are guided by the regulations outlined in their code, as well as the (human) governance of their members. Furthermore, because they are deployed on a public blockchain, they are resistant to censorship because there is no central controller who can disable the DAO and its provided service (Faqir-Rhazoui, 2021). As a result, DAOs will continue to function as long as members are willing to carry out their code, such as providing services, purchasing/selling resources, or hiring individuals.

Due to their reliance on a server-less decentralized architecture, DAOs are classified as decentralized first (a public blockchain). Second, because they rely on decentralized governance processes, decision-making is based on their members' collective consent. This procedure typically includes some form of voting in which DAO members can participate. It should be noted that such decisions may refer to the allocation of DAO resources (such as funding projects or payments to members). They may, however, also refer to changes to the DAO code. That is, if its members agree, a DAO can be changed to run differently, with a new set of encoding rules. This is useful for fixing bugs in the code, but it also allows it to adapt to community needs and

desires.

DAOs are inextricably linked to Ethereum, the most prominent general-purpose public Blockchain in the world (Faqir-Rhazoui, 2021). Every operation in Ethereum has a cost, such as a fee paid by the user to miners to perform the requested operation. In practice, validating and carrying out those procedures requires some computational labor on the part of miners. The amount of computation required by an operation is referred to as gas, and it is compensated in cryptocurrency; on Ethereum, it is represented by the Ether token. The user method states that gas eventually turns into money, and the amount of gas depends on the size and type of each operation. As a result, the Ethereum blockchain can be thought of as a costly and secure distributed database system.

DAO actions are typically recorded in the blockchainFootnote4. Because blockchains are not designed for large amounts of data storage, the type of data that this reality influences DAO stores in the Blockchain. Because DAO software does not typically include interactive communication capabilities, DAO members frequently use other complementary off-chain platforms for communication, such as forums like DAOtalk. As a result, this technological feature unquestionably influences DAO community behavior and may set it apart from other online communities. Consider how Ethereum price increases affected DAO activity in 2020 [12].

the DAO, the first widely used DAO implementation, debuted on the Ethereum blockchain in April 2016 under the (confusing) moniker of The DAO. The DAO was a type of hedge fund in which contributors could directly vote on new initiatives. At the time, it was the most successful investment crowd funding campaign in history, raising DOLLAR/>150 million and concentrating 14 percent of all ether tokens issued (Faqir-Rhazoui, 2021). Due to a mistake in the the DAO code, an attacker stole DOLLAR/>50M in June 2016. The incident sparked

debate, prompting the Ethereum community to "hard fork" the Ethereum blockchainFootnote6 and refund the stolen assets to the original the DAO investors. However, the idea of ledger immutability was harmed as a result of this occurrence, and a portion of the community continued to operate under the previous rules in a blockchain known as Ethereum Classic (in which funds were stolen and not reverted).

This tragedy was excruciating for the blockchain community and had far-reaching ramifications. Nonetheless, the effort to create decentralized organizations that can operate on the Blockchain was maintained. However, it is widely acknowledged that the complexity of blockchain programming makes building a DAO from scratch a risky endeavor, even for experts (Dannen, 2017). As a result, new templates and tools have emerged to significantly reduce both the risks and the technical knowledge required to deploy DAOs. The diagram below depicts the difference between a traditional top-down organization and a DAO.

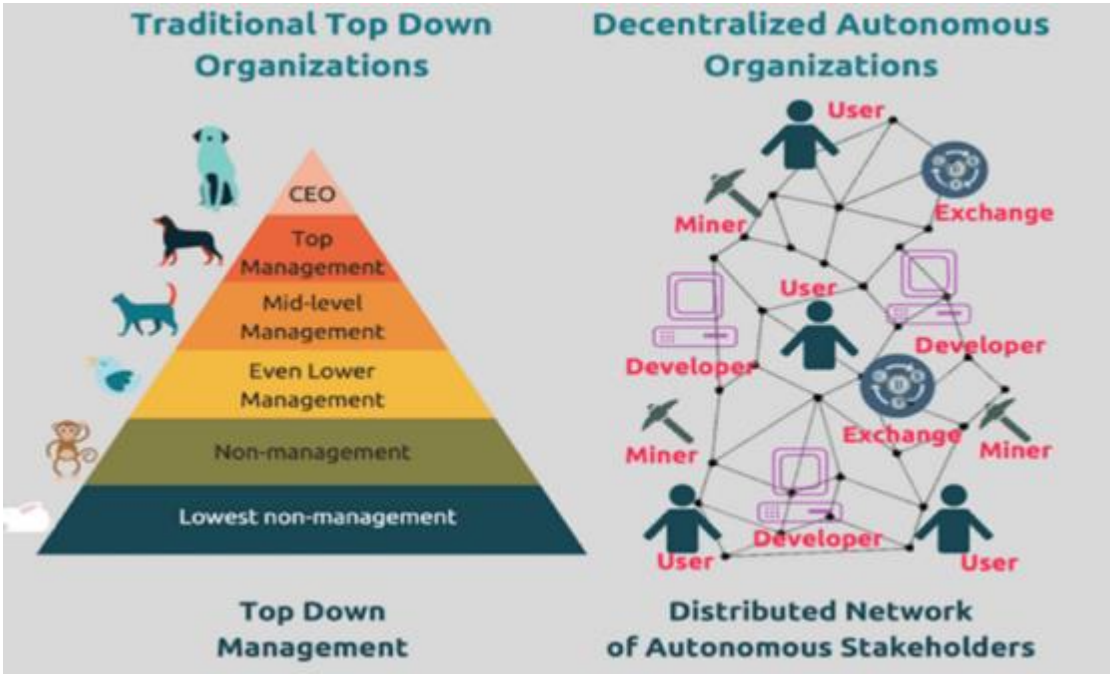

Figure 1: Difference between a Traditional Top-Down Organization and a DAO

Network Security Protocol

The most significant technological contribution of Bitcoin and all other forms of alternative coins has been the development of the peer-to-peer transaction system, which is based on cryptographic proof rather than trust. Replacing the inherent transaction system, on the other hand, presents a massive challenge with no obvious solutions. For example, the currency must be able to exchange ownership (Farell, 2015). When each participant's digital signature and timestamp are recorded, transaction records are created. This allows the transaction date to be recorded. The cryptocurrency and its path through the network are represented by the new record. The code is then sent to all of the network's nodes (devices connected to and running the cryptographic currency network software).

However, the majority of the nodes must agree that the transaction has occurred. If this does not occur, there is a risk of denial of service (DOS) and double spending. The process by which the nodes reach a consensus that the transaction is legitimate ensures the system's integrity. As a result, all transactions are validated, and the system remains secure (Farell, 2015). This is accomplished by establishing mechanisms that make violating the system's integrity prohibitively expensive. "The underlying principle of such a mechanism is the necessity of expending resources when confirming transactions," writes Larry Lein (Farell, 2015).

Different cryptographic currency developers have created a variety of unique resources that are used as network security measures. These measures could include a variety of coinage surrender, electricity, and time combinations. They represent the cost of securing the network. The miners, who own these resources, protect the network. Their efforts are rewarded with newly mined coins or transaction fees (Farell, 2015). The primary determinant of the selected resource and the form of compensation paid to miners is the mechanism used to secure the

network. As a result, the inherent security measures of each currency have a significant impact on the cryptocurrency's inherent economics.

Understanding Shiba Inu Coin

This cryptocurrency is a token designed to become an Ethereum-based alternative to Dogecoin (DOGE), the most popular meme coin. The token is not like Bitcoin, which was designed to be scarce because it was designed to be abundant, with a total supply of approximately one quadrillion (Coinbase, 2022). The ecosystem of the token also supports the development of projects such as non-fungible tokens (NFT), art incubators, and Shibaswap, a decentralized exchange platform.

Ryoshi, an anonymous developer, created the Shiba Inu Coin in August 2020. The total supply of Shiba Inu coins was one quadrillion tokens at the start of the project. The token is available for purchase on a variety of cryptocurrency exchange platforms. Furthermore, because the cryptocurrency is exchanged as an Ethereum token, it can be traded on the majority of the Ethereum ecosystem's supported platforms. As a result, the token is compatible with Ethereum wallets like Coinbase Wallet (Coinbase, 2022). It can also be found on decentralized exchanges (DEX) such as Uniswap. Another benefit of the token is that it can be used in Ethereum-based applications such as borrowing and saving assets and NFT markets.

The Shiba Inu Coin is distinct from Dogecoin in that it is compatible with the Ethereum ecosystem. As a result, Ethereum developers can create crypto-related applications such as ShibaSwap, a decentralized exchange that allows users to exchange and store tokens without the need for an intermediary. The community's future plans include the creation of an NFT platform and a governance system to govern the Shiba ecosystem.

Meme Coins

Despite the fact that Bitcoin is the most well-known cryptocurrency, there are many others. For example, meme-based cryptocurrencies such as Dogecoin have grown in popularity in recent years. As a result, many clones have been created and released into the market, including Dogelon Mars, Shiba Inu, Doge Dash, and Samouyed Coin. Although the majority of these currencies are usually created as a joke, some of them have the potential to become mainstream (O'Rourke, 2018). Dogecoin, for example, experienced a massive increase in value in May 2021 before leveling off. It is currently the 11th most valuable cryptocurrency in terms of market capitalization. The value of these meme coins, on the other hand, is never high. Dogecoin is currently worth approximately $0.14 per coin.

Meme coins are cryptocurrencies that are inspired by internet jokes and memes. Dogecoin, for example, was inspired by a meme of a dog from a viral photo of a Shiba Inu. Most of the time, these currencies aren't meant to be taken seriously. They can, however, gain traction when members of the cryptocurrency community want to be a part of a well-known joke or trend (Bogna, 2021). As the currency's popularity grows and its value rises, retail investors may begin to invest in it, further increasing its value.

Furthermore, celebrities and well-known online figures may boost the popularity of meme coins. For example, Elon Musk, a billionaire investor and well-known internet figure, has advocated for the popularity of Dogecoin. Other meme coins exist today, such as Floki Inu, whose name is inspired by the individual's actual pet dog.

The supply of meme coins is frequently astonishingly large or infinite. This is in contrast to Bitcoins, which are programmed to have a limited number of coins available for mining. Meme coins typically have billions of units in circulation. Furthermore, developers of meme

coins frequently fail to include mechanisms for destroying or removing the coins from circulation. As a result, their market volume is constantly increasing, causing their value per unit to remain very low in most cases. Dogecoin, the most valuable meme coin, is only worth $0.14, while others, such as Safe Moon, are 5000 times less valuable (Bogna, 2021). The low value of meme coins is one of the factors that contribute to their popularity, as virtually anyone can easily purchase a large number of them.

At the moment, almost anyone can create meme coins because there is software that does the majority of the work for the developer. The only effort required is to create coins with a meme-like appeal that correspond to whatever issue is currently trending on social media. The meme coins are based on community sentiment as well as outside influences such as celebrity support. The value of meme coins fluctuates dramatically. As a result, the value of a meme coin, such as Dogecoin, could skyrocket. In contrast, if the community loses interest and moves on to another popular coin, the price could fall quickly.

Only a few meme coins do not use the same technology as well-known cryptographic currencies like Bitcoin and Ethereum. They also lack a reliable ecosystem to back them up. Shiba Inu's protocol is based on Ethereum, while Dogecoin is based on Litecoin, of all the currently popular meme coins that use established blockchains (Bogna, 2021). Furthermore, most of them have no real value outside of the cryptocurrency realm. Very few merchants and service providers accept meme coins as payment. Because of the currency's current nature, it is unlikely that most of them will still be in circulation in the coming years. Even if they survive, their monetary value will be negligible.

CHAPTER 4

DATA AND METHODS

Data

The data in this thesis was gathered and collected from Certik, a database collecting information and metrics about various crypto currency networks. Certik, founded in 2018 by Yale and Columbia University professors, is a pioneer in block chain security, leveraging best-in-class AI technology to safeguard and monitor blockchain protocols and smart contracts. The objective of Certik is to safeguard the digital world. Beginning with Blockchain, Certik brings cutting-edge academic breakthroughs into the enterprise, allowing mission-critical applications to be designed with security and consistency.

Due to the low nature of the nominal price for SHIB, the data was used starting from August 2020, but cleaned all the way till April 2021 when SHIB prices were large enough that they were distinguishable from 0 in our dataset obtained via EViews. The data was originally processed in the EViews format and then converted to Excel format and further analyzed via regression analysis. The data was limited to the following variables for Bitcoin (BTC) and Shiba Inu (SHIB): Open/High/Low/Close prices for the cryptocurrency (daily); Volume traded (daily). We studied the data in regard to the following metrics:

Relative popularity growth

Within the scope of the available data, a great proxy to track both the relative popularity of SHIB as a cryptocurrency and the available liquidity would be the % change versus the first day in the data set as compared to the same metric for Bitcoin (BTC). We ran the numbers for both SHIB and BTC and produced the resulting graph showing % change in prices versus price on 8/1/2020:

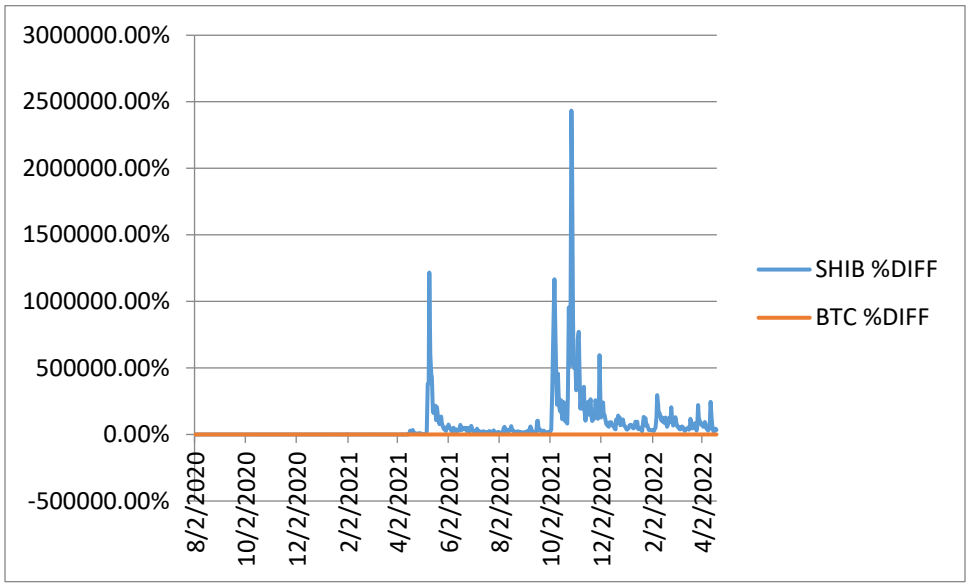

Figure 2: BTC vs. SHIB % difference vs. 8/1/2020

As evident, BTC %change was not only considerably smaller, but also comparable in order of magnitude to the initial volume. On, the other hand, SHIB showed substantial volume growth over the course of the time period, though with much volatility in both directions. SHIB is a younger cryptocurrency, and the nominal volume is much smaller than that for BTC, which explains the much higher % growth in volume for SHIB. At the same time, it is yet difficult to predict if SHIB will actually match the nominal volume for BTC in any foreseeable future. While BTC remains the standard for many cryptocurrencies users, SHIB is certainly scoring well in terms of perceived interest and popularity.

Forecasting, correlation and efficiency

The data could be used to identify if there is a noticeable amount of autocorrelation for SHIB both nominally and as compared to BTC. Additionally, one can extract information on BTC correlation with SHIB and with the market as a whole. Applicability of a certain time series model may also be indicative of how efficient the cryptocurrency may be.

Market

The proxy for the market chosen was the SPY ETF. The SPDR S&P 500 trust is an exchange-traded fund which trades on the NYSE Arca under the symbol. SPDR is an acronym for the Standard & Poor's Depositary Receipts, the former name of the ETF. It is designed to track the S&P 500 stock market index. This fund is the largest and oldest ETF in the world.

Methods

Following the collection of the required data, it was critical to select appropriate modeling methods and regression analysis that would best communicate the thesis's overarching goals and also shed further light on decentralized cryptocurrency technology itself and how it has evolved over time, particularly in regard to the coin prices and market growth. These methods will be discussed in greater detail below to provide additional insight into why they were included in the modeling and regression process, as well as the relevance to the economic insight that they have provided to the overarching goals of this paper. For this paper we utilize the time series model to predict the price of the Shiba Inu currency.

Time-Series Analysis

A time series is a collection of observations for a variable over time such as the monthly cryptocurrency market returns for the past two years. If a consistent pattern can be seen by plotting the data such as the individual observations on a graph, the series has a trend. In this case, we made a comparison between Bitcoin, which is one of the most traded cryptocurrencies, and Shiba Inu, a recently introduced coin that has been making significant growth over the last two years. Two key variables were assessed which were the price changes over time and the market volatility of the two coins.

In this case, we first calculated the daily return for each of the crypto currencies:

y_{1t} = Daily Return for Bitcoin (BTC)

y_{2t} = Daily Return for Shiba Inu coin (SHIB)

In order to calculate the daily return as a percentage, we first subtracted the opening price of the cryptocurrency from the closing price, followed by dividing the outcome by the opening price and finally multiplying the result by 100 in order to convert to a percentage.

The next step was to use different models to show the relationship between the two currencies. The selected models are the auto regression model AR(1) model, VAR(1) model, Static Transfer function model, and CAPM (capital asset pricing model).

Autoregression Model

In this model, the value of a time series is regressed on previous values on the same time series. For instance, a simple case of regressing y_t on y_{t-1} produces:

$$y_t = \delta + \beta y_{t-1} + \epsilon_t$$

In this model, the response variable in the previous time-period becomes the predictor. The order of an autoregression is the number of immediately preceding values in the series that are used to predict the value at the present time. In this research, a first order auto regression AR (1) was used. Therefore AR (1) for the above comparison will be:

$$Y_{1t} = \delta_1 + \beta_1 y_{1t-1} + \epsilon_{1t}$$

$$Y_{2t} = \delta_2 + \beta_2 y_{2t-1} + \epsilon_{2t}$$

An AR (1) model was used to demonstrate how past values influence current values in the dependent variable, average daily. It is referred to as an AR (1) model since the lag time variable is one time period prior to the current time period under consideration.

Vector Autoregression (VAR) Model

This model was used to comprehend the interrelationships between the daily returns of the bitcoins and Shiba Inu coins.The technique generalizes the univariate Autoregression model by allowing for more than one evolving variable. The variables in a Vector Autoregression (VAR) models enter the model in the same way. All the variables have equations that that show the evolution that is based on its own lagged values, the lagged values of other variables, and an error term. The knowledge required in this area will be that of the list of variables that can be hypothesized to affect each other. Like the autoregressive model, each variable has an equation modeling its evolution over time. This equation includes the variable's lagged (past) values, the lagged values of the other variables in the model, and an error term. VAR models do not require as much knowledge about the forces influencing a variable as do structural models with simultaneous equations. The only prior knowledge required is a list of variables which can be hypothesized to affect each other over time. Here we have two variables y_1 (Bitcoin) and y2 (Shiba Inu), which will be forecasted over a period (t). In order to calculate $Y_{1(t),}$ Vector Auto regression (VAR) models will use the past values of both Y1 as well as Y2. Similarly, to compute Y2 (t), the past values of both Y1 and Y2 be used. For example, the system of equations for a VAR (1) model with two time series (variables `Y1` and `Y2`) is as follows:

$$Y_{1,t} = \alpha_2 + \beta_{11} Y_{1,t-1+} \beta_{12} Y_{2,t-1+} \epsilon_{1,t}$$

$Y_{2,t} = \alpha_2 + \beta_{21} Y_{1,t-1+} \beta_{22} Y_{2,t-1+} \epsilon_{2,t}$ Here $y_{1,\ t-1}$ and $y_{2,\ t-1}$ are the initial lags of the time series y1 and y2, respectively. The preceding equation is known as a VAR (1) model since each equation is of order 1, containing up to one lag for each predictor (y_1 and y_2). Because the y factors in the equations are connected, they are treated as endogenous variables rather than

external predictors. Similarly, for two variables, the second order VAR (2) model would incorporate up to two delays for each variable (y_1 and y_2). The idea is to see the relation of SHIB prices relative to its own past AND the past of other cryptocurrencies (in this case, BTC).

Transfer Function

The transfer function technique is a time series model that incorporates many time series and explicitly explains the process' dynamic properties. Equation can be used to write the function in its general form. The term "transfer function" is also used in the frequency domain analysis of systems using transform methods such as the Laplace transform; here it means the amplitude of the output as a function of the frequency of the input signal. For example, the transfer function of an electronic filter is the voltage amplitude at the output as a function of the frequency of a constant amplitude sine wave applied to the input. For optical imaging devices, the optical transfer function is the Fourier transform of the point spread function (hence a function of spatial frequency).

A transfer function format may look as follows:

$$Y_{1t} = \delta_1 + \beta_{11} y_{1t-1} + \beta_{12} y_{2t} + \epsilon_{1t}$$

$$Y_{2t} = \delta_2 + \beta_{21} y_{2t-1} + \beta_{22} y_{1t} + \epsilon_{1t}$$

Here the idea is that the SHIB prices can be modeled used its OWN PAST AND the PRESENT values of other cryptocurrencies (in our case, Bitcoin).

Capital Asset Pricing Model

The Capital Asset Pricing Model (CAPM) is a mathematical model that describes the relationship between systematic risk and expected return for assets, especially equities. The

CAPM model is commonly used in finance to price hazardous securities and generate predicted returns for assets based on their risk and cost of capital. The following model will be used.

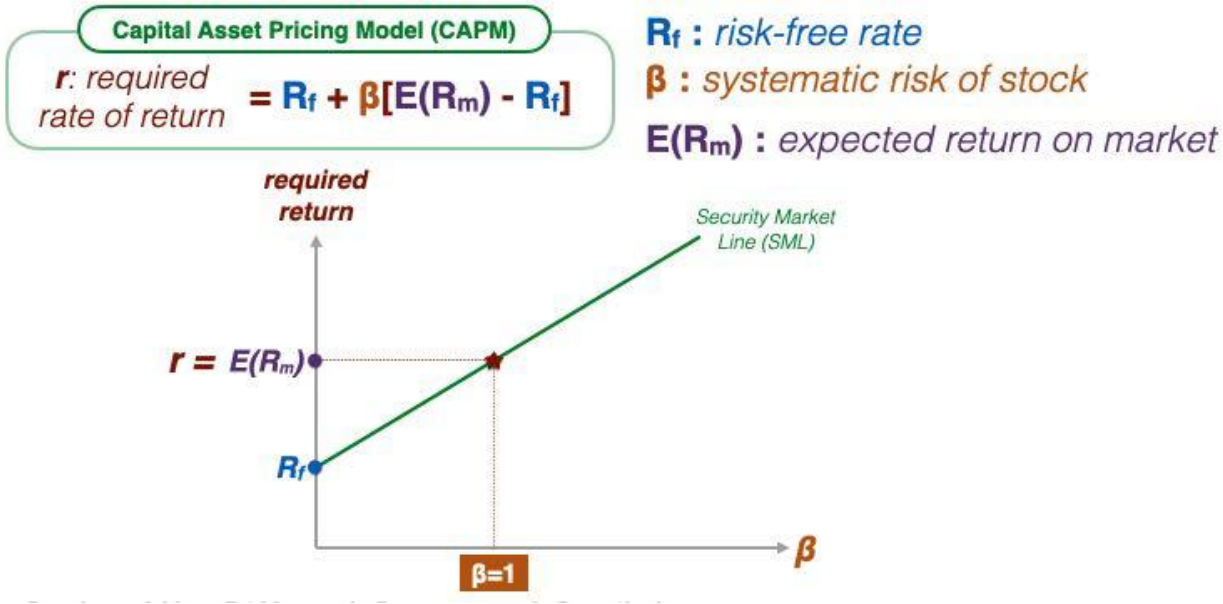

Figure 3: CAPM

In relation to our model, we can view CAPM as:

$Y_t = C_1 + V_1(B)X_{t+} u_{1t}$

The market proxy that we are using in this case is SPY, the SPDR ETF. In general, The model takes into account the asset's sensitivity to non-diversifiable risk (also known as systematic risk or market risk), often represented by the quantity beta (β) in the financial industry, as well as the expected return of the market and the expected return of a theoretical risk-free asset. CAPM assumes a particular form of utility functions (in which only first and second moments matter, which is risk is measured by variance, for example a quadratic utility) or alternatively asset returns whose probability distributions are completely described by the first two moments (for example, the normal distribution) and zero transaction costs (necessary for diversification to get rid of all idiosyncratic risk).

CHAPTER 5

RESULTS ANALYSIS

Certik data compiled via EViews and analyzed via MS Excel was used to draw conclusions about the evolution of decentralized cryptocurrency over time.

The Shiba Ina coin appears to perform moderately well in terms of the first performance parameter. It has grown significantly in terms of price, Token Transfer, transaction volume, and active users.

The cost of a single token of the coin has risen significantly. Shiba Inu (SHIB) began trading on May 10, 2021, at $0.000000000056 and reached above $0.00008. Since then, the Shiba coin's value has plummeted, and earlier this year was worth around $0.000025. When the coin price is examined, it is clear that there has been a significant fluctuation in the coin price, which has been influenced by a number of key issues. The coin's value skyrocketed earlier this year after Vitalik Buterin consumed more than half of the Shiba Inu supply, causing a surge in demand. Elon Musk had also played a significant role in the price's rise and fall, primarily through his massively popular Twitter account. The graph below shows SHIB price progression over time:

Figure 4: Shiba Inu Price Changes

Price Forecasting, Correlation and Efficiency

We ran 4 regression models on BTC and SHIB, as stated earlier: AR(1), VAR(1), Transfer Function model and CAPM model. We observed very low autocorrelation for both AR(1) and VAR(1) models for both cryptocurrencies, indicating that there is not much trendsetting within them and that forecasting would be difficult for these products (as expected on the fundamental level). The Transfer Function model, which uses the value of the other cryptocurrency from the SAME time period, as opposed to the previous time period, as one of the independent variables, showed a higher overall correlation (multiple R coefficient), but still not high enough to indicate any serios trendsetting. The CAPM model produced moderate correlation for BTC, but virtually no correlation for SHIB. As an established cryptocurrency, BTC is expected to have a decent amount of movement in-line with the equity market (SPY proxy). However, SHIB is still young enough where the individual demand that is uncorrelated with the main investor appetite is what is driving the price movements. Additionally, SHIB still

has huge volume fluctuations day-to-day, whereas BTC volume is much more stable. The results for the respective model regressions are below:

AR(1) BTC SUMMARY OUTPUT		
Regression Statistics		
Multiple R	0.053143014	
R Square	0.00282418	
Observations	367	
ANOVA	***F***	
Regression	1.033745157	
	Coefficients	***Standard Error***
Intercept	-0.000323585	0.002012517
BTC x_t-1	-0.053140896	0.052266345

AR(1) SHIB SUMMARY OUTPUT		
Regression Statistics		
Multiple R	0.009075755	
R Square	8.23693E-05	
Observations	367	
ANOVA	***F***	
Regression	0.030067282	
	Coefficients	***Standard Error***
Intercept	0.024295565	0.014482556
SHIB x_t-1	0.008925012	0.051470896

Figure 5: Regression Model Results

The takeaways here are: 1) very low correlation between the past SHIB prices and current ones (low autocorrelation); 2) p-value is too high for results to be statistically significant; 3) results make sense for a relatively young cryptocurrency with huge volatility, lower volume (as

compared to others such as BTC) and less general correlation to other markets including equities. Also low correlation between past and present BTC prices (though a little higher as compared to SHIB). P-values too high still and overall the results make sense (though I would expect a higher autocorrelation for BTC prices).

VAR BTC SUMMARY OUTPUT		
Regression Statistics		
Multiple R	0.053678853	
R Square	0.002881419	
Observations	367	
ANOVA	***F***	
Regression	0.591451673	
	Coefficients	***Standard Error***
Intercept	-0.000294003	0.002025587
BTC x_t-1	-0.051544717	0.053488779
SHIB x_t-1	-0.001063039	0.007354012

VAR SHIB SUMMARY OUTPUT		
Regression Statistics		
Multiple R	0.056995591	
R Square	0.003248497	
Observations	367	
ANOVA	***F***	
Regression	0.553115241	
	Coefficients	***Standard Error***
Intercept	0.02382262	0.014486136
SHIB x_t-1	0.020599611	0.052592774
BTC x_t-1	-0.411325774	0.382529069

Figure 6: Regression Model Results

The takeaways here are: 1) still very low correlation between the past BTC prices and current ones (low autocorrelation); 2) p-value is too high for results to be statistically significant; 3) results still make sense for a relatively young cryptocurrency with huge volatility, lower volume (as compared to others such as BTC) and less general correlation to other markets including equities. Results are also similar for BTC as in the case with AR(1).

StatTrans BTC SUMMARY OUTPUT		
Regression Statistics		
Multiple R	0.217447435	
R Square	0.047283387	
Observations	367	
ANOVA	***F***	
Regression	9.032671782	
	Coefficients	***Standard Error***
Intercept	-0.001043748	0.001977577
SHIB x_t	0.029519853	0.007162498
BTC x_t-1	-0.041911694	0.051230539

StatTrans SHIB SUMMARY OUTPUT		
Regression Statistics		
Multiple R	0.213776957	
R Square	0.045700587	
Observations	367	
ANOVA	***F***	
Regression	8.715825253	
	Coefficients	***Standard Error***
Intercept	0.024654243	0.01416802
BTC x_t	1.528002948	0.366308225
SHIB x_t-1	0.012784785	0.050360612

Figure 7: Regression Model Results

Takeaways here are: 1) the overall level of correlation is higher than in the case of AR(1) and VAR. 2) Seems that cross-sectional correlation (SHIB on BTC and BTC on SHIB) is statistically significant (based on p-value), but not autocorrelation.

CAPM BTC SUMMARY OUTPUT		
Regression Statistics		
Multiple R	0.311860992	
R Square	0.097257278	
Observations	367	
ANOVA	***F***	
Regression	39.32339276	
	Coefficients	***Standard Error***
Intercept	-0.000636826	0.0019155
SPY x_t	1.509752338	0.240757719

CAPM SHIB SUMMARY OUTPUT		
Regression Statistics		
Multiple R	0.010759139	
R Square	0.000115759	
Observations	367	
ANOVA	***F***	
Regression	0.042256956	
	Coefficients	***Standard Error***
Intercept	0.024456664	0.014419718
SPY x_t	0.37256659	1.812403112

Figure 8: Regression Model Results

The takeaways here are: 1) higher overall correlation than with previous models for BTC, but not SHIB; 2) it appears that BTC is somewhat correlated with the overall market (proxy = SPY), but not so much in the case of SHIB, which makes sense; 3) results are statistically significant for BTC, but not for SHIB. Overall, SHIB price is hard to predict no matter what model is used.

CHAPTER 6

CONCLUSION

Over the years, currencies such as Bitcoin and Ethereum have been the leaders in the decentralized market. However, Shiba Inu has been somewhat of a revolution in the space. This cryptocurrency is designed to compete with Dogecoin (DOGE), the most popular meme coin, as an Ethereum-based alternative. With a total supply of approximately one quadrillion, the token differs from Bitcoin, which was designed to be scarce because it was designed to be abundant. The coin has experienced massive growth over the years. However, like other cryptocurrencies, their market is still highly volatile because of the changing market prices and the number of people holding the tokens. As evidenced by this research paper, its volume is still highly unstable while the overall trend is in the direction of massive expansion. The cryptocurrencies such as Shiba Inu have great potential to transform the current economy, and there is a need to understand how to regulate this form of transaction.

When it comes to the functionality of Shiba Inu within the larger space of assets, there are a few interesting observations present that make it quite different from the established leaders such as Bitcoin. Unlike Bitcoin, Shiba Inu is completely uncorrelated to the equity market as tested via ETF proxies. This is partially due to its overall volatility and much noise present in the price movement and partially due to Shiba Inu investors and holders likely being very different from vanilla investors that buy stocks. Additionally, Shiba Inu is not highly correlated with other cryptocurrencies and is tough to forecast via any model and any combination of assets or its own past performance.

At the moment, almost anyone can create meme coins because there is software that does the majority of the work for them. The only effort required is to create coins with a meme-like

appeal and relevant to whatever social media issue is currently trending. The value of meme coins is extremely volatile due to their reliance on community sentiment and outside influence, such as popular individuals' support. As a result, the value of a meme coin, such as Shiba Inu, could skyrocket. On the other hand, the price could plummet quickly if the community loses interest and moves on to another popular coin. Another significant challenge is managing and reducing the astronomically high energy consumption rates associated with mining is an entirely different issue that must be addressed and is currently a major roadblock to the continued successful adoption of blockchain technology.

REFERENCES

Barber, S., Boyen, X., Shi, E., & Uzun, E. (2012, February). Bitter to better—how to make bitcoin a better currency. In *International conference on financial cryptography and data security* (pp. 399-414). Springer, Berlin, Heidelberg.

Bogna, J. (2021). *What Is a Meme Coin and How Do They Work?*. PCMAG. Retrieved 4 February 2022, from https://www.pcmag.com/how-to/what-is-a-meme-coin-how-do-they-work.

Bradbury, D. (2013). The problem with Bitcoin. *Computer Fraud & Security*, *2013*(11), 5-8.

Casino, F., Dasaklis, T. K., & Patsakis, C. (2019). A systematic literature review of blockchain-based applications: Current status, classification and open issues. *Telematics and informatics*, *36*, 55-81.

Coinbase. (2022). *SHIBA INU price*. Retrieved 4 February 2022, from https://www.coinbase.com/price/shiba-inu.

Dannen, C. (2017). *Introducing Ethereum and solidity* (Vol. 1, pp. 159-160). Berkeley: Apress.

Faqir-Rhazoui, Y., Arroyo, J., & Hassan, S. (2021). A comparative analysis of the platforms for decentralized autonomous organizations in the Ethereum blockchain. *Journal of Internet Services and Applications*, *12*(1), 1-20.

Farell, R. (2015). An analysis of the cryptocurrency industry. Wharton Research Scholars. 130. https://repository.upenn.edu/wharton_research_scholars/130

Glaser, F., & Bezzenberger, L. (2015, March). Beyond cryptocurrencies-a taxonomy of decentralized consensus systems. In *23rd European conference on information systems (ECIS), Münster, Germany*.

Karame, G. O., Androulaki, E., & Capkun, S. (2012, October). Double-spending fast payments in bitcoin. In *Proceedings of the 2012 ACM conference on Computer and communications security* (pp. 906-917).

Lyanchev, J. (2020). *Report: Transaction of One Bitcoin Consumes More Electricity Than A British Household In 2 Months*. CryptoPotato. Retrieved 4 February 2022, from https://cryptopotato.com/report-transaction-of-one-bitcoin-consumes-more-electricity-than-a-british-household-in-2-months/.

O'Rourke, M. (2018). The Cryptocurrency Craze. *Risk Management*, *65*(2), 3-4.

Victor, F., & Weintraud, A. M. (2021, April). Detecting and quantifying wash trading on decentralized cryptocurrency exchanges. In *Proceedings of the Web Conference 2021* (pp. 23-32).

Wang, Y., Han, J. H., & Beynon-Davies, P. (2019). Understanding blockchain technology for future supply chains: a systematic literature review and research agenda. *Supply Chain Management: An International Journal*.

Wood, G. (2014). Ethereum: A secure decentralised generalised transaction ledger. *Ethereum project yellow paper*, *151*(2014), 1-32.

Zhang, Y., & Song, G. (2014). *Economics of competing crypto currencies: monetary policy, miner reward and historical evolution* (Doctoral dissertation, Thesis for the MSc Degree in Financial Computing at University College London, UK).

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