Bitcoin Volatility in Web 3.0 and Revelation to Digital Currency

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Abstract. In Web 3.0, bitcoin is the first cryptocurrency and one of the most prominent digital currencies. Cryptocurrency is a form of digital currency that operates on blockchain technology which is decentralized, transparent, and secure. Surrounding why bitcoin fluctuates so intensively, the article illustrates bitcoin's history, explains the running logic and technical principle behind the volatility, analyses a few factors that contribute to its volatility, and explores the essence of bitcoin through the comparison with stock. Stocks represent the ownership of a specific corporation while bitcoin doesn't. Bitcoin is more like an artwork whose value is bestowed by the market consensus. Further, the article compares bitcoin with digital RMB. Digital RMB is far more predictable than bitcoin and has profound meaning for China. In the future, digital currency is going to play a dominant role across the world. Though bitcoin is on a downward trend, blockchain technology and cryptocurrency will have positive developing prospect. The article aims at introducing abstract bitcoin in a comprehensible way to help crypto and digital market newcomers digest bitcoin and blockchain and access Web 3.0 and digital currencies.

Keywords: Bitcoin, blockchain, digital currency, volatility.

1. Introduction

The paper is arguing about why bitcoin is not worth investing. However, crypo currencies are the future. First, review the history and certain big issues of bitcoin in recent 5 years. Digital currency has been becoming one of the hottest topics in financial market. Bitcoin is the most prominent, mysterious, and volatile digital currency.

According to Bitcoin Daily, in 2021, bitcoin price boomed and had a value of around $60,000 in the peak. Dramatically, from May bitcoin price started to drop sharply. Within one month, bitcoin price dropped about 50%. Then, it quickly came to recover to $50,000 and gradually achieved the highest price in history in November 2021. From then on, bitcoin started to plummet constantly, briefly falling below $42,000 with a drop of more than 20% within 24 hours [1]. As of 20:00 on the same day, a total of 417,000 people had exploded positions in the past 24 hours, and the amount of cryptocurrency contracts across the network has reached $2.584 billion, of which the amount of bitcoin within 24 hours has exploded more than $1 billion. In the next eight months, bitcoin has dropped down 68%.

Again, September 13th 2022 was called the "Black Tuesday" because bitcoin price dropped down 10% on the day and in that month, it dropped down a total of 20%, drastically thwarting the confidence of cryptocurrency market. As a consequence, thousands of investors lost an extensive amount of money and were hundreds of dollars in debt; Coinbase, the largest cryptocurrency exchange in the United States, has announced 1,100 layoffs; in November 2022 cryptocurrency unicorn FTX ended up bankruptcy; the financial market no longer believed bitcoin. Bitcoin made myths in a short period of time of getting rich overnight but also took people off the heaven and sent them to abyss. Its appearance is terrific but transient. Is bitcoin the game of the bold or the fool? At present, bitcoin market is still in chaos. In the first two weeks of August 2023, bitcoin plunged 12% [1]. Some people blamed the sharp drop on market structure while others insisted that news of Elon Musk selling the holdings in bitcoin and increased expectations of interest rate hikes in the U.S. are responsible for that [2].

Like all the other financial issues, people hold different opinions about the reasons and logic behind bitcoin boom and collapse. This study figures out some factors that lie behind the fluctuation of bitcoin price. Mechanism, fraud, government, social media. Nowadays various of news media acts

as intermediary, providing real or fake news and trying to dominate consumers' sentiment and action. It is difficult for people to think independently about bitcoin market. Does bitcoin really have a bright future? Is it worthwhile to invest? What is the revelation of bitcoin to digital currency? It is quite important to answer these questions in terms of the development of digital market.

2. Analysis of Technology and Market of Bitcoin

2.1. Bitcoin Technology

2.1.1 The blockchain

Bitcoin is a type of virtual currency and also the first cryptocurrency launched in 2009. Cryptocurrency is a type of decentralized digital currency. Bitcoin is owned and traded in a virtual digital world and requires cryptography rather than a central authority to manage its ledgers and balances [3].

Web 3.0 is a decentralized era. Its representative is blockchain technology which is decentralized, transparent, and secure. Bitcoin operates on blockchain technology.

Web 1.0 is a very early stage of the Internet. There are "read-only" websites that people could merely send or read a message but not interact with others. The representatives are Google and Yahoo.

In Web 2.0, there are centralized platforms like Facebook, Twitter, and Instigram, where people could interact and communicate with each other. However, centralized platforms exert control over their users and partners to extract value. On one hand, they utilize network effect to stick users and take transaction fees. On the other hand, customers' private data such as preference or browsing history could be recorded or "stolen" by the platforms and used in illegal transaction.

In Web 3.0, the emergence of blockchain technology could allow a different vision: enabling users to directly own their data and digital assets.

Blockchain is a ledger, a distributed ledger where all the transactions are recorded. It is also a database, where data is stored. A ledger is a consensus of facts. It provides the proof of one's ownership, identity, status, and authority.

Traditional and centralized ledger means that there is always a third person to approve the transaction. By contrast, distributed ledger distributes data and records across the entire network and does not require any middlemen. When a transaction occurs between any two nodes, trade data will be preserved immutably in the ledger and every node in the network knows it. Thus, the transaction is transparent and secure. It is quite costly for hacker to attack the ledger and try to change the data illegally.

Blockchain is decentralized. Blockchain technology establishes a kind of virtual area--network. In this virtual area, everyone is the center so there is no center. The user has the decentralized and immutable ownership of the data and digital assets. It is totally peer-to-peer to trade with others. Blockchain is scalable. New block can be added to the former one constantly, forming a chain. Each new block contains all the transactions that cannot be changed. Bitcoin is the compensation for those who add new blocks.

2.1.2 Running logic: hash function and consensus protocols

Bitcoin is a purely peer-to-peer version of electronic cash that would allow online payments to be sent directly from one party to another without going through a financial institution in a specific virtual community, like a website, or in a network of users with special software for managing the virtual currency and making payments [4, 5]. The software is called the wallet. It is based on hash function and two consensus protocols -PoW and PoS.

First, the basic logic of bitcoin is to solve hash function puzzles and get compensated with bitcoin. In the block where every transaction is recorded. There are many hash puzzles. A hash is a mathematical function that converts a string of arbitrary length into a string of fixed length [6]. Typically, those who try to solve hash puzzles are called miners. Each miner is an independent node. They compete with each other to work on hash function by supercomputers. The first miner who

solve the latest hash puzzle can add a new block to the ledger and get rewarded with bitcoin. This mechanism is named Proof of Work (PoW). PoW is a consensus mechanism. It is quite difficult to solve the puzzle but is very easy for other miners to check the answer [4]. If the answer is proved to be correct, then this miner's work is proved to be worthwhile and they get compensated with bitcoin. From this moment on, all the miners should start to work on new hash puzzle on the new block.

According to Figure 1, as more hash puzzles are solved and blockchain is elongated, new puzzles become more difficult and require more electric power. The cost to work on hash puzzle is increasingly high and more and more energy will be wasted. Averagely, bitcoin alone is estimated to consume 127 terawatt-hours (TWh) a year [7]. Assuming that the profit does not change a lot, the energy cost becomes much higher, so fewer people will choose to be miners and the supply of bitcoin decreases.

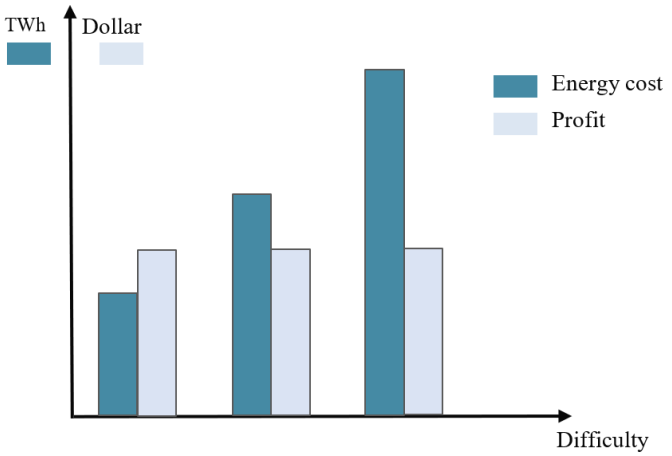

Figure 1. Change of energy cost as mining difficulty increases [7]

In order to solve energy problem, a new consensus mechanism comes into being -Proof of Stake (PoS). Proof of Stake is an alternative to Proof of Work. It substitutes staking for computational power [8]. Proof of stake does away with miners, reduces the amount of computational expenses, and replaces miners with validators [9].

In this arithmetic, Proof of Stake runs in this way: to become a validator and win the bitcoin, people lock up-or stake-their tokens in a smart contract, sort of like depositing money in a vault [10]. If they don't have enough money, they can join a staking service where participants serve as validators jointly [10]. The more a validator stakes, the more likely it is to be chosen by the algorithm, which means the greater chance it has to "winning the lottery" [10]. If fortunately, this validator is chosen and the block is accepted by other validators, it will get rewarded with newly minted bitcoin. On the contrary, if a validator validates bad transactions or blocks, it will lose all the stake.

Thus, basically the payment of PoW is hardware while the payment of PoS is stake. However, PoS is considered to be more secure. Under PoW, a 51% attack means an entity controls more than 50% of the nodes to alter the blockchain [11]. In PoS, an entity would have to own 51% of the staked cryptocurrency, which is severely expensive [11].

2.2. Price Fluctuation Analysis

Bitcoin market crashed in 2022 and constantly declined. Till now, bitcoin price fluctuates significantly. The turbulence foretells the end of crypto. The sequence of collapses seems to demonstrate that crypto is just a house of cards [12]. There are several factors causing the volatility.

Like any products, bitcoin's volatility has a lot to do with supply and demand. In PoW mechanism, it is becoming increasingly difficult to mine bitcoin. The supply is declining. If there is no more bitcoin being mined, the existing bitcoin will not flow normally. In this case, bitcoin market reacts drastically due to some events thereby fluctuating.

Another problem is that bitcoin is too opaque and complicated for the average user to understand [12]. When consumers don't comprehend an offering, computing companies can offer them a series

of attractive deals while obscuring potential pitfalls. Owing to a lack of understanding, many consumers might be "cheated" and controlled.

The "ignorance" of consumers introduced another two factors--market's sentiment and media outlet. The market's sentiment is the sentiment of investors and users. It is largely influenced by the media outlet. As a result of the virtuality of bitcoin, there is constrained ways for the public to analyze bitcoin. For most people, one of the best ways is to read the news or to imitate some financial baron or to follow the public. Therefore, the market sentiment is always influenced or munipulated.

For instance, many "experts", who are not always verified by evidence but opinions, often present information in front of public and share ways to make money overnight. It is not uncommon to hear that someone heavily invested in bitcoin and soon got hundreds of thousands time of return. Then, consumers are attracted to buy. Price increases. More consumers are into it.

On the contrary, when some capricious or opinionated industry moguls, sold their holdings of cryptocurrencies for some reasons, with the media adding some exaggerated claims, the public tended to be confused and worried. They might wonder what is happening behind the action, speculate if the price is going to decrease, or totally believe what the media is saying. Some of them might take a look and wait. Some of them might follow to sell bitcoin. Speculative consumers saw the decline trend of bitcoin and felt fear to lose more money. Then they followed, and more and more consumer sold their holdings. Finally, bitcoin market collapsed.

The government's regulation sometimes plays a role. For example, the Internal Revenue Service (IRS) considers Bitcoin a convertible virtual currency since people can convert it to cash. The tax stance taken by the IRS means taxes must be paid when using bitcoin. As a consequence, taxes factor into bitcoin's price. China's government and central bank announced that all cryptocurrency transactions were illegal. Then, bitcoin mining was cracked down.

Unpredictable demand and supply, unstable market sentiment, complicated principle, and sophisticated government regulation are factors that influence bitcoin's price.

2.3. Comparison of Bitcoin and Stock Market

When exploring the essence of bitcoin, another pivotal investment option must be mentioned--stocks. Both stocks and bitcoin are representatives in financial market. Investors take risks to buy them and get reward. Originally, people were mainly into stocks, but when bitcoin emerged, the rise in the price of bitcoin attracted a number of investors to join the crypto market [13]. Stocks represent traditional finance (CeFi) while bitcoin is on behalf of Decentralized Finance (DeFi).

First, stocks represent ownership in a corporation so its value fluctuates based on the corporation's performance. Bitcoin is a type of digital asset, currency, sort of like USD or RMB. It can be converted to any other currencies such as USD, ethereum, and stablecoin. Bitcoin does not represent any companies. Basically, it is more like an abstract artwork. The market accepts it and gives it value.

Second, stocks are issued by institutions while bitcoin is more independent. No one can issue bitcoin. It is created by mining which is based on mechanism and arithmetic. It is decentralized and traded without a third person.

Third, they are different in terms of transaction fees. When people trade with bitcoin in the network, the exchange fees are quite low. By contrast, stocks are traded in institutions that take transaction fees all the time.

They have different volatility. Admittedly, stock market is quite unstable as the S&P 500 ended up losing more than one-third of its value owing to the Covid-19 pandemic [13]. However, bitcoin is much more volatile than stock.

Essentially, there is no functional value in bitcoin. The value of stock is tied to a company's performance, while the value of bitcoin is tied to nothing but depends on market consensus. When a company performs well, its stock price increases, but for bitcoin, it is up to the market. If market accepts that it deserves this value, then that is the price and vice versa. To some extent, bitcoin is meaningless. It is merely a token that is accepted and given value by the market. This explains why it fluctuates so intensively.

Moreover, bitcoin represents DeFi and the blockchain. The transaction of bitcoin is decentralized, transparent, and open. In a long run, the security and transparency could be valuable for everyone. Trust problems are eliminated; transaction efficiency is improved; assets are well protected. It is the trend of the society and people should be incentivized to trade in this virtual area.

2.4. Comparison of Bitcoin and Digital RMB

To go further about the essence of bitcoin, the paper gives another current hot point in digital currency world--Digital RMB in China.

There are three main varieties of digital currency: cryptocurrency, stablecoins, and central bank digital currency, known as CBDCs [3]. Digital RMB is a central bank digital currency issued by the People's Bank of China (PBC).

The current situation in China is that Alipay and WeChat Pay have long been dominating the market. Banks lost the game totally. China promotes digital RMB to disrupt current domestic market. JD.com, China's largest online retailer, announced that it had processed more than 4 million transactions worth 900 million RMB ($133.5 million) since it began accepting digital RMB in 2020 [14]. Ant Group incorporated digital RMB into its platform in 2021 while WeChat followed suit in 2023. This is crucial since in the previous time, Ant Group merely accepted Alipay and JD.com exclusively took Tenpay [14]. Digital RMB could undermine the duopoly with interoperability, because it can be spent anywhere and merchants avoid transaction fees, according to FPRI Fellow Bob Murray. In this case, trust is transferred from the enterprise to the state.

Bitcoin is a cryptocurrency. China has banned cryptocurrency exchange operations in 2017 and transactions were banned in 2021, largely because it is difficult to regulate them. Bitcoin operates on blockchain technology which is a decentralized and immutable ledger without any financial institutions [14]. Alternatively, Digital RMB is fiat currency and is subject to government control. Bitcoin's price is highly volatile as it depends on market sentiment and consensus and actually has no meaning. On the contrary, digital RMB is predictable, to some extent, since it is the same currency as the RMB. As a centralized state, China benefits more from Digital RMB rather than cryptocurrency.

In addition, digital RMB acts as diplomacy in the international world. It plays a role in international trade and cross-border transactions. Digital RMB has the potential to strengthen the ability of China to retain trading partners, enforce sanctions, and monitor financial flows. China intended to internationalize the RMB via the Belt and Road Initiative (BRI) to foster connectivity across the global world. Digital RMB acted as a tool to promote the internationalization of RMB.

Digital currency era has become inevitable. Digital RMB targets on the national market but has profound meaning in the international transaction. It brings a lot of benefit for China, makes a trend to internationalize the RMB, and strengthen China's international standing. By contrast, bitcoin is more like a financial game with geographical restriction. In China, a centralized state with a relatively vulnerable and unmature financial system, there is no place for bitcoin.

2.5. Outlook of Bitcoin

Bitcoin is in a downward phase. Admittedly, bitcoin is a breakthrough in the traditional financial world, opening a transparent, secure and decentralized trading era. However, owing to its mechanism and essence, bitcoin gradually comes to an end. Unless a new talent come into being and make a difference, it is quite difficult for bitcoin's situation to recover. In the previous time, buying bitcoin was a good idea for someone to speculate to make quick money and a bad idea to preserve money. At the present, many consumers who lose confidence to bitcoin sold or converted their holdings while other long-term holders expect a miracle will happen in the future. Financial world is an amazing place mixing ability and luck. It combines risk with return organically. In the downward phase of bitcoin and worldly economics, perhaps it is again a right time for adventurers to disrupt the world and make something great. There is always the talented.

3. Limitation

This study has three main limitations. The first limitation is that the study lacks the basis of bitcoin transaction business. The second limitation is the small number of researched currencies. The researcher focuses on bitcoin and compares it with stock and digital RMB. No more currencies are involved. The third one is single research method. The researcher starts from big events of bitcoin, researches the cryptocurrency market, explores the technical principle of bitcoin, makes two comparisons, and draws a conclusion.

4. Conclusion

Bitcoin is a type of digital currency existing in blockchain. First, bitcoin runs under two consensus protocols -PoW and PoS. Under PoW, miners solve hash puzzles and get compensated with bitcoin. With more puzzles being solved comes with more energy cost. PoS is an alternative to PoW so as to solve energy problem. Under PoS, validators earn bitcoin by "staking" on a new block, which substitutes staking for computational power. Second, unpredictable supply and demand, complicated technical principle, unstable market sentiment, purposeful media, and sophisticated government regulation contribute to bitcoin's volatility. Third, bitcoin is meaningless, to some degree compared with stock. Stocks are the ownership of a corporation, while bitcoin is a type of digital asset, owned and traded in the network, and more like an artwork that the market gives it value. Forth, digital RMB is another kind of digital currency. It is highly related to the government, more predictable than bitcoin, and has profound influence for the state. Digital currency is the trend of social economic development. In Web 3.0, people benefit a lot from blockchain technology, owing to its decentralization, transparence, and security. Even though Bitcoin is on the downward trend, other cryptocurrencies and blockchain technology have promising future.

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