

The Analysis of Bitcoin's Price Fluctuation

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Abstract. The objective of this article is to examine Bitcoin's price fluctuations. To uncover Bitcoin's dramatic movements and unpredictability, I'll depict the cryptocurrency's price data using a variety of visualization tools, including Python. Additionally, we will discuss the causes for Bitcoin's past increase and rise in 2021, such as how the insane attention generated by certain news stories will fuel Bitcoin's ascent. Bitcoin provides investors with a more profitable investment opportunity, but it is also an exceedingly dangerous one.

Keywords: component; Bitcoin; Fluctuation; Investment.

1. Introduction

Technology has transformed our lives over the past few decades. Because of advanced technology, the way we shop, communicate, work, drive, etc. has changed dramatically. In 2021, many technological concepts have been proposed, among which many virtual currencies such as Bitcoin have become more mainstream investment assets in this year. In early June 2021, El Salvador, a small Central American country, became the first country in the world to announce that it would officially adopt Bitcoin as the legal currency, implying that some virtual currencies, such as Bitcoin, may play a significant role in our daily payment system as a new type of currency in the near future.

1.1 Origin of Bitcoin

Bitcoin, the first and most well-known cryptocurrency, were founded in 2009 by Satoshi Nakamoto. Satoshi Nakamoto is the pseudonym for the individual or group of individuals that published the initial Bitcoin white paper in 2008 and worked on the original Bitcoin software, which was launched in 2009. [1]. One practical life purpose of cryptocurrencies is the transfer of economic value in the digital environment. Since the creation of Bitcoin, many scholars and policy-makers have paid a large majority of attention to the Cryptocurrencies such as Bitcoin as its specific feature named decentralization, not requiring any central bank to accomplish the payment. To put it another way, its own value would be defined through everyone who possesses it instead of the government or the central bank [2]. In conclusion, this extremely unique technology, decentralization, behind cryptocurrencies represents that no central bank can make a change the rules without a consensus between the subset of the users. In short, cryptocurrencies can be circulated 24/7, allowing values to be transferred anytime and anywhere you desire to without the intervention of intermediaries. This also means that the investment and value changes of cryptocurrencies are uninterrupted 24 hours a day. Additionally, it is critical to understand that Bitcoin's payment method is entirely peer-to-peer [1]. This enables users to make and receive money from and to anybody on the network. Unless they are receiving or transmitting bitcoin through a regulated institution or exchange, the participants in a transaction are not needed to get authorization from an authority or an external source. Cryptocurrency networks are voluntary, and the code in the high-quality protocol is completely open source, supporting the fairness and security of the user verification system. Generally speaking, everyone can contribute to the development of cryptocurrencies, review the code themselves and choose whether to run it. New features or code changes must be reviewed by the developer community before being agreed upon and released officially.

Many other virtual currencies have also been invented in the few past years. And more digital currencies are constantly improving the role of cryptocurrencies, and even have features that Bitcoin

does not have. Many blockchain's also support running decentralized applications using smart contracts. Ethereum is the most popular example of this type of blockchain.

1.2 The development of Bitcoin

According to David's findings, during the era of the worldwide COVID-19 pandemic, COVID-19 had a huge impact on the cryptocurrency market during a brief period of financial panic from 12 March to 1 April 2020 [3]. Against the backdrop of the global spread of the Coronavirus-19, cryptocurrencies have generally gained the increasingly wild popularity among the whole world since the Bitcoin has been dramatically increased to an exaggerate price, reaching the highest 69000 USD roughly. In the field of encryption currency, the meaning of the word ups and downs was perfectly interpreted in 2021, as during this period, which experienced the sharp ups and downs of the Bitcoin, an announcement about the retreating virtual currency mining and speculation in China mainland, a great upsurge of the NFT around the global. In terms of Google news search, the top 10 list of the hottest word in 2021 includes the Dogecoin and Ethereum price. Coinbase Global, a U.S. cryptocurrency exchange, went public in April, 2021, with a valuation of \$86 billion on its first day of listing, making it the largest cryptocurrency company to date which symbolizes the mainstream acceptance of Bitcoin. Richard Galvin, a digital capital asset management of a cryptocurrency fund, said that "It's graduated into the sphere where it is traded by the sort of people that are taking bets on treasuries and equities"².

On the background of such intense price changes, Musk was undoubtedly the key word of the virtual currency in the first six months in 2021. At the end of January 2021, the conflict between American retail investors and institutional investors has been staged around some stocks such as GameStop (GME)³. However, Dogecoin, introduced as a "joke currency," unexpectedly appeared to the public in this conflict of the interest between institutional and retail clients in the stock market. On January 28th Twitter user WSB Chairman (not the Twitter account of the real GME retail leader WSB) tweeted: ' Does DOGE ever get a dollar? '. Perhaps just experienced the conflict with the Wall Street, Enthusiasm from the individual investors and the support of Elon Musk promoted Dogecoin to an exaggerated price that the market value of Dogecoin has skyrocketed 1,000 times [4]. In addition, a majority of the comments about the Dogecoin from Musk had attracted many people's investments. ' Dogecoin was invented as a joke, essentially to make fun of cryptocurrency ', ' Bitcoin just gave power to the new rich ', and ' Dogecoin is the future of money '. Such these comments prompted Dogecoin to rush into the top ten cryptocurrencies. Not just Dogecoin, when Musk ' s company bought \$ 1.5 billion Bitcoin, he announced that Tesla will accept the payment of bitcoin, which will directly push up the price of Bitcoin and the other kind of the other cryptocurrency⁴.

In comparison to the stock market and futures, Bitcoin trading has only been active since 2008, but its significance has grown quickly over the last several years. In general, there is some degree of correlation between the commodities and stock markets. After ten years of growth, bitcoin has steadily gained the status of a gold-like investment commodity. Its capacity to preserve assets and diversify risks has garnered more attention [5]. The value of the banknote would generally decrease caused by the long-term inflation, while the gold, owning a high purchase power in the case of the high inflation, is a strong currency to hedge against rising inflation [6]. Bitcoin, known as "digital gold", is also expected to be the same hedge asset as gold to against the inflation as it has a lot in common with gold. Actually, gold is considered as a physical asset while bitcoin is as known as a digital asset. One of the most obvious similarities between gold and bitcoin is the restriction on their amount, as the banknote, held by government and central bank, could be printed in unlimited numbers. But for bitcoin, it will be only 21 million bitcoins in the mathematical algorithm and this limited number will not be increased any more. The same as the gold that the supply of it will be restricted to a number, roughly 2,500 tons per year. In fact, gold, a mineral resource from our earth, has its limited amount. So, the value of the bitcoin and the gold is considered to be a commodity that cannot be controlled by the central bank or the government but is valued jointly by every bitcoin and gold holder.

2. Data and Methodology

There is no doubt that Bitcoin was one of the most popular investment products in 2021. Compared to the real gold, the price of digital gold, Bitcoin, has dramatically fluctuated after its invention. Since the market value of Bitcoin has always dominated the digital currency market for a long time, and its influence and market value ratio are much higher than that of other digital currencies, Bitcoin is used as a research representative of encrypted digital currencies. This article selects S&P500, one of the three major stock indexes in the US stock market, and Gold which is a majority of features being similar to Bitcoin, called virtual gold, as the rest research samples.

2.1 6 Virtual Currencies Price Correlation

Bitcoin price data and gold price data are sourced from www.Longtermtrends.net from the 1st of January 2013 to 1st of Mar 2022. Then I put the dataset to the Jupyter Notebook to do some data analysis. The use of machine learning (ML) models such as correlation heatmap is beneficial for us to understand the correlation between the different dataset. The correlation matrix would be selected to display the heatmap through Seaborn in Python.



Figure 1. Correlation Heatmap between Bitcoin and the other 5 Cryptos

With the help of the Koyfin, a website that you can take the Compound Annual Growth Rate (CAGR) for any stocks or virtual currencies into comparison, I put the CAGR for Bitcoin, Gold, S&P500 into together in order to show the bitcoin’s tough volatility and unpredictability.

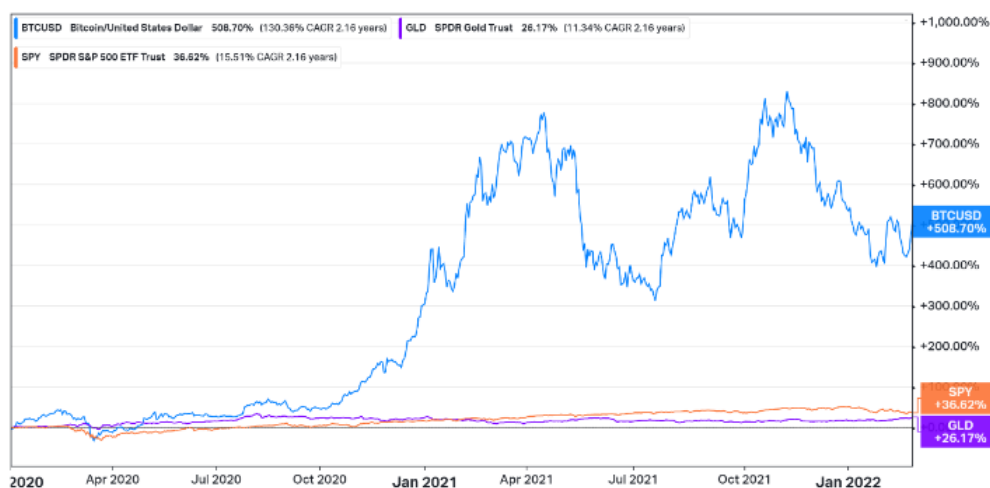


Figure 2. The Comparison of CAGR Between Bitcoin, Gold And S&P 500

2.2 Historical Price of Bitcoin

In addition, I have uploaded individual price data for bitcoin to a new dataset in order to observe the historical bitcoin price and pointed the 5 most significant increase in the period of 1st January, 2013 to 1st March, 2022 with a useful website, the Koyfin, which can well visualize the commercial data.



Figure 3. The Historical Price of Bitcoin and the 5 Most Increase

3. Findings and discussion

3.1 Historical Price of Bitcoin

With the economic instability caused by the new crown epidemic, Bitcoin is regarded by some as a means of saving value. According to Dyhrberg (2016), Bitcoin is decentralized and has a finite market cap. This does not imply, however, that Bitcoin is less valuable than other financial assets available on the market [7].

From the figure 2, we can find that although the price trend of Bitcoin is increasing, its price fluctuation is extremely violent compared to S&P500 and gold. With the comparison to Gold and S&P 500 stock markets, there is a deep increasing for Bitcoin price, nearly 4.638 times from 2013 to 2021, while only 20 stocks in the A-share market have risen more than 20 times since 2013. We can make selective investments in the virtual currency. In the process of investing, your asset allocation is of vital importance for your positive returns. Additionally, in response to this situation, we can also adopt some investment strategies. From the picture, we can observe that the price trend of Bitcoin is very rapid. Both the ups and downs are huge. However, as shown by historical statistics, the value of Bitcoin is continuously increasing. DCA is a long-term strategy where an investor regularly buys a small amount of an asset over a period of time, regardless of price (e.g., 100 USD per month in Bitcoin for a year instead of 1,200 USD at a time). Adding to your stash makes sense, since you are already long-term bullish. DCA can be an effective way to own cryptocurrency, the key is to choose an affordable amount and invest it regularly, regardless of the asset's price. This has the potential to "average" the cost of purchases over time and reduce the overall impact of a sudden price drop on any given purchase. If prices do drop, investors can continue to buy as planned and potentially be rewarded when prices recover.

Bitcoin has had five significant price surges since its introduction in 2009, as shown by the red circles in Figure 3. Too far, the cryptocurrency has reached a new all-time high of over \$64,000, and mainstream organizations are boosting their embrace. The whole process has been fraught with ups and downs and is often influenced by political, economic, and regulatory activities. Bitcoin is expanding at an annual pace of over 200 percent on average. As of August 2021, the market capitalization of Bitcoin is over \$710 billion, accounting for almost half of the whole cryptocurrency market.

1) April 2013: The price was approximately \$13 at the start of the year, then enjoyed its first bull run of the year, steadily rising to \$260 on April 10, 2013. But within the next two days, the price plummeted to \$45 again.

2) December 2013: Bitcoin rallied nearly 10 times between October and December. In early October, Bitcoin traded at \$125 before climbing to a peak of \$1160.

3) December 2017: The starting price in January 2017 is about \$1000. By December 17, 2017, Bitcoin had rapidly risen to just under \$20,000. This bull market has solidified Bitcoin's mainstream market position, attracting the attention of institutional investors and governments.

4) April 2021: Following the March 2020 stock market and cryptocurrency market crashes, prices continued to rise, hitting a peak of \$63,000 on April 13, 2021. With the economic uncertainty brought about by the new Crown pandemic, some view Bitcoin as a method of preserving value. In May 2021, there was a massive sell-off in Bitcoin and cryptocurrency markets, and then prices have been stagnant.

5) In November 2021, cryptocurrencies benefited from the flow of funds, positive news and inflation concerns. On November 10, 2021, Bitcoin recorded its all-time high price of \$68,928.9.

3.2 Cryptocurrency Market in 2021

Typically, the equity investment of the cryptocurrency has the high-risk and high-yield characteristics. From Figure 1, we can find that the correlation coefficients, calculated by the function $\text{Corr}()$ in Seaborn, between the Bitcoin and the other cryptocurrencies are not low, even could reach roughly 0.9. In 2021, the most popular new type of investment is virtual currency. From Bitcoin, to Dogecoin, to SHIB coin, and LUNA coin at the end of the year, it has become a hot topic one by one. There is no denying that because of such price volatility, there are also a large number of people have gained a great profit from it. Additionally, what is you are supposed to know is that Bitcoin has skyrocketed 4,638 times, and its value has reached 60,000 USD per piece from 2013 to April 2, 2021.

Observing the short-term price trend in 2021, Bitcoin's price dramatically volatile. A downtrend follows an uptrend in price, mostly because of a lack of momentum or the enthusiasm for Bitcoin investing is waning. A large part of the investment trend in Bitcoin comes from the enthusiasm of the market. Whether it is the rise in April or the peak in November, there is a hot social event supporting it. For example, in April, the Tesla's announcement, which had acquired 1.5 billion U.S. dollars' worth of the digital coin which means it has fueled mass interest. A number of virtual currencies, such as Bitcoin, are performing well in 2021. As the highest return Terra even reached 12967.3%.

For Bitcoin, and even the wider crypto industry, El Salvador's decision to establish Bitcoin as the country's legal tender is undoubtedly the single most important event in 2021, and arguably one of the major milestones in Bitcoin's history. On September 7, 2021, the El Salvadoran legislature officially entered into force the bill "The simultaneous use of Bitcoin and the US dollar as legal tender in El Salvador", and residents of the country can download the government's digital wallet free of charge 1. On October 12 of the same year, the SEC approved ProShares, specializing in ETF products for investors, for the first time in eight years to launch a Bitcoin ETF and list it on the New York Stock Exchange. This marks the first compliant bitcoin futures ETF to land in the U.S. capital market. This also means that the exposure to cryptocurrency investment has expanded again.

3.3 Analysis for Price Change of Bitcoin in 2021

There are many reasons why Bitcoin is rising. The reason for the surge in virtual currency in April 2021 is due to a common investment thesis behind Bitcoin (BTC) that it is a good hedge against inflation. The theory of bitcoin as an inflation hedge is simple. According to Chan et al. (2019), the rapid Bitcoin price spike in December 2017 is critical in determining the currency's hedging capabilities, as is the steep increase in 2021 [8]. T The total supply of bitcoins is restricted to 21 million, while the total supply of dollars often rises with time. If the quantity of dollars rises, the value of bitcoin in dollars should increase as well. Due to the restricted quantity, Bitcoin (BTC) is resistant to inflation. Global consumer expenditure has been impacted by the epidemic, with household

spending decreasing precipitously in nations such as the United States, the United Kingdom, and Germany. Celebrations and gatherings ended and the travel came to a standstill as numerous states in the United States went into lockdown and residents avoided dining out in favor of staying in. Numerous governments, including the United States, have created money to satisfy their populations' stimulus needs. The second rise in prices, which occurred in November 2021, was triggered by the US Securities and Exchange Commission's approval of a Bitcoin ETF.

According to Rahma Chemkha, Bitcoin has various obstacles in comparison to gold, most notably in terms of history, acceptability, consumption, inherent value, and low volatility. Gold and Bitcoin, on the other hand, have some qualities. Both assets are limited in availability, and it is this scarcity that adds value to them. Due to the fact that Bitcoin's supply is restricted to 21 million units, it is a deflationary asset, bringing it closer to gold. [9].

Buchholz et al. (2012) established that a significant determinant of Bitcoin's price (as well as the price of any currency) is the relationship between Bitcoin supply and demand. Bitcoin's supply affects the quantity of units in circulation and, therefore, its market scarcity. Bitcoin's demand has been mostly defined by its use as a means of exchange for goods and services. It is said by Buchholz et al. That to a considerable degree, Bitcoin's price increases may indeed be explained by supply and demand dynamics [10]. For example, in April, the Tesla's announcement, which had acquired 1.5 billion U.S. dollars' worth of the digital coin which means it has fueled mass interest. A number of virtual currencies, such as Bitcoin, are performing well in 2021. The second price hike, which appeared in November 2021 was connected to the launch of a Bitcoin ETF in the United States.

Compared to Bitcoin's early stages of development, regulations are more stringent today. Investments in control and regulation tend to increase as governments learn more about cryptocurrencies and blockchain technology. Regulations that are loosened or tightened might have a variety of implications. Bitcoin's price varies in part as a result of a country's prohibition on the currency or its popularity in another. Economic factors on a global scale now have a direct impact on the pricing and trade of Bitcoin. For instance, residents in inflation-prone nations have resorted to cryptocurrencies as a hedging instrument against rising prices. Venezuela was thrown into economic catastrophe in 2016, and as a result, the market volume on Bitcoins reached a new high. The stock market crisis of 2020 sparked a more than year-long bull run in Bitcoin. Bitcoin, like gold, seems to have become a widely accepted store of value. When trust in other markets is low, people purchase these assets. Acceptance of Bitcoin by major corporations may result in a price spike. PayPal, Square, Visa, and Mastercard have all announced some level of support for cryptocurrencies, instilling confidence among investors. Retailers have even begun to accept bitcoin as a form of payment. The removal of support could also spark a sell-off, such as Elon Musk's May 17, 2021 announcement that Tesla would stop accepting bitcoin payments. On the news, Bitcoin fell from just under \$55,000 to around \$48,500 on the day. Additional demand in the market is driven by speculative activity and a rise in derivatives such as Bitcoin contracts. In the contract market, traders and speculators do not invest and hold Bitcoin for its fundamental value. They simply made a profit by shorting Bitcoin, causing the price to come under downward pressure. The above facts show that utility is no longer the only factor that determines the price of Bitcoin.

3.4 The risk of the Bitcoin Investment

Bitcoin is young and unproven as an investment, but cryptocurrency speculators are using it to store value and a hedge against corrections and recessions. The features of the medium of exchange are obvious, and bitcoin responds considerably to the federal funds rate, indicating that it behaves like a money. Although the application of virtual currency has promoted the development of the social economy. And such a high return feature also attracts many people to invest. But, in the absence of scientific guidance and control, the direction of the virtual economy cannot be correctly estimated. In the Internet world where virtual currency circulates, inflation caused by virtual currency is unavoidable. The main reason for this problem is that virtual currency issuers are lack of control over the virtual economy. To give an illustration of this phenomenon, in the field of real currency

circulation, it is a prerequisite to use the currency as a general equivalent. When there is a lack of gold reserves, the effective exchange of goods and the smooth circulation of currency would not be achieved. Banks use the equivalent relationship between currency and gold to control inflation. For virtual currency, it is impossible to effectively suppress inflation in the virtual world due to the lack of sufficient gold. In addition, hackers can create a large amount of virtual currency by tampering with programs to cause serious inflation affected by the openness of the Internet. And through the uncontrollable increase in the amount of virtual currency, the purchasing power of real currency is certainly influenced.

On the contrary, investing in virtual currency also has certain advantages. Cryptocurrency provides multiple distinguishing properties, including no taxation on purchases, no third-party disruptions, user privacy, and its use in asset split after divorce. I believe the best investors for virtual currency have to be open-minded. He likes or trusts Bitcoin while remaining curious about Blockchain technology developments and the other solid emerging tokens. Occasionally, cautiously investing is the best methodology. Whether the virtual currency is dead or become popular, the most important thing for you is to control the risk. In other words, we must allocate our assets reasonably and have the mentality of being able to take risks. Also, we would calmly handle the assets after successful investment. In the majority of situations, Bitcoin portfolios have a high Sharpe ratio, which does not always imply an increase in variances or needed risk premium. This level of success is maintained even when Bitcoin represents just a minor component of the portfolio, such as in minimum-variance portfolios, demonstrating that risk-averse investors may benefit as well [11].

4. Conclusion

Just as the people of the old era defined gold as an item of value, so the value of Bitcoin will also be defined by the people of an era. Judging from the performance in 2021, people will pay more and more attention to Bitcoin. Whether it is because of some of its own characteristics, such as decentralization, or an idea represented by Bitcoin, it has become the digital currency of the new era instead of paper money. To get to the bottom, the appreciation space of Bitcoin is that the more participants, the more valuable Bitcoin is. We have to learn to accept virtual currency investment. And reasonable constraints on their own investment. We have to adopt some investment methods. We have to adopt some investment methods such as Dollar Cost Averaging to avoid the high risk of virtual currency as much as possible. It is beneficial for you to change your mindset and replace the goal of investing with understanding yourself rather than getting money. Knowing yourself enables you to choose the right strategy at the right moment.

Clearly, other hypotheses have tried to explain the price history of Bitcoin. Whichever response is correct, Bitcoin's roughly 200 percent compound annual growth rate (CAGR) over the last decade has heralded the astounding ascent of digital currencies. Even in the sphere of digital currencies, as of August 2021, Bitcoin's market value had reached over 710 billion US dollars, responsible for nearly half of the whole market.

The foundations of bitcoin, market mood, and economic activity all contribute to this massive increase. However, prior performance does not guarantee future success. While it is beneficial to understand how it was that Bitcoin has such a steep price trajectory, it does not provide a precise forecast of the future. Based on its evolutionary process, Bitcoin has done fairly well for a brand-new asset class with a 12-year existing.

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We have to adopt some investment methods such as DCA (Dollar Cost Averaging) to avoid the high risk of virtual currency as much as possible. Change your mindset, and replace gaining money with understanding yourself as the goal of investment. Knowing yourself enables you to choose the right strategy at the right moment.

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