

Empirical Analysis of Cryptocurrencies in Global Financial Market

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Abstract

In this paper, the price fluctuation of Bitcoin under speculative environment is studied. The main objective of the present study is to understand the different types of crypto currency and to investigate bitcoin price drivers under speculative market behaviour. Over the course of the period from 2014 to 2018, the trend in price movements of bitcoin has proved to be strongly speculative. In that regard, investors might be curious about what drivers might be instrumental in these speculative price changes.

Keywords: *Bit-coin, Speculation, Bit-coin Price drivers, Go Trend, VIX, volatility in Crypto Currency Market*

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1. Introduction

A form of digital money that uses codes is a cryptocurrency. A universal ledger called a block chain store the details of each transaction of these electronic coins. To hold access to the database, a user must realize some specific conditions called a private and a public key. The bank account, money, and the transactions are spreadsheet of a database on the internet. The data is stored in a ledger that has a network of servers called nodes, to keep track of your money. The blockchain preserves every transaction in the ledger and shares the details with several other users. It renders the Bitcoin users a form of proof-of-work or simply they trust their counterpart. When people talk about cryptocurrencies, they usually refer to Bitcoins. Bitcoins are one of the many forms of electronic currency. There are Ethereum, Ripple, Litecoin, Monero and many other cryptocurrencies. Till date, there are about 700 Bitcoin-like currencies and they all hold different monetary values. Digital cash needs a payment network with account, balances, and transaction. A central authority like banks, take control over these transactions. The problem with this type of payment network is that customers had free will to double-spend. This means that one can spend the same amount twice or conduct any type of

fraud. Therefore, a central server keeps the record of the balances and prevents the entities from double-spending.

Cryptocurrency allows money to transfer faster and costs much cheaper compared to other conventional methods. A blockchain contains all the accounting data of economic transactions, property and the record of every single trade that have occurred among users. It is a universal digital book or an online ledger. Users can also check whether a future transaction is valid or not through the blockchain. Since a blockchain technology does not have an imprint or physical validation of the transaction, the Internet stores this information. The information inside the block chain database is truly public and shared all over the internet. They exist as a shared and continually updated string of data, and these data are consistent with one another. Only the parties involving in the transactions can access and view the details. Consequently, duplicating or counterfeiting these data is impossible for some hackers. A global network of computers that use blockchain technology manages the directory for each Bitcoin transaction and operates on a peer-to-peer basis, also known as a node. A node is a network of computers that create a blockchain. These networks use clients that perform the task of validation and record the transfer of coins from user-to-user. These nodes circulate the documentations throughout the Internet. Every computer in a node is an administrator of a blockchain that can join the network freely. Each of these administrators has a chance of winning Bitcoins.

Cryptocurrencies like Bitcoin use an SHA 256 Hash algorithm which stands for Secured Hash Algorithm 256-bit. A Hash is a string of strong cryptographic codes or functions (similar to binary 1's and 0's) that use hexadecimal codes. Miners decrypt the SHA code using high-powered computers and strong mathematical calculations. The transaction adds to the blockchain after the miners decode the hash. Coinbase then provides the miners with a specific number of Bitcoin as a reward. This is how miners create valid Bitcoins. The number of people who use these coins for their daily administration set the value of Bitcoins. But for those who do not use these powerful processing chips, they can buy or sell Bitcoins through online exchanges like Coin base or Local Bitcoins. These bitcoins do not have an intrinsic value or any physical form. They just exist and possess a certain value. In late 2008, Satoshi Nakamoto, the unknown brain behind cryptocurrency, developed 'A Peer-toPeer Electronic Cash System' also known as Bitcoin. A peer-to-peer network is a hub of computers for sharing files, videos or any other information (just like bit-torrent). In previous years, digital cash took rapid economic growth since its evolution in the late 2000s. People started to use electronic card systems that provided more security than carrying paper currency. Banks, shopping malls, money exchange, and many other sectors use digital cash such as credit and debit cards for their daily transactions. But still, digital cash have their inadequacy. The main objective of the present study is to understand the different types of crypto currency and to investigate bitcoin price drivers under speculative market behaviour.

2. Popularly Used Cryptocurrencies

Bitcoin

The first and the most famous cryptocurrency Bitcoin has a market cap that exceeds over \$7billion. A single bitcoin is worth \$2,570. Its transaction volume has reached more than 200,000 daily transactions. Some Cyber-crime agency like DarkNet uses Bitcoins as a global means of payment for illegal transactions.

Ethereum

Ethereum has ascended to the second position below Bitcoin in the hierarchy of cryptocurrencies. Other than Bitcoins, Ethereum not only allows transactions for existing accounts and balances but they also validate complex contracts and programs for corporate banks. Besides Ethereum, there is a host of cryptocurrencies like DigixDAO and Augur. They belong to a family of cryptocurrency of Ethereum. A single Ethereum coin is worth \$250 in the current market.

Litecoin

Litecoin is one of the first cryptocurrencies after Bitcoin. They are faster than Bitcoins and take a larger amount of token with new mining algorithm. Users trade Litecoins excessively with one another. They use Litecoins as a backup for Bitcoins.

Monero

Monero uses a new type of algorithm (a cryptonite algorithm) that adds privacy features which were missing in Bitcoins. This type of algorithm introduced a concept of ring signatures. The ring signatures were able to pierce through the blockchain and secure the transactions. It was famous for the darknet marketers when the internet felons decided to use it as a currency. The best cryptocurrency apps those are free on android market are; Bitcoin Checker, Bitcoin Price IQ, Bitcoin Wallet by Coinbase, Cryptonator, and zTrader.

3. Method of study

This paper's main goal is to investigate bitcoin price drivers under speculative market behavior for the period of August 2014 to May 2018. The data has been obtained for closing prices of bitcoin (in dollars) from the online cryptocurrency market Bitstamp since it has been one of the biggest online cryptocurrency markets in terms of volume of transactions. Weekly closing prices, weekly total public interest, weekly volatility index VIX are taken. The reason why weekly frequency was chosen is that it is not possible to obtain the data on daily basis for public interest data from Google Trends. Google does not provide daily figures for that.

4. Review of Literature

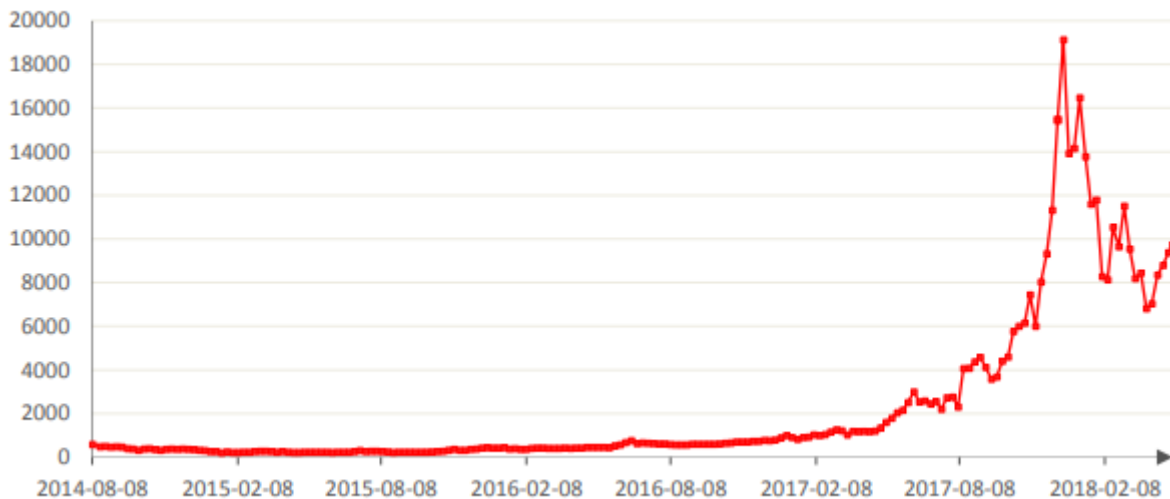
Kim, et. al. (2016) analyzed the user comments in online cryptocurrency communities to predict fluctuations in the prices of cryptocurrencies and the number of transactions. By focusing on three cryptocurrencies, each with a large market size and user base, the researcher attempted to predict such fluctuations by using a simple and efficient method. Furthermore, the simulated investment demonstrated that the proposed method was applicable to cryptocurrency trading. In addition, the rich information in online communities could contribute to understand

the cryptocurrencies from different perspectives. Cryptocurrencies were increasingly being used, and their usability had drawn attention from different perspectives.

Heilman (2015) was eager to identify new attack vectors against the bitcoin network since the authors of the selfish mining paper garnered praise and publicity in 2013. The researcher had revealed the eclipse attack, in which the attacker had monopolized all of the victim's incoming and outgoing connections, thus isolating the victim from the rest of its peers in the network. The attacker could then trick the victim by feeding him misinformation about the state of the ledger, or coopt the victim's computing power for its own nefarious purposes. Poon and Dryja (2016) had presented their invention: the Bitcoin Lightning Network, which was an extension of two-party payment channels applied in such a way as to permit instant transactions between any numbers of participants. Lightning transactions were normal bitcoin transactions, but except for rare cases were not actually posted to the Blockchain.

5. Data Analysis

bitcoin closing prices in dollar



Source: primary source

Fig1: Weekly bitcoin closing values between 8 August 2014 and 4 May 2018

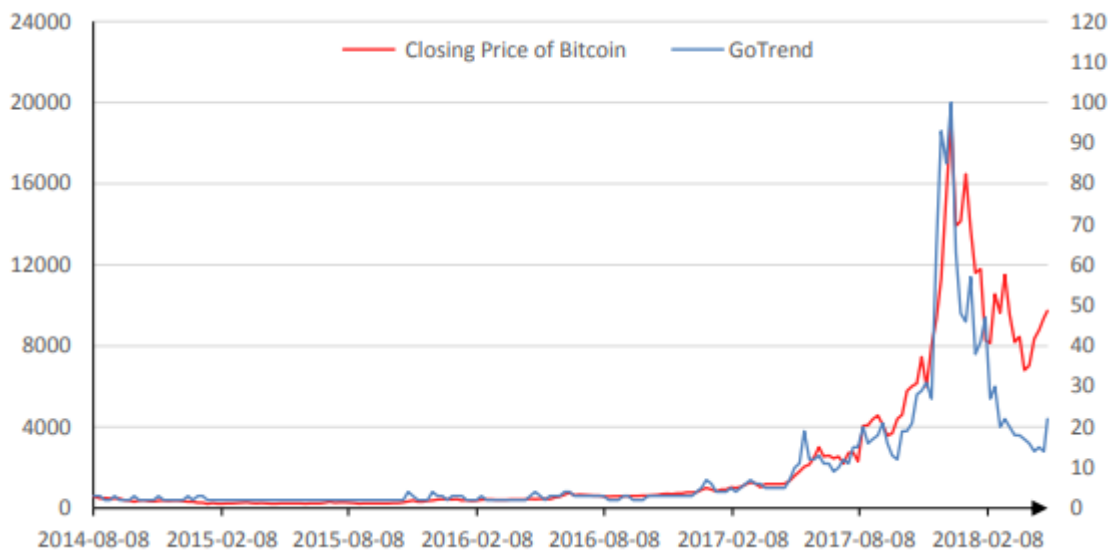
In the dataset, the lowest and highest price values of bitcoin for the given period are \$210 and \$19,140. The mean is \$2,259.86 and the standard deviation (volatility) is \$3653.58. As it is seen in figure 1 above, there is a substantial volatility as of February 2017 which might be driven by increased speculation.

6. Public Interest Variable

Considering the variable, “public interest”, the data has been obtained from the online platform Google Trends. It is a platform that belongs to the parent company Google. In this public platform, one could see how popular a keyword has been over any period (weekly frequency) on the internet. The parameter varies based on the numbers of “searches” (queries) including the keyword “bitcoin”. Considering the complex nature of crypt currencies and block chain

technology; crypto-currencies are not physical, and they are not backed by any institution like banks, it is not traditional investment instrument investors have been familiar with. The fact that Google search engine has been the most popular and common way of getting instant knowledge, one might contemplate investors (especially millennials) simply undertake queries in which the keyword “bitcoin” exists (Kristoufek, 2013). By doing so, it is possible to have basic knowledge about it before engaging in any trade. Hence, the associated data in this platform can be used in measuring the “public interest” (or “public attention”) to bitcoin or its derivatives. Also, one can argue that public interest might increase dramatically at times of steep decreases in price since panicked investors would increasingly monitor it with curiosity (or even short sellers of bitcoin).

As it is seen from the figure 2 below, the patterns public interest and bitcoin closing prices in dollars are highly similar over the period from August 2014 to May 2018 on weekly basis. The correlation coefficient between them is 0.895 which points out they are strongly correlated with each other. One might ask what if the GoTrend variable is also high at times price of bitcoin is decreasing dramatically. Under this case, at times bitcoin price depreciating substantially, Bitcoin will get popular and increase in GoTrend value might be expected. However, it is not the case for this time period. This case is ruled out through high correlation value between GoTrend and Bitcoin prices. It is also confirmed thanks to the similar pattern observed in the table below. It is seen that at times GoTrend is high, the price of bitcoin is also high and vice versa. This case suggests high prices recalls high GoTrend value and low prices are associated with low GoTrend values.



Source: primary source

Fig 2: Pattern similarity between the price of bitcoin and public interest to bitcoin.

According to a research handled in January 2018 by online magazine “Money”, top 10 most popular topics which include the keyword “bitcoin” investors query using google is 1. What is Bitcoin? How do you buy Bitcoin 3.Where can you buy Bitcoin? How to invest in Bitcoin?

How much is Bitcoin worth? How does Bitcoin work? What is Bitcoin mining? How do you mine for Bitcoin? How many bitcoins are there? What is Bitcoin cash?

Looking at the top 10 most asked questions data in Google, one can see that investors have very limited knowledge about bitcoin and the market dynamics in the cryptocurrency market. The most asked question is “What is Bitcoin”. Monitoring the most queried questions shows that investors are at very basics about bitcoin trading and investing. This research points out how limited investor knowledge is in this market.

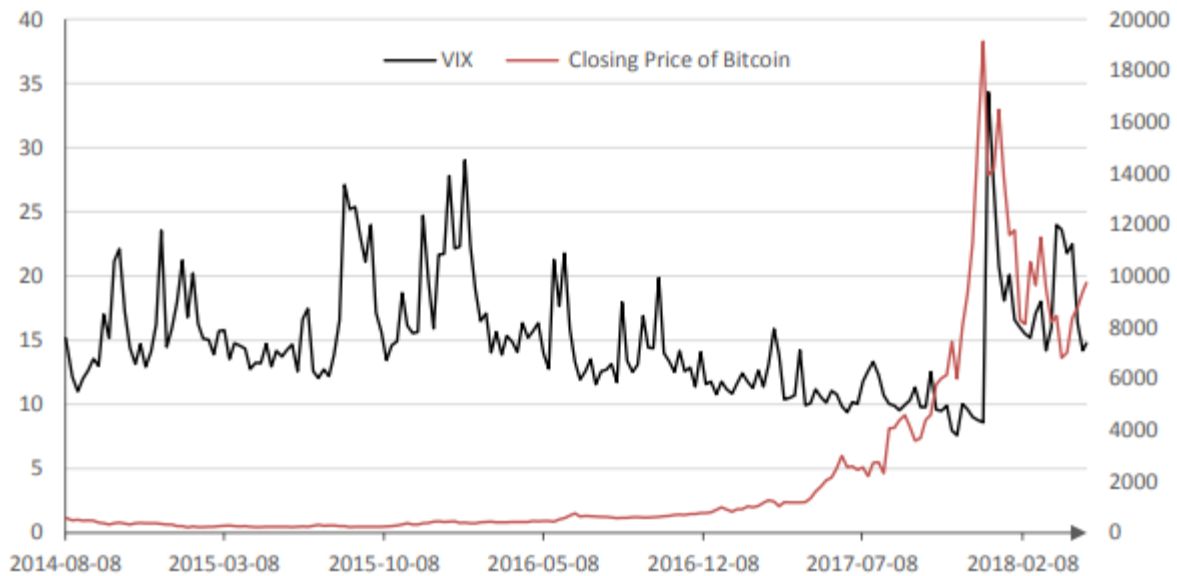
7. VIX, Volatility of Traditional Markets Variable

The Chicago Board of Options Exchange (CBOE)’s index of Volatility Index (VIX), so-called ‘fear index’, is implied volatility metric of S&P 500 Index options. It has been counted as a legitimate way of having knowledge about overall market sentiment for a long time by economists. According to analysts Muraki, Tori, and Xu (2018) from Deutschebank, there is a justifiable correlation between VIX and price of bitcoin too. In the report, they claim that retail investors firmly monitor the fluctuations in cryptocurrencies and the high returns in the market attract them influencing their risk preferences for stocks, options, and other risky securities. On the other side, surprisingly institutional investors also follow this trend; they keep investing in risky assets despite of awareness of the existence of endogenous bubbles asset prices just like cryptocurrencies. Instead, they forecast retail investors’ behavior for cryptocurrencies and investing accordingly. Hence, under these circumstances, constantly increasing number of institutional investors determine their risk threshold depending on volatility levels in cryptocurrency markets. The result of this behavior shows that even institutional investors do not rely on market fundamentals and their expertise in financial analysis. To be concise, Muraki and his team argue that there is a correlation between investors (both retail and institutional) being risk-lover for cryptocurrencies and the low volatility levels (VIX) in traditional markets. This is fueled by lower prospects of higher returns in traditional markets due to low volatility. In this sense, VIX might be a reliable source in explaining price fluctuations under a speculative environment of bitcoin. As it is seen in figure 12, released in the report, there is a negative correlation between VIX and XBTUSD; at times VIX has increasing trend, XBTUSD (price of one bitcoin in terms of American dollars) has decreasing trend and via verse over the period from December 1 st , 2017 to January 20th, 2018.



Fig. 3: VIX and Bitcoin from December 1st to January 20th, 2018
Source: Bloomberg Finance, LP, Deutsche Securities

To see that, in the dataset, the correlation between VIX and Bitcoin closing prices were calculated. In figure 13 below, for the time interval of the initial dataset which is from August 2014 to May 2018, the correlation happened to be 0.024 which suggests there is no correlation between them (Armstrong, 2012).



Source: primary source

Fig4: VIX and bitcoin prices from August 2014 to May 2018

8. Conclusion and scope for further research

One of the interesting results in this paper is that there is an inconsistency in results when Mondays' and Fridays' closing prices times series are incorporated into the model. This case suggests that a more comprehensive study which takes daily closing prices times series into the model might yield more accurate results. Since all the other data was weekly, for the sake of consistency, this paper worked with weekly bitcoin closing prices. One another point is that the relationship between Bitcoin price movements and public interest variable might be bidirectional. According to the findings for public interest variable's significance, this paper suggests; Bitcoin prices do increase as it gets more and more popular throughout the internet and speculative bubble formation is observed. However, the case might also be the other way around; Public interest does increase as bitcoin prices get more and more expensive. In the end, there is a vicious cycle in which prices increase public interest, and as public interest increases, prices go higher. Theories about behavioural finance might be studied for better understanding the speculative environment of bitcoin prices.

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