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Research Article

BITCOIN: REAL OR VIRTUAL CURRENCY?

Leela Joshi*

Department of Commerce Shaheed Bhagat Singh College University of Delhi
Seikh Sarai, Phase II, New Delhi-110017

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ABSTRACT

Bitcoin saw its value trading at above $18,000 per bitcoin, up by about 900% from its value on January 1, 2017. With approximately 16.6 million Bitcoins circulating, the worldwide value of the currency exceeded $300 billion in the year 2017.Recent appreciation in Bitcoin value is an inspirational force behind this work wherein an attempt to analyse the historical trading behaviour of bitcoin has been made to examine whether this virtual currency behaves like other sovereign currencies or not.

INTRODUCTION

Bitcoin is one of many cryptocurrencies that have gained popularity across the world. A cryptocurrency is basically a digital asset that has been created to function as a medium of exchange, like cash. It uses cryptography to ensure the security of transactions (authentication and prevention of duplicate transactions) and to control the creation of new units of currency. This is different from cash in the sense that it does not have physical form. In fact, they are just numbers on screen and there is no central bank that issues new currency. Other cryptocurrencies include Ethereum, Ripple, Litecoin, Dash, Ethereum Classic, Monero, and Zcash. However, bitcoin has emerged as the popular face of cryptocurrencies.

Bitcoin is a decentralized electronic cash system initially designed and developed by Satoshi Nakamoto (whose name is conjectured to be fake by some, and who has not been heard from since April 2011). Bitcoin originated using a scheme outlined in Nakamoto (2008), a nine-page proposal for a "peer-to-peer electronic cash system." According to the algorithms proposed by "Nakamoto," new Bitcoins are created and awarded to computer users who solve pre-specified mathematical problems. A transparent, decentralized registry tracks the ownership and subsequent transfers of every Bitcoin after it is "mined" by its initial owners. The algorithm limits the rate at which new Bitcoins can be created, and it fixes an ultimate limit of 21 million Bitcoins that will be reached in the year 2140. All of these quantities and growth rates are known with certainty by the public, so Bitcoin's circulation cannot be affected by monetary policy in the way that the Apex Bank Reserve Bank of India controls the public supply of Indian Rupee. Wallace (2011) reviews the early history of Bitcoin and states that "Nakamoto" introduced the first 50 Bitcoins into circulation in 2009, essentially to demonstrate the mining method to online enthusiasts who were attracted to the concept of an algorithmic currency.

The first purchase of goods and services using Bitcoin is said by Wells (2011) and other sources to have been a pizza procured at a cost of 10,000 Bitcoin in 2009. The pizza parlour didnot accept Bitcoin directly, and instead a third-party broker was enlisted who agree to procure the pizza using a credit card (based on a real currency) and accept Bitcoin as consideration. Much of the commerce involving Bitcoin continues to take place using middlemen who facilitate immediate exchanges of Bitcoin into more widely used currencies. Figure 1 shows the daily closing Dollar-Bitcoin exchange rate for the period from January 4, 2013, up to December 19, 2017. Value of one Bitcoin, which had begun trading at less than five cents in 2010, exceeded $19000.00 on December 19, 2017.

Trading of Bitcoin grew rapidly from 222K on January 4, 2013 to 4.22M on January 6, 2017 as exhibited by Figure 2. Figure 2

Corresponding author:* **Leela Joshi
Department of Commerce Shaheed Bhagat Singh College University of Delhi Seikh Sarai, Phase II, New Delhi-110017

shows the dailyvolume in U.S. Dollars, calculated by multiplying each day's midnight exchange rate by the unitvolume over the prior 24 hours, for the period from January 4, 2013, up to January 6, 2017.

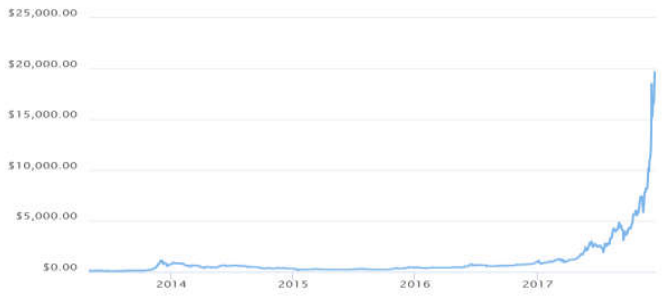

Figure 1 Value of one Bitcoin in U.S. Dollars

The figure shows the value of the Bitcoin-Dollar exchange rate, recorded daily at midnight from January 4, 2013, up to December 19, 2017

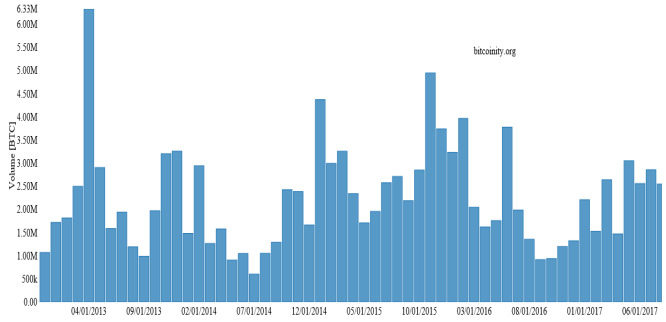

Figure 2 Daily Bitcoin Trading Volume

The figure shows the daily volume of Bitcoin trading on the from January 4, 2013, up to January 6, 2017.

As per David(2013) Bitcoin appeals to two distinct clienteles. One group consists of technology enthusiasts who embrace Bitcoin for purposes of online commerce. As more and more routine business transactions migrate online, these users believe Bitcoin's value should increase due to transaction demand. A separate group finds Bitcoin attractive due its lack of connection to any sovereign government. Bitcoin's introduction in 2008-09 coincided with the very bottom of the global financial crisis, and Bitcoin has found adherents among persons who lack confidence in the world financial system or have strong Libertarian beliefs. The daily transaction flow of Bitcoin trades suggests that the large majority of worldwide demand originates in two countries, the U.S. and China.

In this research paper, it has been argued that Bitcoin does not behave like a currency at all. Instead it resembles a speculative, risky, and volatile investment asset.

Bitcoin's weaknesses as a currency

This section exhibits analysis of ways in which Bitcoin fails to conform to the classical properties of a currency. A successful currency typically functions as a medium of exchange, a unit of account, and a store of value.

Medium of Exchange

While it is difficult to benchmark the size of the merchant network that accepts Bitcoin, evidence suggests that Bitcoin has made significant in roads as a medium of exchange. For example, various businesses like Richard Branson's Virgin Galactic space travel attracted publicity by agreeing to accept Bitcoin as payment in 2013. Similarly, Overstock.com was the first big online retailer to start accepting bitcoins in January of 2014[1].However, it is widely understood that most of the time these transactions involve transfers between speculative investors, and only a small chunk of bitcoinsis used for purchases of goods and services. In a world with so many billion consumers, making several economic transactions every day, bitcoin appears to have an extremely negligible market presence. As per latest data confirmed bitcoin transactions per day are 3,78,622 on December 19, 2017[see Figure 3].

Moreover, another obstacle to bitcoin becoming a widely used medium of exchange arises from the difficulty of procuring new bitcoins. Unless a consumer is successful as a bitcoin miner, he or she must buy bitcoins from online exchanges or dealers and then find a way to store them securely. These purchases typically cannot be made using a credit card or PayPal, and instead the buyer must make a bank transfer or link an existing bank account to the exchange.[2] The existing bitcoin exchanges are often having low liquidity, significant bid-ask spreads, and a certain amount of execution and custody risk [David 2014].

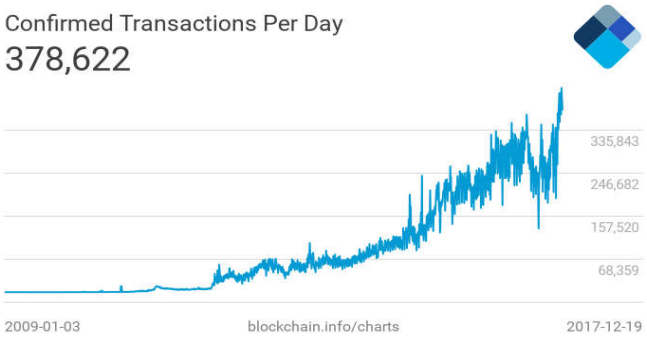

Figure 3 Total Number of Bitcoin Transactions Per Day

Unit of Account

Bitcoin does not seem to have established itself as a unit of account or a store of value. Bitcoin imposes large risks on its owners, because it has excessive volatility and fails to exhibit correlation with the behaviour of other currencies. For a currency to function as a unit of account, consumers must treat it as a numeraire when comparing the prices of alternative retail goods. For instance, a cup of coffee that costs Rs 150 in one café is five times as expensive as a cup of coffee selling for Rs 30 at another road side café. Bitcoin faces a number of obstacles in becoming a useful unit of account. One problem arises from its extreme volatility. Volatility means that an asset is risky to hold on any given day, its value may go up or down substantially. The more volatile an asset, the more people will want to limit their exposure to it, either by simply not holding it or by hedging. Volatility also increases the cost of hedging, which is a major contributor to the price of merchant services. Figure 4 shows the year-to-date volatility of the Bitcoin-Dollar exchange rate, calculate dusing daily data from June 8 –

[1]More online stores are opening up to accepting Bitcoin as a form of payment from their customers like Microsoft, Subway, Expedia.com. Dish, Pizza for coins, Egifter etc.
[2] See http://howtobuybitcoins.info/us.html.

December 5, 2017[3]. For comparison purposes the graph shows the volatilities of the exchange rates of the Euro, Yen, British Pound, and Chinese Yuan as well as the London price of gold, with all volatilities annualized. Bitcoin's exchange rate volatility since the start of June 2017 has been 81%, an order of magnitude higher than the exchange rate volatilities of the other currencies, which fall between 2% and 6%. Gold, which is a plausible alternative asset to these currencies as a store of value, has had volatility of 10.4% since the start of June 2017. Thus, from Figure 3 it can be concluded that holding Bitcoin even for a short period is quite risky, which is inconsistent with a currency acting as a store of value.

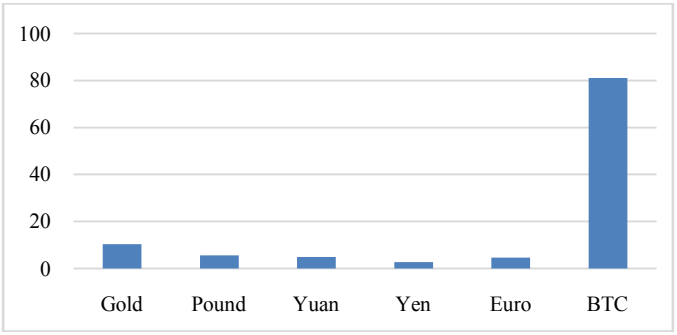

Figure 4 Volatility of Bitcoin Compared to Major Currencies

The figure shows the annualized volatility of the percentage change in daily exchange rates for four major currencies, gold, and Bitcoin, all measured against the U.S. dollar. Volatilities are calculated for the period June 8, 2017 up to December 5, 2017.

Figure 5 shows Maximum and minimum of the percentage change in daily exchange rates for four major currencies, gold, and Bitcoin, calculated for the period June 8, 2017 up to December 5, 2017. Evidently, max and min daily percentage change for bitcoin are widely scattered with each other as against max and min range of other currencies and gold implying that bitcoin is a most volatile (risky) asset.

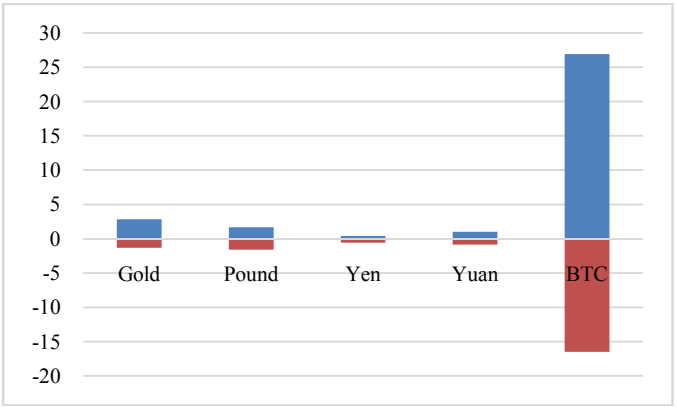

Figure 5 Maximum and Minimum Volatility of Bitcoin Compared to Major Currencies

The figure shows Maximum and minimum annualized volatility of the percentage change in daily exchange rates for four major currencies, gold, and Bitcoin, all measured against the U.S. dollar. Volatilities are calculated for the period June 8, 2017 up to December 5, 2017.

This statement holds true when bitcoin price volatility has been further compared with other investment alternatives such as Bonds, S&P500, US Real Estate Prices, Oil Prices etc as manifested by Figure 6 covering time period from Jan 2012 to Dec 2017. The value of a bitcoin compared to other currencies changes greatly on a day-to-day basis. Retailers that accept the bitcoin have to recalculate prices very frequently that would be costly to the merchant and confusing to the consumer creating ambiguity and chaos.

Figure 6 Comparison of Volatility of Bitcoin with other Investment Alternatives

This figure shows comparison of bitcoin price volatility with other investment alternatives such as Bonds, S&P500, US Real Estate Prices, Oil Prices etc for the time period from Jan 2012 to Dec 2017.

Volatility Index[4] has been examined to compare 30 days volatility of BTC against USD with exchange rates of other currencies with USD and gold as shown below:

Table 1 Summary of Volatility Index

Particulars	30 Days Volatility Index	60 Days Volatility Index
Volatility of BTC/USD	6.01%	5.49%
Volatility of GOLD/USD	0.59%	0.54%
Volatility of EURO/USD	0.29%	0.42%
Volatility of GBP/USD	0.64%	0.60%
Volatility of CYN/USD	0.10%	0.17%
Volatility of JYN/USD	0.45%	0.38%

Source: https://www.buybitcoinworldwide.com/volatility-index/

Table 1 clearly indicates that Bitcoin Volatility Index is highest as against Volatility Index of other currencies and Gold.

As per David [2014] the most serious and overlooked obstacle to bitcoin becoming a widely used unit of account is relatively high cost of one bitcoin compared to most ordinary products and services. This requires merchants to quote bitcoin (BTC) prices for most goods in four or more decimal places. For instance, a visit to one online food retailer yields offers of a jar of Ketchup for0.092576 BTC, chocolate bars for 0.00529 BTC, and a tea variety pack for 0.05255 BTC. Alternatively, these prices could be expressed in scientific notation as 9.257 x 10-2 BTC, 5.29 x10-3 BTC, and 5.255 x 10-2 BTC, respectively. It is hard to find any other currency in the world for which consumer prices are quoted in these units.

[3]To present this volatility in annualised terms, daily standard deviation need to be multiplied by the square root of 252. Here, it has been assumed that there are 252 trading days in a given year.

[4]Volatility is measured on the basis of standard deviation of daily returns for the preceding 30- and 60-day windows.

Store of Value

As per David [2014] When currency functions as a store of value, the owner obtains the currency at a certain time and exchanges it for goods and services at some future time of his choice. When the currency is spent, the owner expects to receive the same economic value that the currency was worth when he acquired it. Strategies for hiding bitcoins under mattresses or elsewhere cannot work, because the currency has no physical manifestation. Instead, bitcoins must be held in computer accounts known as "digital wallets," and security for these wallets has become a major difficulty for the bitcoin industry. If a consumer finds a successful way to hold and secure his bitcoins, he faces the further problem of managing the risk arising from bitcoin's volatility as discussed earlier.

Univariate Analysis

Univariate analysis is the simplest form of quantitative (statistical) analysis. The analysis is carried out with the description of a single variable.

Table 2 reports Spearmen correlation matrix between the Bitcoin compared to the other currencies. The table is based on the daily changes in each currency's exchange rate against the U.S. dollar, using daily data from June 8, 2017up to the December 4, 2017. As shown in the table, the three Fiat currencies tend to exhibit strong positive correlation, with the Euro having 0.46correlation with the Japanese Yen, 0.44 with Chinese Renminbi and 0.48 correlation with the British Pound. The Yen's exchange rate is also positively correlated with those of the other currencies (0.33 with British Pound and 0.38 with Yuan). In contrast, the Bitcoin-Dollar exchange rate exhibits almost zero correlation with the exchange rates of any of the four currencies.

Bitcoin's complete separation from other prominent international currencies indicates that macroeconomic events that cause similar impacts on the value of various currencies do not affect Bitcoin either positively or negatively. The result implies that Bitcoin is completely ineffective as a tool of risk management, which is a common use for Currencies.

Table 2 Correlation matrix of daily changes in exchange rates, and Bitcoin. The table shows simple correlations of the percentage changes in daily exchange rates for pairs of currencies, with all exchange rates measured against the U.S. Dollar. Correlations are calculated for the period from June 8, 2017 up to December 4, 2017

	Euro	Pound	Yen	Yuan	BTC
Euro	1	0.475535	0.46093	0.441831	-0.0252
Pound		1	0.330924	0.181284	0.084605
Yen			1	0.381708	0.015234
Yuan				1	-0.00125
BTC					1

CONCLUSION

Bitcoin at this time plays a very small role in the payments system. It is not a stable store of value and it doesn't constitute legal tender. It is a highly speculative asset. Bitcoin can't be treated as a real currency as of now as it precludes fundamental features of traditional currency. In other words, it doesn't have established itself as a store of value and unit of account.

For bitcoin to establish as a real currency, its daily value will have to be more stable or less volatile so that it can serve as a store of value or unit of account in commercial markets. The extreme volatility is making bitcoin as a speculative highly risky investment asset rather than bonafide credible currency. Moreover, its preclusion from International Payment Markets, its non-integration in International Banking System, Central Monetary Authority of many countries including India declaring bitcoin as an illegal, non-issuance and non-regulation of this digital currency by Financial Regulator across the world are some of the major problems facing by Bitcoin making it most risky for retailers.

However, it is not possible to ban bitcoin at the current phase, as that would lead to a government or an economy to be isolated from the global bitcoin market and cryptocurrency industry. Hence, in the long-term, it is highly likely that governments and countries including India will regulate their bitcoin markets. Major remittance markets such as the Philippines have seen significant success in legalizing bitcoin as a payment method over the past year. If India regulates bitcoin and legalizes the currency, its remittance industry will be quick to adopt bitcoin, growing the mainstream adoption of the digital currency in the region.

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