Is Bitcoin a Currency or a Speculative Asset?

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# Introduction

Since ‘Satoshi Nakamoto’ (pseudonym) uploaded ‘Bitcoin – a Peer-to-Peer Electronic Payments System’ to an internet forum in 2008, the cryptocurrency has continued to generate interest. Knowing whether Bitcoin is a currency or an asset has now become an important issue in the legal sector (Rosenberg, 2018) – but it is also essential to understanding the potential impact on the real economy. Bitcoin as a currency would influence fiat money and monetary policy (Baur et al, 2017), whilst Bitcoin as a speculative asset may exhibit bubble-like behaviour and cause a financial crisis (Cheung et al, 2015).

As a simplification, this essay focuses on the three properties of money according to the standard economic definition: a unit of account; a medium of exchange, and a store of value (Baur et al, 2017). Speculative assets fluctuate too much to meet these conditions (Glaeser et al, 2014). Although ‘Nakamoto’ created Bitcoin as an alternative currency and not an asset (Baur et al, 2017), economists researching the topic have reached diverse conclusions. Some say that Bitcoin satisfies all the outlined criteria (Fry & Cheah, 2015), others that it meets none (Cheung et al, 2015) or alternatively that it is a hybrid between a commodity and fiat money (Peng et al, 2018). This essay concludes that Bitcoin doesn’t comply with the traditional properties of money, mostly due to the volatility that stems from its lack of generalized acceptance as a currency. However, it is investigated whether certain conditions could change this by boosting public confidence and reducing volatility; this is found to be plausible but in need of more research. It is also highlighted that Bitcoin has fundamental value and that there are unstable national currencies which exhibit similar characteristics to Bitcoin but are viewed as money nevertheless. Therefore, a case is made for the classification of Bitcoin as a currency.

# Background

## Money and precious metals

Since the global economy transitioned from an economy centred around barter to one based on monetary transactions, there has – according to the majority of texts – been a direct connection between money and precious metals (Yermack, 2013). Firstly, currency was minted directly from precious metals; it then became convertible in fixed quantities, following which the gold standard began (Yermack, 2013). Due to the fundamental value (value aside from the market price) of precious metals, their relationship with money encouraged public confidence; but, when the gold standard plummeted globally between 1920-1980, almost all economies in the world adopted fiat money (Yermack, 2013). Fiat money lacks fundamental value and relies solely on public confidence; this gives it the disadvantage of allowing the government to use discretion in its monetary policy (Selgin, 2015), which can sometimes cause monetary problems such as hyperinflation. Bitcoin was created with the goal of overcoming the problems of both these monetary systems.

## Characteristics of Bitcoin

Bitcoin has a finite total supply controlled by independent agents – like gold – which gives it a fundamental value and eliminates government discretion (Dyhrberg, 2016). However, instead of being based on physical material, Bitcoin uses cryptographic protocols (Krafft et al, 2018). Figure 1 demonstrates the mechanisms of the system when two users carry out a transaction. The number of stages that must be completed to verify a transaction gives security because the level of computational power – and therefore the cost – to falsify transactions yields less profit than verifying genuine transactions (Peng et al, 2018). Public confidence in Bitcoin depends on the perception and strength of these characteristics.



*Figure 1 – the mechanisms of the Bitcoin system*

# Unit of account

Bitcoin is a unit of account if it can be used to measure the value of an item for sale (Ali et al, 2014). Therefore, Bitcoin should have a consistent value and function as a numeraire to compare goods.

Differences in price

According to the efficient-market hypothesis, prices should reflect all available information and the true value of the articles, where changes in prices can only be caused by the ‘random walk’ of unknown information (Fama, 1970). If this holds, there cannot be a constant difference between the prices of different ‘traders’ (webpages that sell Bitcoin). Yet Brandvold et al (2015) observed that, in 2014, there was sometimes a difference of 7-14% between traders. This is a violation of the law of one price and signals inefficiency. To examine the same phenomenon more recently, Figure 2 compares the prices of Bitcoin in four of the most popular traders on six separate dates. Although in some months (like May) the prices were similar between most traders, there was generally a substantial difference: *LocalBitcoins* exhibited very distinct prices to those of other traders, with a price 16% higher than that of *Bitstamp* in January. This confirms other evidence that the Bitcoin market is inefficient due to its predictability, persistence and the clustering of prices (Caporale, 2018; Phillip et al, 2018).

Figure 2 – Bitcoin prices in USD on different traders (data taken from Bitcoincharts.com on 14/05/2018)

Arbitrage is the phenomenon by which traders use mispricing to generate profit, which removes inefficiencies in the long-run (Summa, 2009). The large discrepancies between Bitcoin prices suggest that it is difficult or even impossible to do this in the Bitcoin market. Brandvold et al (2015) found that arbitrage isn’t possible in the traditional sense as the need to use fiat money in transactions increases complexity. Inefficiency without the possibility of arbitrage impedes the function of being a unit of account (Yermack, 2013), as prices may never be consistent and reflective of all available information, so goods cannot be reliably compared with Bitcoin.

## Numeraire

Extreme volatility (discussed more in Section 5.1) compromises Bitcoin’s function as a numeraire for various reasons. When retailers want to publish a price using Bitcoin, they must incorporate a spread over the price in the original currency to avoid losses (Fry & Cheah, 2015) and are forced to update their prices extremely frequently (Ali et al, 2014). This brings complexity for price comparison. Also, prices aren’t aligned with ordinary reference points for consumers – as Figure 2 indicates, one Bitcoin is worth a lot more than one US dollar. According to human behavioural heuristics, the numerous decimal points that must be used to quote prices cause confusion amongst consumers, further complicating price comparison (Yermack, 2013). Many users have to reach an agreement about price separate to the system, proving that Bitcoin is not a good numeraire (Ali et al, 2014).

In order to become a unit of account, arbitrage and efficiency in the market must be facilitated to give Bitcoin a more consistent value and increase public confidence. However, the volatility of the cryptocurrency and its high relative value remain issues that prevent it being used as a numeraire.

# Medium of exchange

A medium of exchange is that which can be used to make payments (Ali et al, 2014). Although various retailers accept Bitcoin (Peng et al, 2018), complexities remain in using it for transactions.

## Liquidity

Liquidity refers to the speed of buying or selling an asset (Mueller, 2018). A medium of exchange is much more liquid than a speculative asset as they are used in transactions frequently. Supposedly, Bitcoin can be exchanged for any given currency in any given moment and transactions should be processed in only ten minutes (Dyhrberg, 2016), suggesting high liquidity. However, in practice there are limitations – transactions can experience a delay of almost an hour (Bohme et al, 2015). Low liquidity contributes to inefficiency and a lack of arbitrage as it frustrates the sales process; therefore, the discrepancies in prices shown in Figure 2 may suggest that the Bitcoin market still suffers from lacks liquidity. Transaction speed may slow with time as the difficulty of algorithms increases (Grinberg, 2012), which would exacerbate the issue. Therefore, Bitcoin seems closer to a speculative asset.

## Common use

Consumers don’t want to make transactions with a medium of exchange that has a constantly fluctuating value (Glaeser et al, 2014), meaning that volatility is a problem once again and there is incentive to use Bitcoin as a speculative asset. If Bitcoin is used as a medium of exchange, after Bitcoins are obtained they will be used in transactions and not accumulated with the expectation of achieving a profit. To assess this, the model of Baur et al (2017) identifies 6 categories of Bitcoin users: active investors; passive investors; currency users; testers; miners, and hybrid users. Although total users increased over the period studied, currency users – classified as such because they did not react to profit nor volatility – decreased (Baur et al, 2017). Additionally, passive investors and miners were found to have the highest balances of Bitcoins; this implies that Bitcoin was mostly used for speculation since these users accumulated what they acquired instead of spending it (Baur et al, 2017). Both these findings suggest that Bitcoin is most commonly used as a speculative asset. However, more recent research points out that there is a growing volume of transactions with Bitcoin on trading platforms (Aoyagi & Adachi, 2018). Although there may not be generalized acceptance of Bitcoin as a medium of exchange, this acceptance appears to be increasing.

It is important to highlight the difference between ‘national currencies’ (for example, the Mexican peso) that are only used as a medium of exchange within their own country, and ‘international currencies’ – like the US dollar – that are used in many different countries as a medium of exchange, and also as foreign reserves (Radovan, 2014). Many of these national currencies, which are from lower income countries, are used as speculative assets internationally; it has been found that currencies in emerging economies often have a higher Sharpe ratio, which signals a high return relative to risk, due to their instability (Burnside et al, 2007). However, despite being used for speculation internationally, these currencies still persist as money within their own country. Therefore, Bitcoin can be a currency as long as it is accepted within at least one group, which in this context would be a ‘country’. The next section examines those who may wish to use Bitcoin for transactions despite its drawbacks.

## Network effects

The lack of generalized acceptance faced by Bitcoin is due to a coordination problem between agents: although the use of Bitcoin as a medium of exchange would benefit all agents, due to volatility it wouldn’t benefit whichever individual tries to use it first. There is a ‘network effects’ problem: the value (of an article) increases with its use (Luther & Olson, 2014). Many retailers don’t want to accept Bitcoin, which discourages buyers from using it and further exacerbates the issue (Grinberg, 2012). Figure 3 portrays an economy that suffers from this ‘vicious cycle’: the S-shape function portrays the private rational decisions of economic agents and the 45-degree line shows the expected decisions of other agents (Todaro & Smith, 2011). There are multiple equilibria where expectations and observations are equal; but whilst expectations are maintained at a low level, it is almost impossible to leave the equilibrium D1 and reach the second equilibrium D2, because individuals don’t benefit from changing their actions. A ‘big push’ is needed to change expectations: an external event which encourages a change in behaviour to end the vicious cycle (Todaro & Smith, 2011). In the context of this essay, the private rational decision is the choice over whether to use Bitcoin as a medium of exchange; if the agents do not want to use Bitcoin in this way, it persists as a speculative asset without an external stimulus.



*Figure 3 – a model of an economy trapped in a ‘vicious cycle’*

A crisis concerning conventional money (the default currency of a country, such as the US dollar) could incentivise people to use an alternative medium of exchange such as Bitcoin, serving as a ‘big push’ mechanism. To investigate this possibility, firstly it must be established whether Bitcoin is a viable alternative. According to Kocherlaota (1997), any assignation that money achieves can equally be achieved by ‘memory’: the knowledge of the record of transactions. Bitcoin has the function of memory, because it is like a public record-keeping book of past transactions and was created as an alternative to money (Luther & Olson, 2014).

It is thus necessary to examine whether financial crises in the past have encouraged the use of Bitcoin. Kuittinen (2013) analysed the impact of the banking crisis in Cyprus of 2013 on the popularity of Bitcoin by studying the number of downloads of ‘Bitcoin Gold’ – an application that was popular for acquiring Bitcoins at the time – both before and after the European Union promised to give financial support to Cyprus. Cyprus and other countries with similar problems (Spain, Italy and Ireland) experienced a much higher number of downloads the week before help was guaranteed compared to the week after the announcement (Kuittinen, 2013). The adverse economic conditions changed the expectations of agents, which encouraged Bitcoin use. More recently, hyperinflation in Venezuela increased Bitcoin usage in the country. Figure 4 demonstrates that, during 2018, the volume of Bitcoin on the trader *LocalBitcoins* measured in the bolívar fuerte venezolano (the national currency of Venezuela) experienced a dramatic increase – in the week of 26/05/2018 there was a volume of almost 5,000,000,000,000, in comparison to less than 2,000,000,000,000 in the week of 07/04/2018. The majority of this increase was due to the hyperinflation of the bolívar – but comparing the number of Bitcoins in various countries during the same period shows a disproportionate amount of Bitcoin use in Venezuela. In the week of 07/04/2018 there was a volume of 474 Bitcoins in Venezuela, compared to 836 in the USA and 36 in Mexico (Coin Dance, 2018), although Venezuela has a much smaller population than both countries and conditions make it more difficult to purchase Bitcoins and speculate. Additionally, a very high number of Bitcoin miners in Venezuela have been observed, which further suggests that Bitcoin is being considered as a serious alternative (The Economist, 2018).

*Figure 4: the weekly volume of Bitcoin on LocalBitcoins, measured using the bolívar fuerte venezolano (data taken from coin.dance on 29/05/2018)*

Currently Bitcoin isn’t being used as a medium of exchange on net, but certain conditions encourage its use, such as the current situation in Venezuela. Since many national currencies are not used as a medium of exchange universally, acceptance as a medium of exchange amongst users who need to use Bitcoin is sufficient for it to be classed as money. However, illiquidity remains an obstacle.

# Store of value

A ‘store of value’ transmits purchasing power from the present day to the future, meaning that when a currency is exchanged in some future moment the owner will receive the original economic value (Ali et al, 2014).

## Volatility

Volatility has been shown to be relevant to all properties of money, making it an important factor in determining whether Bitcoin is a currency. Peng et al (2018) used various estimation models and found that Bitcoin has a much higher volatility level than a selection of conventional currencies (USD, GBP, EURO and JPY), which generally remain stable except for events that bring uncertainty. Similarly, there is evidence that Bitcoin is more volatile than gold (Dwyer, 2015) and even other risky assets (Yermack, 2013). Volatility is influenced by expectations about future demand, which for Bitcoin depend heavily upon expectations about future use, which explains its high volatility (Ali et al, 2014). However, the majority of studies only compare Bitcoin with stable international currencies; for a complete analysis, it is necessary to examine national currencies too, which also contend with negative expectations.

The bolívar fuerte venezolano is an extreme example of an unstable national currency, as Venezuela is faced with hyperinflation due to a corrupt government and international sanctions (Rosati & Laya, 2018). Figure 5 highlights that, over the last 6 months, Bitcoin experienced much more fluctuation than the Euro (a percentage difference of 63% between its highest and lowest points in comparison to only 5%) – but the bolívar saw a difference of nearly 200% in the same period. Additionally, there are reports of speculative activity with the bolívar – due to difficulties in acquiring it, a ‘premium’ can be imposed to yield additional profit from sales (Miranda, 2018). This suggests that some national currencies suffer from extreme volatility and are used frequently for speculation; yet despite not being stores of value they still achieve generalized acceptance within their own country.

|  |  |  |  |
| --- | --- | --- | --- |
| **Month** | **Bitcoin (using Bitstamp)** | **Bolívar fuerte venezolano**  | **Euro** |
| December 2017 | 14797 | 0.099183 | 1.18 |
| January 2018 | 12844 | 0.099655 | 1.22 |
| February 2018 | 9365 | 0.021456 | 1.24 |
| March 2018 | 8999 | 0.000025 | 1.24 |
| April 2018 | 7688 | 0.000018 | 1.23 |
| May 2018 | 8836 | 0.000014 | 1.19 |

*Figure 5 – average monthly volatility of Bitcoin, the bolívar fuerte venezolano and the Euro against the US dollar (data taken from Bitcoincharts.com and Oanda.com el 22/05/2018)*

## Fundamental value

Although undoubtedly there are some highly volatile currencies, it is less convincing to argue that Bitcoin is a currency if it is not also a store of value; this condition could hold if Bitcoin has a fundamental value (Cheung et al, 2015). There are various possible sources of the fundamental value of Bitcoin – such as its shortage of supply or protection from hyperinflation – but, since there is limited economic research on these areas, this essay focuses on one aspect only. Aoyagi and Adachi (2018) argued that cryptocurrency – or for the purpose of this essay, Bitcoin – has fundamental value because the Bitcoin market contains minimal asymmetric information. Asymmetric information explains a discrepancy between the knowledge of agents; in this case, a lack of information of the buyers compared to the sellers. This causes adverse selection: when a buyer makes a bad decision due to asymmetric information (Nickolas, 2017). This occurs less in the Bitcoin market because the secure nature of the Blockchain can incorporate measures to remove fraudulent or low-quality items. Therefore, the market attracts those that want high quality. A segmented-market model can be used to analyse the interaction between the Bitcoin market and conventional money market and demonstrate the value of Bitcoin. In the model, agents decide which type of money to use when quality is unknown – meaning there is a possibility of adverse selection – and the Bitcoin market has less asymmetric information (Aoyagi & Adachi, 2018). The equilibrium is given by the following condition:

 (1)

Where is price, is quality, represents the conventional money market the Bitcoin market. There is also the assumption that:

 (2)

There are therefore a positive number of buyers with sufficient productivity (or preference for high quality) to enter the market *B*, because the identities in (1) represent the points of indifference between remaining inactive and entering the relevant market. Buyers face a trade-off because the *B* market has less asymmetric information but higher prices. Figure 6 shows the returns *V* to buyers with productivity in the two markets. The two curves demonstrate the returns to the buyer when buying an article in the *B* and *C* markets. There are also returns for remaining inactive. The buyer chooses the *B* market under the condition:

 (3)

Because this means returns are sufficiently high to justify the higher price. Alternatively, the *C* market is chosen under the condition:

 (4)

Because this means more returns are possible in the *C* market*.* If neither (3) nor (4) apply, the agent chooses inactivity (Aoyagi & Adachi, 2018).



*Figure 6: returns to buyers in a segmented-market model with a Bitcoin market and a conventional money market*

Additionally, the inverse demand functions – where *K* is demand – show that there is complementarity between the prices in the two markets:

 (5)

 (6)

The price for the *B* market*, ,* appears in (5), the inverse demand function for the *C* market – and the reverse is also true. Thus, an increase in lowers demand in the *B* market whilst simultaneously increasing demand in the *C* market. The difference in quality between the two markets affects the demand in both markets: an increase in quality difference encourages more buyers into the *B* market whilst increasing the price in the *B* market and decreasing the price in the *C* market, therefore affecting its demand too*.* The quality difference therefore functions as a feedback mechanism to encourage the equilibrium behaviour examined previously, because the tendency to compare price and quality between the two markets is further encouraged (Aoyagi & Adachi, 2018).

Hence Bitcoin is volatile but has a fundamental value, meaning it could be a store of value if public expectations are changed. This analysis suggests that Bitcoin has a place in the market and can exist alongside conventional money, thus verifying previous results showing that Bitcoin is more suitable in certain contexts and conventional money better for others. However, the Bitcoin market is still emerging and more study is needed, especially regarding aspects of fundamental value beyond asymmetric information.

# Conclusion

When assessed against the traditional criteria, Bitcoin is not a currency. It is not a unit of account because it cannot be used as a numeraire to compare goods; neither is it a good medium of exchange since it is used more for speculation, nor a store of value as there is no guarantee it will retain its original value. Expectations that Bitcoin will continue as a speculative asset cause high volatility, the major obstacle preventing Bitcoin from meeting the properties of money; this has created a vicious cycle which is difficult to break despite Bitcoin’s function as memory. However, data shows that events such as the hyperinflation in Venezuela have promoted the use of Bitcoin, which proves that expectations can be changed with a ‘big push’. The conclusion that expectations can be changed and volatility lowered is further supported by the demonstration that Bitcoin has fundamental value. By possessing value beyond the speculative, Bitcoin has a place in the market and can maintain a stable level; however, this analysis is currently limited and must explore more aspects of fundamental value.

Finally, national and instable currencies such as that of Venezuela do not comply with the traditional criteria of money, unlike the international currencies that are generally used as base examples. Yet these currencies achieve generalized acceptance within their own countries despite high volatility due to a lack of other options; it is thus plausible for Bitcoin to be a currency as long as it is used a such amongst one segment of the market which views it to be the best option. This segment could be those that appreciate its advantages and fundamental value. However, some changes are needed in the design of Bitcoin trading platforms to promote its use as a currency and not a speculative asset. For instance, liquidity and faster transactions would help to promote arbitrage and efficiency in the market. Bitcoin is a currency despite not meeting the traditional criteria, and there is scope for it to achieve lower volatility and higher public confidence and thus meet all criteria in the future.

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