

Bitcoin: Currency or Investment?♦

Submission to the Senate Economics References Committee Inquiry into Digital Currency

Dirk Baur
KiHoon Hong
Adrian D. Lee

Finance Discipline Group, University of Technology, Sydney

♦ We acknowledge funding from the SWIFT institute.

ABSTRACT

*Bitcoins are neither precious commodities with intrinsic value nor fiat currency backed by a monetary authority.

*Bitcoins are hybrids of commodity and fiat money.

*Bitcoin returns do not co-move with any traditional asset class.

*Bitcoins are mainly used for investment at present and not as an alternative currency.

*Bitcoins are “small” relative to the size of other asset classes and thus do not pose an immediate risk for monetary, financial or economic stability.

1. Introduction

According to Nakamoto (2008), Bitcoin is a peer-to-peer electronic cash system which allows online payments to be sent directly from one party to another without going through a financial institution. This definition suggests that Bitcoin is mainly used as an alternative currency. However, Bitcoin can also be used as an investment and thus would serve a different purpose. This submission analyses the question of whether Bitcoin is currency or investment and more specifically, what is its current usage and what usage will most likely prevail in the future given its characteristics?

If Bitcoin is mainly used as a currency to pay for goods and services, it will compete with fiat currency such as the Australian dollar and thus influence its value and ultimately monetary policy. If, on the other hand, it will mainly be used as an investment, it will compete with other assets such as government bonds, stocks and commodities among others and potentially influence financial stability. Whether it is currency or investment, the potential to influence on the economy as a whole depends on the success of Bitcoin or similar alternatives compared to existing currencies and financial assets.

To answer the question of whether Bitcoin is currency or investment, we analyse the value of Bitcoin's financial characteristics relative to a large number of different assets and the usage of Bitcoins; i.e. is Bitcoin mainly used as an investment or as an alternative currency to pay for goods and services? We find that Bitcoin is mainly used as an investment despite or due to its high volatility and thus high returns. Interestingly, Bitcoin returns are essentially uncorrelated with all major asset classes which offers large diversification benefits. This low correlation, if stable and persistent over time, would also imply low risk from a macro perspective. For example, if Bitcoins showed bubble-like characteristics, a significant fall in the value of Bitcoins could be an isolated event if the correlation remained at zero and thus no other assets would be affected. If, however, Bitcoin investments are leveraged for example, a significant fall in the value could lead to margin calls and then also affect other assets.

2. Background

Bitcoin is designed as a peer-to-peer payment system and thus a medium of exchange. It can be defined as synthetic commodity money (e.g. Selgin (2014)) sharing features with both commodity monies such as gold and fiat monies such as the Australian dollar. Whilst commodity money is naturally scarce and has a use other than being a medium of exchange, fiat money is not naturally

scarce but issued by a central bank and its main purpose is that of being a medium of exchange. In addition, both types of money can be used as a store of value and thus as an investment.

Bitcoin is a hybrid of commodity money and fiat money. Bitcoin is scarce by design, i.e. its scarcity is determined by an automatic, deterministic rule fulfilled by competitive mining similar but not equal to commodity money (e.g. gold) but its value is better characterised by fiat money as Bitcoins have no “intrinsic” value.

When evaluating the potential future use and acceptance of Bitcoin it is important to analyse the growth path of Bitcoin supply. The supply of Bitcoins is perfectly predictable and will continue to increase until 2040 and remain at the 2040 level. This has strong implications for the value of Bitcoins and the potential deflationary effects it may entail. Since the demand for Bitcoin is unpredictable both in the near future and beyond 2040, it is difficult to forecast the future value and usage of Bitcoin. However, the deflationary effects that are built into the system make it more likely that Bitcoins will be used as a store of value and an investment than as a medium of exchange. If Bitcoins are not viewed as an alternative currency and not used as a medium of exchange, it will not compete with fiat currency and thus not affect the effectiveness of monetary policy. If, on the other hand, Bitcoins are viewed as a stable money benchmark and thus a potential medium of exchange, it may influence the value of fiat currency and ultimately monetary policy.¹

Given the potential influence of Bitcoins on fiat money and thus on monetary policy, central banks and regulatory authorities may be well advised to carefully monitor the future developments of Bitcoins and other “virtual currencies”.

3. Data

Our analysis of the return properties of Bitcoin use daily data between January 2012 and September 2014. We use the WinkDex as the daily exchange rate of Bitcoin to USD from the WinkDex website (<https://winkdex.com/>). According to the website, the WinkDex is calculated by blending the trading prices in US dollars for the top three (by volume) qualified Bitcoin Exchanges.

All other return data comes from Bloomberg. We base our analysis on excess returns over the three month treasury bill rate, which is also obtained from Bloomberg. Table 1 lists the assets that we

¹ *Gresham's law* which predicts changes in the relative values of two alternative monies labeled “good money” and “bad money”.

analyse against Bitcoin. These assets include US equities, precious metals, commodities, energy, bonds and the VIX as a measure of volatility.

Table 1
Variable list

This table reports the list of 17 variables, explanation of the variables and the asset classes of the variables used in this analysis.

Variable	Explanation	Asset Class
<i>bitr</i>	WinkDex (Bitcoin exchange rate index)	?
<i>sp5r</i>	S&P500 (US equity index)	Equity
<i>sp6r</i>	S&P600 (US equity index)	Equity
<i>gldr</i>	Gold Spot	Precious Metal
<i>silvr</i>	Silver Spot	Precious Metal
<i>eurr</i>	EUR USD (Euro to US Dollar exchange rate)	Currency
<i>audr</i>	AUD USD (Australian Dollar to US Dollar exchange rate)	Currency
<i>jpyr</i>	JPY USD (Japanese Yen to US Dollar exchange rate)	Currency
<i>gbpr</i>	GBP USD (British Pounds to US Dollar exchange rate)	Currency
<i>cnyr</i>	CNY USD (Chinese Yuen to US Dollar exchange rate)	Currency
<i>huf</i>	HUF USD (Hungarian Forint to US Dollar exchange rate)	Currency
<i>twus</i>	Trade weighted us dollar index	Currency
<i>wtir</i>	WTI 1 month (Crude oil index)	Energy
<i>hhr</i>	HH 1 month (Natural gas index)	Energy
<i>cbr</i>	Bloomberg US Corporate Bond Index	Bond
<i>tbr</i>	Bloomberg US Treasury Bond Index	Bond
<i>hbr</i>	Bloomberg USD High Yield Corporate Bond Index	Bond

For analysis of Bitcoin users, we use Bitcoin transaction data from Kondor *et al.* (2014) as available on their website.² The data are actual transactions originating from the public Bitcoin ledger. The dataset contains the complete set of individual Bitcoin transactions that have the timestamp, amount transacted, and sending and receiving address IDs (i.e. the Bitcoin wallet addresses). The data also consolidates individual wallets to unique users based on when multiple wallets are used to send Bitcoin.³ We also remove users that only make two trades within an hour with an ending balance of less than 100 Satoshi⁴ as these appear to be ‘change addresses’ as Meiklejohn *et al.* (2013) identify. The sample period is from the first Bitcoin transaction on 9th January 2009 to 28th December 2013. Due to the earlier time series than our returns analysis, we also use the daily trade-weighted Bitcoin USD value from Mt Gox from 16 July 2010 to 31 December 2011. Prior to 16 July 2010 we do not have Bitcoin value data.

4. Bitcoin Returns compared with other Assets

In this section we compare the return properties of Bitcoin to other assets. As a first step, Figure 1 shows the Bitcoin price in USD over our sample period. As seen, the Bitcoin has experienced a

² <http://www.vo.elte.hu/bitcoin/default.htm>

³ Such consolidation will still overestimate the number of unique users as unrelated wallets may be held by a user.

⁴ 1 Satoshi is 100 millionth of a Bitcoin.

dramatic increase from \$5.28 at the beginning of our sample period and ending at \$388.55. Bitcoin has been very volatile with several large falls over the sample period. An example is when Bitcoin hit its peak price of \$1150.75 on 30/11/13 and halving in price to \$547.53 on 18/12/13. An even larger magnitude fall in Bitcoin happened in April 2013.

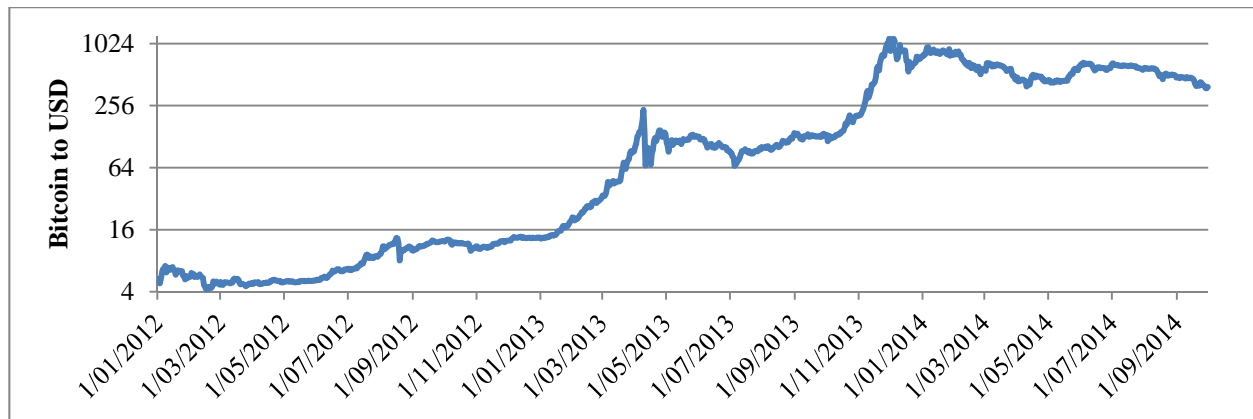


Figure 1. Bitcoin Price to USD from WinkDex in log scale

Table 2 reports descriptive statistics for the returns of Bitcoin and other asset classes. We find that Bitcoin returns exhibit the highest return and standard deviation (or volatility) compared to the returns of the other 16 assets. As such, the level of historical return and volatility is not comparable to any other asset.

Table 2
Descriptive Statistics

This table reports the descriptive statistics (mean, standard deviation, skewness and kurtosis) of the variables. Daily data between January 2012 and September 2014 is used. Bitcoin to USD data is from the WinkDex website. Prices for all other data are from Bloomberg.

	<i>bitr</i>	<i>sp5r</i>	<i>sp6r</i>	<i>gltr</i>	<i>silvr</i>	<i>eurr</i>	<i>audr</i>	<i>jpyr</i>	<i>gbpr</i>
Mean	0.62%	0.04%	0.04%	-0.06%	-0.10%	-0.03%	-0.05%	-0.07%	-0.02%
Stdev	6.77%	0.72%	0.95%	1.05%	1.71%	0.45%	0.59%	0.57%	0.40%
Skewness	-2.43	-0.28	-0.29	-1.15	-0.98	-0.15	-0.17	-0.13	-0.07
Kurtosis	32.01	4.26	3.50	14.44	12.76	4.25	4.73	8.99	4.09

	<i>cnyr</i>	<i>hufr</i>	<i>twus</i>	<i>wtir</i>	<i>hhr</i>	<i>cbr</i>	<i>tbr</i>	<i>hbr</i>
Mean	-0.02%	-0.02%	-0.01%	-0.04%	0.02%	0.00%	-0.02%	0.01%
Stdev	0.13%	0.80%	0.24%	1.32%	2.75%	0.24%	0.22%	0.14%
Skewness	-0.25	0.03	0.17	0.24	0.20	-0.58	-0.43	-2.50
Kurtosis	19.14	4.52	7.96	6.65	5.15	4.48	4.03	21.23

The Bitcoin returns also show very high negative skewness and very high kurtosis. Large negative skewness is comparable to the skewness of high yield corporate bonds, gold and silver returns. Such large negative skewness indicates the asymmetric Bitcoin return distribution and that the tails on the left side of the distribution is longer or fatter than the right side.

Bitcoin return distribution has extremely high kurtosis compared with other assets. This indicates that there were a much greater number of tail events in Bitcoin returns.

We report correlations between Bitcoin returns and other asset returns in Table 3. Consistent with Yermack (2013), it is clear that Bitcoin returns are not correlated to any of the analysed asset returns. Bitcoin has at most six percent positive correlation with the US Treasury Bond index (*tbr*) and at most six percent negative correlation with the AUD/USD exchange rate (*audr*). No other asset has such weak correlation with other assets across the board. Overall, we conclude that Bitcoin is different from all traditional assets we investigated.

5. Bitcoin User Analysis

In this section we classify Bitcoin users into user types and investigate the wallet characteristics of these user types. We categorise user types to determine whether Bitcoin is predominantly used for investing or as a currency. Section 5.1 shows how we classify user types; Section 5.2 reports the total Bitcoin balance and Section 5.3 reports wallet characteristics of the user types (mean balance, number of transactions and transaction size).

5.1 Categorising User Types

We define users into four categories by their lifetime activity up to the balance date:

Active investor - More than two transactions and only sends Bitcoin in greater than USD\$2,000 transactions.

Receive only investor - More than two transactions and only receives Bitcoin in greater than USD\$100 transaction with no sending of Bitcoin; or has made only one receiving Bitcoin transaction of greater than USD\$100.

Currency user - Makes more than one transaction, has made both sending and receiving transactions and sending transaction sizes are less than USD\$2,000.

Hybrid user - All other users not categorised.

Tester - Makes only one transaction of less than USD\$100.

Bitcoin transaction sizes in USD use the Bitcoin to USD price on the day of the transaction as per Mt Gox or WinkDex's trade weighted price. Prior to 16th July 2010 we set all transaction as being worth USD\$0 as there is no USD exchange price during this period.

Our categorisation system attempts to distinguish between those users that are investing in Bitcoin by building up Bitcoin balances over time and either not sending Bitcoin (*receive only investor*) or only making large send transactions (*active investor*). In contrast, users that send small amounts of Bitcoins are exchanging Bitcoin for goods and services (*currency user*). We also group users that are just testing the system and so are neither investors or currency users (*tester*) and those that appear to do both currency and investing (*hybrid user*).

We take three snapshots of user type balances on 31/12/11, 31/12/12 and 28/12/13 (the end of our sample period). We use these three snapshots to see whether there are trends in users purely investing or using Bitcoin for as a medium of exchange.

5.2 Total Bitcoin Balances of User Types

Table 4 reports the total Bitcoin balances in Bitcoin and USD across user types for our three snapshot dates.

Total Bitcoin value in USD has risen dramatically due to the rapid rise in price of Bitcoin and from the mining of Bitcoin which increases the total number of Bitcoins available. The total value in USD as at the end of 2013 is \$8.8 billion dollars which is small relative to other assets such as shares where trillions of dollars are invested.

We find that the *active investor*, *receive only investor* and *hybrid user* group total holdings have increased over time while *Bitcoin currency user* and *tester* have fallen over time. There has also been a dramatic increase in users over time from 720,705 users as at the end of 2011 to 6.7 million as at the end of 2013. The largest group of users by share of Bitcoin and user numbers are *hybrid* from 41% in 2011 to 47% in 2013 which is expected as hybrid users would consist of merchants and consumers who hold Bitcoin to purchase goods and services.

The second largest user type is *receive only investors* who hold 30.22% of all Bitcoins as at 2013 end despite being the smallest group by user numbers. The fact that such users remain dominant strongly suggests that Bitcoin is mainly a vehicle for investment rather than for trade and has continued to be as such during our sample period.

Tester is a large group although its share of balances has fallen from 24.90% at 2011 end to 16.16% at 2013 end. Such a fall is expected as Bitcoin gains recognition over time. However *currency user* holdings declined from 7.02% of total Bitcoins in 2011 to 2.54% in 2013 which suggests that Bitcoin's usage purely for purchasing goods and services has diminished. Whether this is related to the volatility of Bitcoin in 2013 remains for future research. We conclude that there are very few users that use Bitcoins purely as a medium of exchange and a dominant group of users that use Bitcoin purely for investment.

4.3 User Type Bitcoin Wallet Characteristics

In this section we investigate the wallet characteristics of our user group classifications. First, at the individual user level, we calculate the mean wallet characteristic across all transactions until the snapshot date. Then we calculate statistics based on the user mean wallet characteristics for each user type.

Table 5 reports mean and standard deviations of individual user wallet characteristics for various user types and as at the end of our snapshot periods. The wallet characteristics are user mean Bitcoin balances in USD (Panel A), user mean number of Bitcoin trades (Panel B) and user mean transaction size (Panel C).

In Table 5 Panel A we find *receive only investors* have the largest mean and standard deviation of balances amongst all groups over all time snapshots. This suggests there are many *receive only investors* holding large Bitcoin balances. *Active investors* and *currency users* keep small balances. *Testers* keep small balances prior to 2012 although in 2013 their balances are larger reflecting early adopters who only did one trade when the Bitcoin price was low. Overall we find that *receive only investors* while a small group in number, tend to hold large balances compared with other groups.

In Table 5 Panel B we find that *currency users* trade the most frequently having a mean of 43.27 trades as at 2013. *Active investors* trade the least of all groups, even compared with *buy only investors*. Combined with evidence in Table 5 Panel A this suggests that *active investors* appear to be ‘all-in’ investors rather than active traders of Bitcoin. *Hybrid users* have the largest standard deviation in number of Bitcoin transactions of up to 4,593.90 as at 2013 end suggesting that some of these users captured are merchants.

In Table 5 Panel C we find that *active investors* make large transactions with a mean transaction size of \$18,120 and standard deviation of \$156,325.10. This group thus appears to make large receiving and sending transactions to enter and completely exit out of Bitcoin. *Currency users* have the second smallest transaction sizes consistent with consumers making many small transactions in order to purchase goods and services. *Hybrid users* as at 2011 made larger transactions than *receive only investors* although by 2013 the mean and standard deviation of transaction sizes are similar. We conclude that our user groups have wallet characteristics consistent with our user group classifications.

6. Conclusion

Bitcoin's intended purpose is as a medium of exchange although it may also be used as an investment. We find Bitcoin's return properties are very different from traditional investments and thus have great diversification benefits. Analysing the Bitcoin public ledger, we find about a third of Bitcoins are held by investors, particularly users that only receive Bitcoin and never send to others. A minority of users, both in number and Bitcoin balances, appear to use Bitcoin as a medium of exchange. This suggests that at present Bitcoin is held for investment rather than being used for transactions. Whether the trend towards investment (rather than a medium of exchange) is due to the volatility in Bitcoin is a matter for future research.

Since the size of Bitcoin investments and transactions can be characterised as small relative to other assets we do not see an immediate risk or even threat for financial or monetary stability and the Australian economy as a whole. However, we believe it is important to emphasise that this conclusion is based on its size. If the acceptance of Bitcoin or similar "virtual currencies" increased significantly on a global level, it could affect the behaviour of consumers and producers and as a consequence change the relevance of monetary policy. Given Bitcoin's global nature and independence from any central bank or supranational authority, regulatory oversight may be difficult and challenging.

References

- Kondor, D., M. Pósfai, I. Csabai, and G. Vattay, 2014, Do the rich get richer? An empirical analysis of the bitcoin transaction network, *PloS one* 9, e86197.
- Meiklejohn, S., M. Pomarole, G. Jordan, K. Levchenko, D. McCoy, G. M. Voelker, and S. Savage, 2013, A fistful of bitcoins: Characterizing payments among men with no names, Proceedings of the 2013 conference on Internet measurement conference (ACM).
- Nakamoto, S., 2008, Bitcoin: A peer-to-peer electronic cash system, *Unpublished manuscript*, retrieved from <https://bitcoin.org/bitcoin.pdf>.
- Selgin, G., 2014, Synthetic commodity money, *Journal of Financial Stability*, forthcoming.
- Yermack, D., 2013, Is bitcoin a real currency? An economic appraisal, *Working paper*, NBER.

Table 4
Total Bitcoin Balances by User Types

This table reports the total Bitcoin balances of various user types as at the end of 2011, 2012 and 2013. User types are defined in Section 5.1. The data is transaction data from the Bitcoin public ledger from 9th January 2009 to 28th December 2013. Bitcoin to USD values are from Mt Gox and WinkDex.

Total Balances (millions)												
Balance Year End	2011				2012				2013			
User Types	Bitcoin	USD Value	% Share	No. Of Users	Bitcoin	USD Value	% Share	No. Of Users	Bitcoin	USD Value	% Share	No. Of Users
Active Investor	0.30	1.44	3.78	20,217	0.28	3.80	2.67	84,375	0.54	389.34	4.42	1,039,517
Receive Only Investor	1.90	8.96	23.58	39,784	2.64	35.41	24.88	93,843	3.68	2,662.11	30.22	329,730
Hybrid	3.28	15.49	40.73	469,466	4.79	64.21	45.13	1,596,202	5.68	4,109.90	46.65	4,118,031
Currency User	0.57	2.67	7.02	34,560	0.88	11.85	8.33	121,494	0.31	223.88	2.54	473,089
Tester	2.00	9.47	24.90	156,678	2.01	27.02	18.99	294,927	1.97	1,423.90	16.16	761,971
Total	8.05	38.02	100.00	720,705	10.61	142.30	100.00	2,190,841	12.18	8,809.12	100.00	6,722,338

Table 5
Bitcoin Wallet Characteristics by User Types

This table reports the wallet characteristics of various user types as at the end of 2011, 2012 and 2013. User types are defined in Section 5.1. The data is transaction data from the Bitcoin public ledger from 9th January 2009 to 28th December 2013. Bitcoin to USD values are from Mt Gox and WinkDex. Panel A reports statistics for individual account Bitcoin balances, Panel B for number of Bitcoin trades and Panel C for transaction size across various user types.

Panel A. Bitcoin Balances in USD of User Types

User Type	2011			2012			2013		
	Mean	Std	N Users	Mean	Std	N Users	Mean	Std	N Users
Active Investor	71.15	5,649.96	20,217	45.09	2,799.94	84,375	374.54	40,849.14	1,039,517
Receive Only Investor	225.34	4,673.96	39,784	377.30	9,324.76	93,843	8,073.60	370,268.33	329,730
Hybrid	32.99	1,875.10	469,466	40.23	2,229.50	1596,202	998.02	72,828.99	4,118,031
Currency User	77.22	1,074.72	34,560	97.56	3,115.00	121,494	473.23	58,460.70	473,089
Tester	60.42	114.41	156,678	91.62	249.88	294,927	1,868.71	8,608.79	761,971

Panel B. Number of Bitcoin Trades by User Types

User Type	2011			2012			2013		
	Mean	Std	N Users	Mean	Std	N Users	Mean	Std	N Users
Active Investor	3.90	39.08	20,217	2.98	6.61	84,375	3.29	18.91	1,039,517
Receive Only Investor	10.07	30.45	39,784	12.98	57.60	93,843	11.12	39.79	329,730
Hybrid	3.27	70.70	469,466	7.03	2,941.21	1,596,202	9.38	4,593.90	4,118,031
Currency User	38.55	112.83	34,560	68.41	557.22	121,494	43.27	387.85	473,089
Tester	1.00	0.00	156,678	1.00	0.00	294,927	1.00	0.00	761,971

Panel C. Transaction Size by User Types

User Type	2011			2012			2013		
	Mean	Std	N Users	Mean	Std	N Users	Mean	Std	N Users
Active Investor	16,202.06	10,4261.97	20,217	8,741.47	54,424.90	84,375	18,120.06	156,325.10	1,039,517
Receive Only Investor	97.97	3,303.67	39,784	53.21	993.54	93,843	759.31	36,687.30	329,730
Hybrid	232.36	1,885.73	469,466	242.47	1,197.28	159,6202	672.33	33,865.47	4,118,031
Currency User	60.01	149.68	34,560	78.20	174.53	121,494	130.14	388.84	473,089
Tester	4.02	24.80	156,678	3.53	16.56	29,4927	7.55	38.87	761,971