Valuation of Bitcoin to USD

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Invented in 2009 by an anonymous group of developers, Bitcoin can be described as an online communication protocol that allows the use of a virtual currency such as electronic payments(Bohme, 2015). Bitcoin differs from the currency that we know and use today such as the U.S. dollar because it is not governed or regulated by any third party and exists solely on its own. It is able to do this due to the unique technology called blockchain where every transaction is verified, recorded and stored and every bitcoin can be traced back to its origin. Due to this fact, Bitcoin is referred to as a peer to peer payment system. Bitcoin is made by the process called mining where miners solve puzzles to verify transactions and gain bitcoin as a reward. As time goes by these puzzles get exponentially harder and therefore it is much harder to mint these coins. The supply of Bitcoin itself is limited and its production through mining will slow down due to a process called halving (investopedia). This paper will use two valuation methods namely the relative purchasing power parity and quantity theory of money to further study the change in demand for Bitcoin and the valuation of Bitcoin against the U.S. dollar to find a suitable value for it.

$$\frac{E^e - E}{E} = \pi^e - \pi^{B,e}$$

1.1 Relative Purchasing Power Parity

This equation is called the Relative Purchasing Power Parity and it states that the relative price of identical consumption baskets in different countries should remain constant. The data that we will use will be taken from may 4 2011 and may 4 2021. E is the nominal exchange rate of bitcoin to the USD,E^e = \$53242 per btc, E = \$3.56 per btc(blockchain.info). $\pi^e$is the home inflation of USD from 2011 to 2021 π^e= 17.8 % (C.I.U.S) and $\pi^{B,e}$is the inflation of Bitcoin from 2011 to 2021.

$$\pi^{b,e} = \frac{M^{S,B,e} - M^{S,B}}{M^{S,B}} - \frac{L^{B,e} - L^{B}}{L^{B}}$$

1.2 Inflation of Bitcoin

The Inflation of bitcoin can be further decomposed into the change in money growth of Bitcoin where money supply, $M^{S,B,e}$ = 18.7 million btc in may 4, 2021 and $M^{S,B}$= 6.91 million btc in may 4, 2011 (blockchain.com). Now $\frac{E^{e} - E}{E}$= 1495461.80 %, π^{e}= 17.8%, $\frac{M^{S,B,e} - M^{S,B}}{M^{S,B}}$= 170.62%. So now solving for $\frac{L^{B,e} - L^{B}}{L^{B}}$= 1495264.38 %.

$$M^{B} * v^{B} = P^{B} * Q^{USD}$$

2.1 Quantity Theory of Money

$$v^{B} = \frac{Bitcoin\ Sent\ last\ 24H}{M^{B}}$$

2.2 Velocity of Bitcoin

By applying Quantity Theory of Money we are then able to find out a theoretical value for Bitcoin today. The variables used are:

- The supply of Bitcoin, M^{B}= 18.699 million bitcoin (blockchain.info)
- Velocity of Bitcoin, $v^{B} = \frac{632389}{1869900}$= 0.0338 bitcoin (blockchain.info, bitinfocharts.com)
- Estimated transaction volume, Q^{USD}= $7,840,813,781.93 (blockchain.com)

In this case we are solving for the price of the U.S. dollar in terms of bitcoin, P^B, by dividing the left hand side of the equation with Q^{USD} we found that the $P^B = 8.064 * 10^{-5}$usd/btc. By taking the inverse of P^B,we find the fair estimated exchange rate for bitcoin E = $ 12400.68 which is far less than the current valuation of 53 thousand dollars.

By using the relative purchasing power parity, it can be concluded that there is a huge surge in demand for bitcoin in the last decade, this valuation method is useful in the sense that it gives a relatively accurate overview of demand based on price, supply and inflation but it does not take into account the volatility of bitcoin as prices surge and drop significantly with this currency. Next, by using the quantity theory of money we see that today's bitcoin price is very much overvalued compared to the fair estimate theoretically. This theoretical value is useful for us to have a standard to compare with its present value, we see that because bitcoin is a disruptive technology, it might not conform to economic theory accurately, but this value still gives us insight as to how overvalued it might be today if it were a normal currency. These two relationships give us a brief insight into the valuation of bitcoin but fail to take into account factors such as volatility as well as the present economic situation of today, but still give us reasonable insight to compare against conventional currencies. In order to truly understand and find a fair valuation for bitcoin, more variables need to be included into this research mainly due to the special circumstances of 2021, furthermore it might be interesting as well to view bitcoin when comparing them to other country currencies.

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