A Critique on Textbook Valuation of Bitcoin

Article by Dr. Bibek Bhatta on behalf of the CPA Examinations Team for Strategic Level Strategic Corporate Finance, January 2024.

Abstract: *The valuation of Bitcoin using discounted cash flows approach, owing to purported efficiency gains, is based on a flawed argument.*

1. Introduction

Bitcoin is one of the first and most well-known cryptocurrencies, launched around 2009 and is advertised as "*an innovative payment network and a new kind of money*". Cryptocurrency, often shortened to "crypto," is a digital or virtual currency secured by cryptography and existing outside the traditional financial system. Unlike traditional currencies controlled by central banks, crypto operates on a decentralized network (distributed ledger), often called a blockchain.

A blockchain is a method of securely recording information on a peer-to-peer network. It's a shared public database, duplicated across computer systems, in which new entries can be added but existing entries cannot be altered. This is like a digital notebook accessible to everyone to observe and add to, but where no one can erase or change what is already written. Hence this is similar to a big, shared record book that spreads across many computers, with each page securely linked to the one before it. This makes it nearly impossible to tamper with since any changes would be obvious. Each block contains encoded information about the previous block, reinforcing the order and structure of the blockchain as it grows. This means transactions are recorded on a public ledger, accessible to everyone, and verified by a network of computers instead of a central authority.

At the time of writing [24 Dec 2023], one Bitcoin is priced approximately at USD 43,700 (EUR 39,670)[1] according to Nasdaq . Three months prior (on 24 September 2023), the price was approximately USD 26,200 (EUR 23,780). Bitcoin has registered much higher and lower prices in the past, as depicted in Figure 1 .

[1] Exchange rate EUR/USD of 0.908 as of 24 Dec 2023

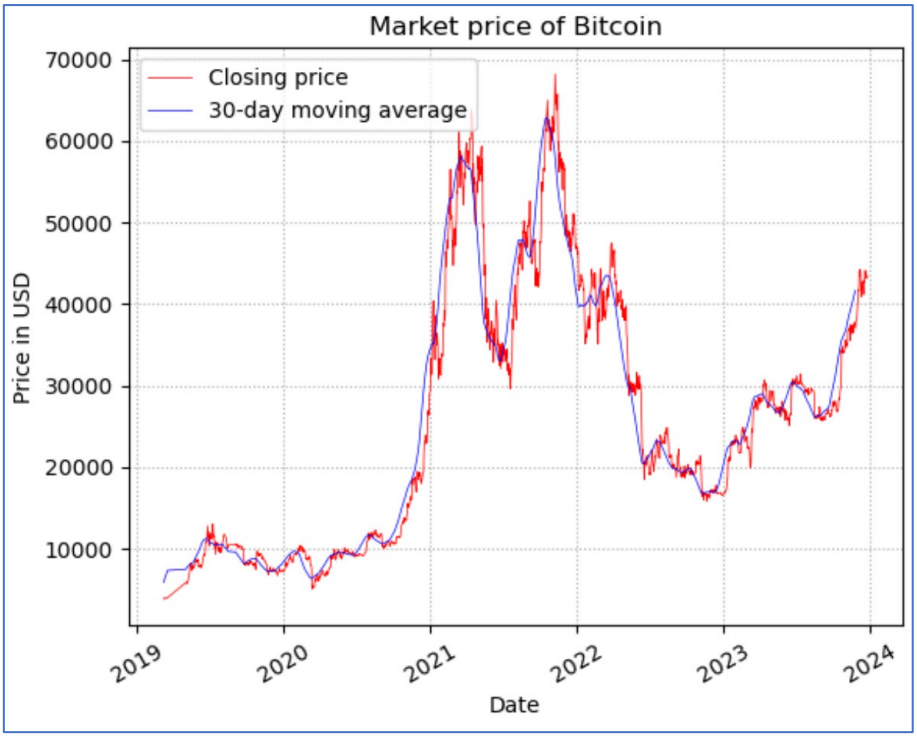

Figure 1: Price of Bitcoin. Data source: Nasdaq.com ; Author's illustration

In a free market, price is a subjective thing and is influenced highly by supply and demand. The supply and demand (for any given service/commodity) depend on various factors and remain beyond the scope of this article. Considering the average wage of EUR 22.9 per hour in the EU in 2022, (which translates to approximately EUR 44,655 annual salary for full time employees [2]), the cost of buying one Bitcoin requires 89% of an average individual's yearly salary in the EU.

So, where does Bitcoin derive its value from? Does it store value? Or does it offer efficiency in payment services? Or can it be used for ornamental purposes? Why do people pay nearly one year's salary to acquire one Bitcoin?

> *Important Note: A crucial point to note in the above data is that the volume of trade for Bitcoin in not made available in Nasdaq website. Generally, volume of trade for a given asset reveals information about how liquid certain asset is providing an indication of how easy it is to buy or dispose of an asset. For example, one company A could have just one share[3] traded in an exchange between two individuals on a given day for EUR 95 and that price would be registered as the closing price for that day. Similarly, another company B could have 1 million shares traded on the same day among 10,000 different investors, the last transaction being held at EUR 95 per share, and B also would have the same EUR 95 as closing price for the day. While both the companies are similar in terms of closing price, they are vastly different in terms of volume of trade.*

[2] Based on 37.5 hours of work per week

[3] It is unusual to have just one share to be traded in an exchange; normally, the minimum quantity, say at least 10, would have to be traded at a time.

2. Is Bitcoin similar to money?

At this point, it is relevant to briefly discuss what money is and how it is created so that a meaningful comparison of Bitcoin can be done against money (which is often termed as fiat currency).

Money serves as a store of value and a medium of exchange, as standard textbooks on money tell us. Though we may often hear phrases like "money is just printed by the government", the money we use is a store of value and is 'backed' by commodity/services. Money also generally serves as a medium of exchange, i.e. producers (like bakers, brewers, butchers, etc) can agree on a common form of IOU (paper money or coins that cannot be easily duplicated) to exchange for each other's products. As the activity in an economy grows, banks provide a more streamlined and new kind of service which does not quench hunger or thirst but nevertheless is valuable to society to a large extent; this provides the producers with incentives to exchange some of their own products with the banker in exchange for banks' services.

In democratic societies, members assign a working group called government to work in the best interest of the electorate and give this government limited but important powers which include power to collect tax. The tax so collected can then be spent by the government to carry out its duties - as instructed by the electorate – to maintain law and order, to thwart external threats, and to provide services and build infrastructure for the greater good of the society. The government may also create or print money, but it is fair to take this statement in conjunction with the tax-collecting power vested on the government, with the use of force if required. [*Private companies like banks create most of the money and such money creation is also expected to be done in a disciplined manner, mainly based on future productivity of their customers.*]

Governments can pay out using not just the tax it has already collected but also from the tax that it expects to collect in the future. When the government collects tax from the producers, it is essentially collecting the various products (bread, building, biscuit, beer, etc) and services produced by the taxpayers; similarly, when government pays its employees and various contractors, it is essentially giving out the various products and services that it collected from the taxpayers (or is very likely to collect from the taxpayers in the future). But just to streamline operations, the collection of tax and spending of such taxes for social purposes is done through money (as money is a medium of exchange). This explains to a large extent why currencies issued by some (more disciplined) governments are preferred to those issued by other (less disciplined) governments.

Money also needs to be approved by the governing authority in a given society for it to become legal tender; otherwise, a valuable currency in one part of the world could be utterly useless in another part if the society does not accept that currency as a legal tender.

2.1. Neither a store of value, nor having aesthetic appeal.

Does a Bitcoin store value just like money does? Bitcoin does require considerable amount of electricity [4] and computing power to be generated but the consumed energy is a spent force (i.e. electricity so consumed cannot be used again to heat up houses or charge mobile phones). By the same token, extracting gold might also require intensive effort and resources – again a spent force – but gold might be useful as a technological component or for social rituals or even to show off one's wealth providing some sort of utility to the wearer; however, this kind of utility is unlikely to be applicable in the case for Bitcoin.

Or can Bitcoin be considered more like fine art where people with the taste and resources are willing to pay substantial amount of money to acquire? It is difficult to see how bitcoin could resonate with people seeking aesthetic value.

2.2. Speculative investment?

Bitcoin could certainly be used as a speculative investment asset with bubbling price where the buyer hopes that someone else will be willing to pay an even higher amount in the future. In this sense, Bitcoin price could be explained by price bubble similar to a high-risk Ponzi scheme as described by Berk and DeMarzo (p-335).

3. Textbook valuation of Bitcoin due to efficiency

Or does Bitcoin perhaps derive its value due to the efficient payment system that many claim that it offers? For further discussion on this matter, let us first refer to the valuation of Bitcoin offered by Berk and DeMarzo – both professors at Stanford University - in their excellent textbook named Corporate Finance (5th edition).

The authors write that one of the sources of Bitcoin's value is through what they term as Transactional Value. According to the authors, Bitcoin's economic value, among other things, derives from the fact that it can be used as a "*means of transferring funds across borders*" cheaply. It is worth mentioning that international transfer of funds is costly (generally attracting considerable charges and fees from financial intermediaries). A quick glance at Bank of Ireland website shows that such transfers generally cost minimum of EUR 12.5 plus foreign exchange fees for foreign currency transfers. By lowering costs of such international transfers, the authors believe that Bitcoin provides economic value to users. In the own words of the authors, "*value to users from such bitcoin-enabled transactions can be thought of as a transactional dividend to holders of the currency*" (pp-334).

[4] Digiconomist.net estimates that mining one bitcoin requires 1449 kWh of electricity. For context, 1 kWh of electricity can be used to boil water in 1-litre electric kettle nine times.

Such free or reduced-fee transfer of funds owing to Bitcoin is a gain for Bitcoin users, per the authors. The present value of this 'gain' can then be calculated using discounted cash flows approach with constant growth model as shown below:

$P = D/(r-g)$

Where P is the present value of an asset; D is the cashflows at the end of this period/year; r is the periodic cost of capital and g is the constant growth rate of such cashflows. [*The derivation of this formula, known as Gordon's Dividend Growth model, and the assumption behind this formula, is shown in this video*].

Plugging reasonable values on the amount of total money being saved annually in global fund transfers, the above formula then provides overall value of all Bitcoins at $94 billion; assuming 17 million bitcoins in circulation, the authors price Bitcoin at $5529 per unit (appx EUR 5010).

3.1. Correct method but flawed reasoning

While the idea of using discounted cash flows in itself provides a simple and tidy way of valuing Bitcoin (or any other asset), the idea that users stand to gain from Bitcoin and Bitcoin alone is deeply flawed. Let us discuss this in more detail below.

First, can individuals currently send money across borders for free without Bitcoin? Theoretically they can! Ms A in Scotland can easily use her online banking service, without any direct fees, to transfer money to Mr B's account who may be residing in England. We can extend this idea to include people living in different countries or different parts of the world. It is possible to send a payment of EUR 100 by someone residing in Dublin (Ireland) to a recipient living in Frankfurt (Germany) or Glasgow (Scotland) through online banking without incurring any direct fees. The point is that we already have the necessary technology to transfer funds internationally at little or no cost. Why should Ms A spend nearly one year's wages to buy Bitcoins to transfer funds to Mr B when she can simply use her existing online bank account without additional charges? Some international transfers are cheaper (e.g. say between UK and Ireland) while others may be more costly (e.g. transfer between Ireland and Nepal). These additional costs can be attributed largely to government regulations in different countries. To understand this further, let us segregate overall fund transfer costs (like that of Halifax above) into two components: Infrastructure Cost and Control Cost. [*There might also be cost arising out of inefficiency but such costs can be dealt with by more competition as some service providers (e.g. Revolut) are already offering international fund transfers at no added cost*].

Infrastructure Cost would consist of the actual infrastructure and technological cost needed to transfer funds and would be applicable in the case of both traditional online banking and cryptocurrencies. Control Cost would mainly be incurred to ensure government regulations regarding such fund transfers

are complied with. Such government regulations could be owing to governments' desire to maintaining law and order and also as a part of wider macroeconomic policy. It is true that the cost of transferring funds through Bitcoin, as discussed in the textbook, has the potential to lower cost to some extent by avoiding the Control Cost. However, if we were to treat the anonymity offered by Bitcoin and the resulting lower cost as a gain because Control Cost is not applicable in Bitcoin's case, then we have to ask whether such anonymity really adds value to society. These Control Costs are there for various reasons (including to prevent money laundering and to maintain capital control) and using Bitcoin to shun these regulations do not add value to society; and governments are unlikely to approve such anonymous transactions anyway. If the governing authorities did indeed somehow allow such anonymous and limitless transactions without oversight, then existing financial institutions could also exploit the situation to lower the fees as they no longer have to deal with Control Cost.

Hence, arguing that Bitcoin lowers the cost of international transaction misses some important aspects on security concerns and capital controls. Such argument is akin to claiming that burden of tax on taxpayers can be lowered by abolishing the entire security apparatus of a society. Though one could argue - in the spirit of Adam Smith's discussion on Theory of Moral Sentiments (1759) - that ideally police and military force will not be necessary and humans can be expected to act in a sympathetic and virtuous manner, such an argument cannot be considered a realistic proposition in the face of unchecked self-interest.

4. Concluding remarks

Bitcoin does not store value in itself like other paper/plastic money that we use. The idea of Bitcoin's utility as a decorative asset is also unrealistic. Bitcoin's value is expected to be derived from the efficiency of payment that it purportedly offers. The perceived efficiency is largely possible by contravening government regulations designed to promote social good and macroeconomic stability.

For Bitcoin to have inherent value due to efficiency gain and as deduced using the discounted cash flows approach earlier, any gain that can be used to justify the current value of Bitcoin should be the net gain over and above what is already available to consumers. The mechanism of transferring funds without direct fees is already available with or without Bitcoin; hence, the idea of treating lower costs due to evasion of legal requirements - that is likely to destroy value and very likely to be prohibited by any functioning government - as incremental gains is not consistent with the method of valuing an asset. As such, Bitcoin's market value is most likely explained by high-risk Ponzi scheme.

About the author: *The author has previously worked in commercial banks for more than five years before completing PhD in Finance. He also has an MBA in Banking and Finance (with distinction). His banking experience centres mainly around credit analysis and credit control. He has delivered lectures in finance in both developed and developing countries and has conducted banking training around the issues of credit, risk and capital adequacy. He currently teaches finance and data analytics to postgraduate students in the UK.*