



Valuing Bitcoin

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Genesis (Introduction)



On the first day of the finance class of the second year of my MBA degree, the young lecturer opens the class by asking what seemed to be a very innocuous, simplistic question: “What is the value of a brick of gold?” After a moment of silence came an outpouring of some of the best in ignorance the financial services industry produces on a regular basis – even today. Fifteen minutes into this, the lecturer tells the class the most basic fact of valuation that nobody, not even the young accountant in me had been able to espouse with any clarity – “the value of a brick of gold is the present value of all its future cash flows.” You may not like the answer, but it is as simple as that.

The valuation of any asset – let us say that again – **any asset, is the present value of its future cash flows**. You may already be thinking in your mind, “what does this have to do with Bitcoin, or for that matter, any so called ‘cryptocurrency?’” We are quite content in our analysis that Bitcoin is not a currency, but you do not have to take our word for it. While it can perform some of the functions of money, it does not do any of them well. For someone interested in a primer on money, can refer to [this](#) to come to a determination. Many ‘assets’ have attempted to masquerade as currencies by adopting part of money’s characteristics – Gold did it for an exceptionally long time, first as a primitive form of money and then for a while it backed money, until we realised it didn’t serve that purpose for a modern, well-functioning, prosperous economy. We contend that similarly, Bitcoin and other cryptocurrencies are ‘assets’ too, and mistaking them for currencies, would be, well, a mistake.

The biggest part of the debate that many proponents of cryptocurrencies either deliberately gloss over or purposely want you to ignore is that money requires something called ‘state sanction’. A currency can only be defined as such when it is issued and approved (thus has sanction) for usage by a nation state. Proponents of cryptocurrencies would rather have you ignore that none of these coins have the approval of any state (by citing the lack of disapproval as proof), or have you believe that you do not need to use state sanctioned currency for transactions other than those requiring transacting with the Government. They will even suggest that currencies should be borderless and that is why we will all use cryptocurrencies and then sing Kumbaya [1] together. This particular belief requires you to suspend everything we know about how nation states function, how they develop, succeed and provide for their populace. To expect nation states to give up control over their economies and in effect sovereignty is not only a Herculean ask, but damn nigh impossible [2]. The belief that Bitcoin is the ‘native currency of the internet’[3] while sounding Utopian is also very Dystopian because it tries to identify the Internet as a state outside of state control, which as we have seen in countries like China, does not resonate very well. This idea follows the usual ‘tech bro’ attempt to create network effects, influence fellow tech believers into suspending the belief in economic realities and impose what can only be called uncalled for control over the future of nation states and their utility [4] .

It is quite interesting that we want to somehow create a new form of globalisation push driven by a poorly thought out ‘monetary system’ and owned [5] by a ridiculously narrow group of ‘elite’ who we have continuously demonised as bringing misery to the lives of ordinary folk. Where this line of argument leads to is pretty clear, but it has probably not been debated enough. This is not how nation states start a new currency – already loaded in favour of the top 1%[6] , intending to make them even wealthier through its price appreciation. And with potentially up to 20% of Bitcoin ‘[lost](#)’ and never coming back into circulation [7] , we already have a severely compromised this ‘State beyond States’.

The more curious and infinitely more interesting part of the cryptocurrency narrative is how it has forced nation states to establish their own versions of digital cash, starting with the upcoming launch of the Digital Currency/Electronic Payment platform (DCEP or e-Renminbi) by the Chinese state. A discussion on that and how it will impact the technology and payments ecosystem and in fact global power dynamics is the subject of a whole other paper!

[1] Interestingly, the Wikipedia entry for Kumbaya also mentions a town in Ecuador that is homonymous; Ecuador is a country whose official currency is the US Dollar, but before the reader starts pointing that out to us, the usage of the Dollar has full state sanction.

[2] In Elon Musk style, [click here](#).

[3] CFO of Square Inc on the Q4 2020 earnings call.

[4] A worthwhile book to read on this is The Globalization Paradox: Democracy and the Future of the World Economy by economist Dani Rodrik. Also [this article](#).

[5] [Bloomberg.com: The Bitcoin Whales: 1,000 People Who Own 40 Percent of the Market](#)

[6] Ok, we are sorry, it's not 1%, but more [like 2% owning 95% of Bitcoin](#). Makes you feel better, doesn't it?

[7] In its recent S1 filing, Coinbase highlighted [the risk of a substantial fall](#) in the price of Bitcoin if the creator ever came forward to claim them or try to sell them.

At this point, the reader may start thinking if this is going where most discourses on Bitcoin and other cryptocurrencies go – if they are not favourable, they are vehemently dismissive. Wait! ADS Investment Solutions Limited is an avid investor in technology companies – we have a fundamental belief that in this global economic environment, especially in the developed world, where returns on capital and labour are ever lower, technology and the increase in productivity it brings is key to economic growth and must be a significant part of any investor’s portfolio. Our investors have benefited from the attention we pay to this space and the value we generate from it so we cannot be dismissive of it. We are rigorous in our analysis of technology companies, new concepts and the potential that disruptive tech brings with it. It is that same rigour that we bring to analysing the potential of cryptocurrencies and the technology behind it and what true value they hold, in line with the principle we outlined at the outset – that the value of an asset is defined by the present value of its future cash flows.

Building Blocks (The Basics)



In 2014 (it now feels like forever ago), shortly after Bitcoin had its first few months in the sun (and the first public failures), we published a note titled ‘Revolutionising Transactions (and then everything else) – Bit by Bit(coin)’. In that short two-page note (available to all those who ask for it), we identified the reason why investors should be looking at this development seriously. The sole reason was that Bitcoin brought with it a revolutionary technology that changes the way we transact everything, with the biggest potential being in payments, especially in an increasingly online world. We encouraged investors to look at companies enabling this, and while investing in Bitcoin remains an intermediary step to a bigger stake in the payments revolution, the key revenue generator is the usage of Bitcoin’s Blockchain. Re-reading that paper, it was fun to note that at that time, Bitcoin was called ‘the new email’ and now it is the next best thing since sliced bread. Even then we recognised the potential was significantly large but what we did not do then, and do now, is quantify that potential and point out what a Bitcoin is and what it represents.



In the not so distant future, you tell your new Martian friend (just arrived on earth after hearing that Elon Musk is building a Starship and decided it is time to make their general presence known to us Earthlings) that you have invested in a Musk favourite, “Bitcoin” (we are assuming that these Martians also understand investing). If Bitcoin is an asset as we say, what is the stream of cashflows that comprise the value of this asset? What does owning a Bitcoin mean to an investor? You begin by explaining thus.

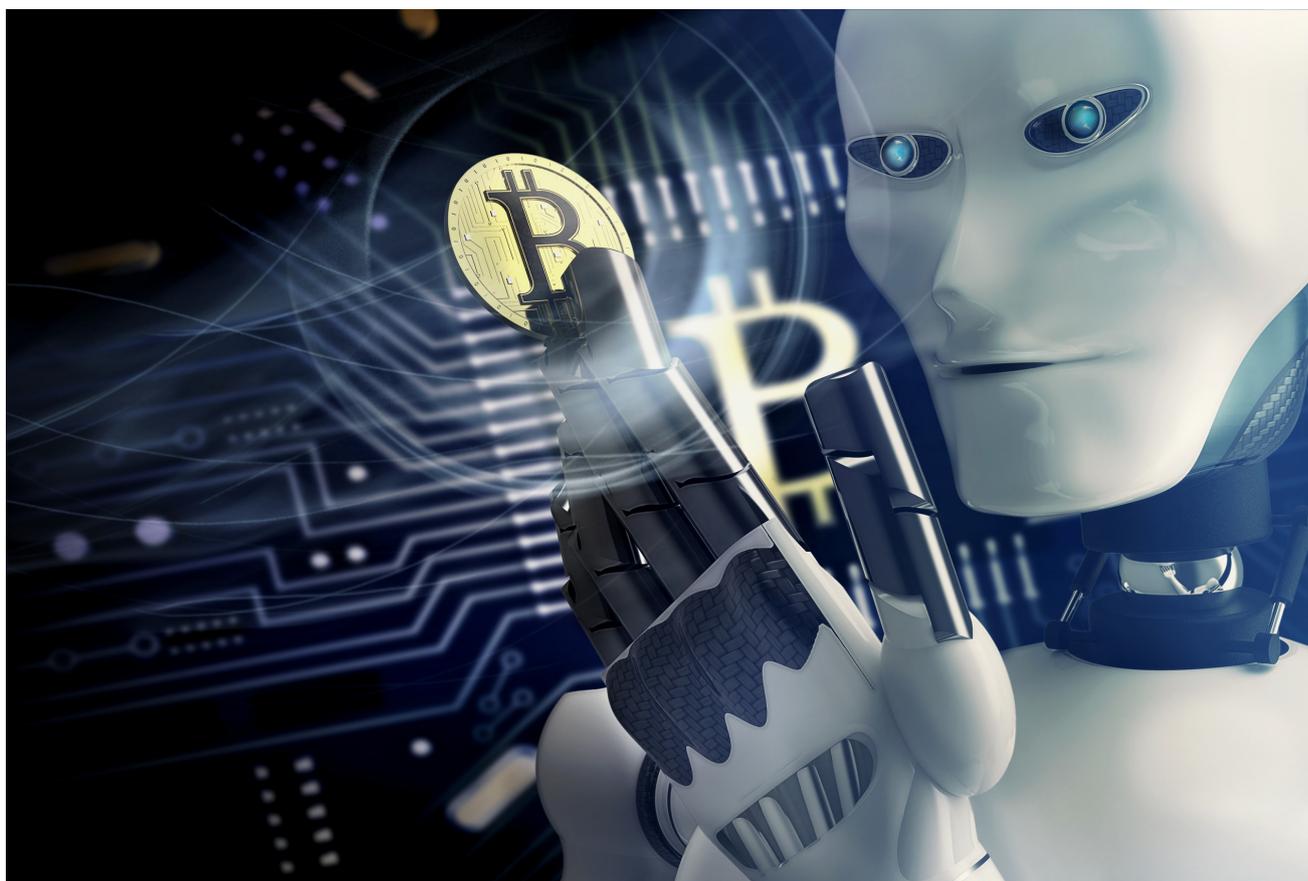
In the beginning... no, let's skip to the part where you have already explained that global payments were a patchwork of intermediaries, all trying to make a huge cut of the small amount of money you were trying to send to your friend or buy an umbrella off of Amazon (explaining rain should be easy) and that it sometimes took forever for payments to reach the intended recipient and even then you couldn't trust if it got to the right person and all this headache despite the world being able to communicate at the speed of light. Then came along this wonderful paper written by an anonymous person who was just doing a cryptography experiment and mistakenly invented this wonderful system that solved all these problems. All you had to do was use cryptography to create a public, decentralised ledger that was immutable with a network of cryptocurrency ‘miners’ that solved a mathematical problem acting as validators of a block of transactions updating this ledger and getting rewarded for doing so in a cryptocurrency, the quantity of which was fixed at inception.

“Solving an ever complex, convoluted mathematical problem, utilising immense energy resources, all just to validate transactions and update a public database?” thought the Martian. “These Earthlings must have discovered some wonderful energy source that they can just idly waste on this. I must remind my boss to get hold of it.” But he does not interrupt you and you carry on with the explanation and end by saying that you have bought that cryptocurrency because it performs such an important function and thus must go up in value relative to the humble US Dollar which you are being forced to use against your wishes by the

US Government. The word 'value' catches the Martian's attention and he quickly runs a calculation [8] (they are smart; obviously not as smart as Satoshi, but they are born investors), asking you to search the Almighty Google (which now obviously at some point will run on the Blockchain) for various inputs and exclaims, "Aha! My calculations say that the value of this so-called cryptocurrency – if it is the only one in existence – in your US Dollars should be 64,909! I am sure you paid much less and therefore, congratulations!"

You look at him, aghast. How is that even possible? You had bought MicroStrategy [9] convertibles, which in turn had bought Bitcoin at a grand price of USD 52,000 and change, with every tech bro and sis telling you that it will go up to a gazillion dollars because of finite coins etc. But at \$64K and change – this is not the upside you expected! Do the other coins have negative value? Have you been taken for a ride? What about Ether, Litecoin, and the space dog one and one that was a cute little kitty? What happened here?

So, you ask for a detailed explanation and here is how it went (in a more professional tone because unlike crypto speculation, valuation is serious business).



[8] It wasn't as quick for us Earth bound humans as it took a better part of 2 days for us to get robust assumptions that went into that model, creating and testing the model and a 3rd day to reflect on it further just to make sure we didn't get anything wrong. I am sure we can still refine it further and your comments and inputs are more than welcome

[9] [www.coindesk.com - Microstrategy Bets Another \\$1 Billion on Bitcoin](https://www.coindesk.com/microstrategy-bets-another-1-billion-on-bitcoin/)

The Value Framework



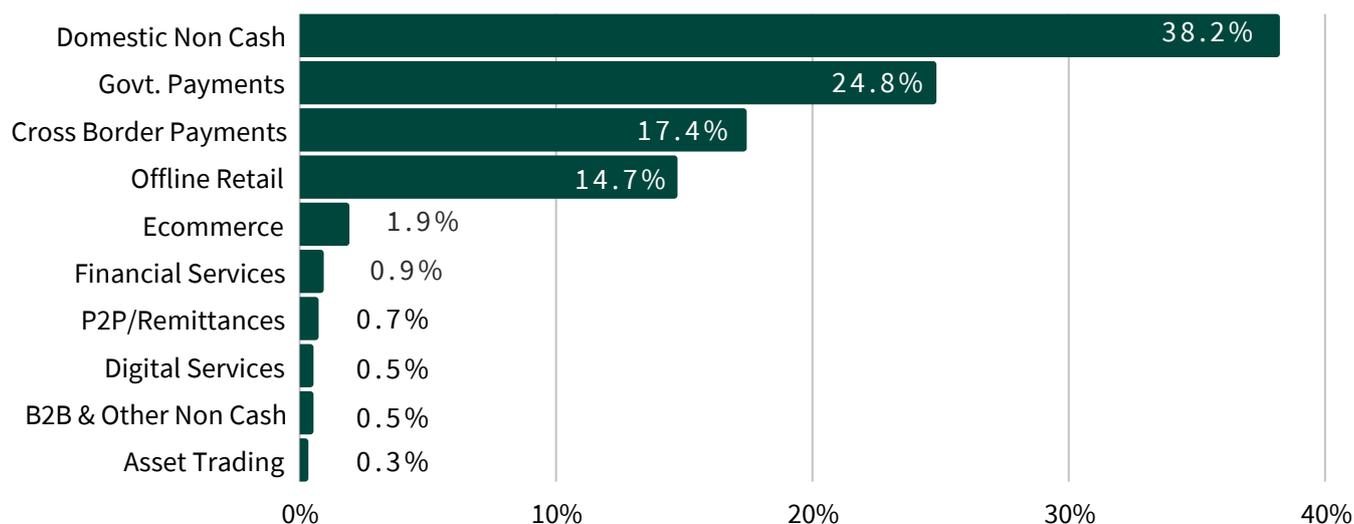
The value of a cryptocurrency is in the value of the transaction network. That is it. The value of the transaction network is in the transaction fees it generates. However, someone needs to set up the network and that capital expenditure needs to be rewarded. Replacing an existing transaction system with something that is public that no one owns, and consequently does not have an equity interest in future cash flows of, means the present value of the future cash flows must be paid promptly to those who are setting it up. That reward is a cryptocurrency valued in real money. And the price you pay for that cryptocurrency is the communal or joint equity that the public pays the miner (or what should be accurately called the transaction processor). It's no mistake that the accurate term for the collective price of this network is termed as 'Market Cap'. A Bitcoin is thus no different than a stock that can trade hands at a price that investors in that stock determine to be fair (so much for setting up a new financial system).

The value of this transaction network is thus the present value of future transaction fees that this network can generate. We use this framework as the basis for valuing the aggregate Cryptocurrency Market Cap and consequently derive a price for Bitcoin if it became the only cryptocurrency in use.

Proof of Work – The Bitcoin Valuation Model

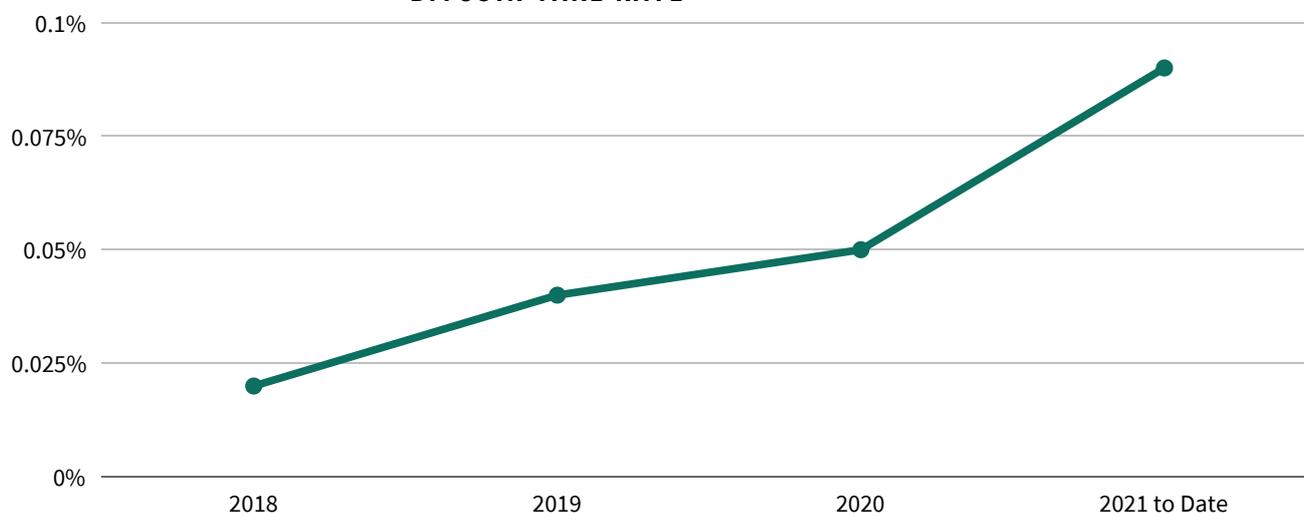
This Bitcoin valuation model uses a top-down approach, beginning with the establishment of a Total Current Addressable Market of USD 143.8 trillion for Bitcoin transactions and growing at three per cent annually.

TOTAL ADDRESSABLE MARKET 2021



The model also assumes that by 2030, Bitcoin will be the sole cryptocurrency in use and one that will address 100% of the transaction volumes. For these assumptions to have commercial footing, we believe that Bitcoin transaction dynamics will need to evolve in a way that makes Bitcoin compelling from a merchant/user standpoint (competitive take rates etc.) and give it an edge over established transaction network players such as PayPal. It will also need to evolve for scale and for faster processing times, which currently it does not.

BITCOIN TAKE RATE



Note: PYPL's Take Rate is 2.17% per average of last 6 quarters

[10] [How Bitcoin Transaction Fees Are Determined](#)

[11] <https://ycharts.com>

A quick analysis of the cryptocurrency network behind Bitcoin reveals critical operational infancies such as the fact that the amount of transaction fee (paid per transaction) is largely your personal decision [10]. Average Bitcoin transaction fees can spike during periods of congestion on the network, as they did during the 2017 Crypto boom where they reached nearly USD 60 [11]. To circumvent the hurdles around forecasting transaction fee, we analysed Bitcoin transaction data for the past three years and calculated implied take rates (.02% in 2018, .04% in 2019, .05% in 2020, and .09% in 2021 to date). Further, we analysed the existing transaction/credit card processing system to understand take rate disaggregation. It appears that the payment processors' take rate is around .30% and card networks charge around .10%. Our assumption for Bitcoin's long term take rate is .20% which we believe is an attractive transaction fee incentive to move all transactions over to Bitcoin. Moreover, Bitcoin transaction processing greatly reduces the need for several intermediaries (such as a clearing system) and is largely a function of one core service i.e., verification. Drawing parallels to card processing, verification is closely aligned with what card companies (Mastercard/Visa) contribute to the current process – validating the authenticity of the user and the transaction. This gives us further comfort in proposing the .20% take rate mentioned above. However, over time this take rate should ideally go lower and tend towards matching the maintenance cost of the network, otherwise, it allows for rival networks to take over. For now, we will assume that this take rate would be hard to match for anyone else.

We started this paper by noting that the value of any asset is the present value of all future cash flows. For the cash flows associated with Bitcoin processing, we analysed the three-year average free cash flow margins of established peers across the payments supply chain.

We see that free cash flow margins averaged around 34.0% with a broad range of 20.9% to 52.0% (see appendix). However, we chose to go with the assumption of a 47.5% free cash flow margin (average of FCF margins of Mastercard and Visa), which is in line with our thinking around Bitcoin transaction processing being analogous to card verification as explained in the prior paragraph.

Finally, the number of Bitcoins in rotation per year was estimated based on the existing supply and the rate of addition of new coins in 2020 adjusted for the declining reward rule (refers to the number of coins that miners receive for adding new transactions to the blockchain being cut in half every four years). This Bitcoin supply estimate was used to calculate the value on a per Bitcoin basis.

[10] [How Bitcoin Transaction Fees Are Determined](#)

[11] <https://ycharts.com>

Using the inputs above, the value of the Bitcoin transaction network in 2030 was established and the present value derived based on a cost of equity of 8.5% (we would call this very generous, but we give it the benefit of the doubt). The resulting value in today's terms is USD 1.33 trillion (the 'Market Cap'). And the resultant value on a per Bitcoin basis is USD 64,909. A snapshot of the model is presented here:

INPUTS/ASSUMPTIONS	VALUE
Total Current Addressable Market (USD mm)	143,898,089
Bitcoin Penetration	100.0%
Penetration Year	2030
Growth in TAM per year	3.0%
Transaction Take Rate	.20%
Free Cash Flow Margin	47.5%
Cost of Equity	8.5%
Long Term Growth Rate	2.0%
Bitcoin Annual Transaction Revenue in 2030 (USD mm)	404,122
Bitcoin Annual Free Cash Flow in 2030 (USD mm)	191,958
Bitcoin Transaction Network EV in 2030 (USD mm)	3,012,261
Bitcoin Transaction Network EV Present Value (USD mm)	1,332,280
Value Per Bitcoin Today (USD)	64,909

**Please see appendix for further information*



What the FUD? Let's Summarise

As the reader would have noticed, the current price of Bitcoin (somewhere under USD 50K as of the writing of this paper) in the context of this extremely aggressive blue-sky valuation makes no sense. It would not make sense even if we eliminated 20% of the coins as unusable. It does not make sense despite eliminating every other cryptocurrency out there. It does not make sense even if we hand over the whole global asset base to Bitcoin to transact on. It does not make sense even if we assume the world will keep offering a 2% perpetual growth in assets to transact with (I am sure Europe would love to have 2% growth rates at some point).

In fact, Bitcoin is not meant for growth. Logically, starting a new transaction network should be more expensive at the beginning, and as it gets widely accepted, building out and maintaining that network should become cheaper. In the case of Bitcoin, it becomes ridiculously expensive and harder to do so because of capital requirements and energy intensity. By the way, did we say already that due to the finite nature of Bitcoins that the network is not built for growth? Maybe alternative networks like Ethereum or some other or a new network can fill the gaps that Bitcoin cannot. Because Bitcoin is not built for scale.

What about Central Bank Digital Currencies? That is the real threat to cryptocurrencies because as designed, that transaction network would be costless and instant and offline too! From what we see, DCEP is on its way and will become the standard in China and its regions of influence before Bitcoin can even get its act together in processing some reasonable level of transactions daily. Other Central Banks are desperately trying to catch up and will have an advantage over Bitcoin. The biggest advantage being that they are approved by the state. In that context, what happens to our transaction fees and margin assumptions? What if providing a payments network became a free, public service (that is Bitcoin's aim after all)? More importantly, what happens to all the fintech valuations that we are currently paying? Are the investments by large payment networks into Bitcoin, thus pushing Bitcoin usage, merely a survival strategy for the future? A payment network does not have to hold cryptocurrency on its balance sheet – unlike US Dollars, the transactions are immediate.

There is no need to hold a buffer. So, is the future of every payments company to become a MicroStrategy? Just equity holders of another payments network?

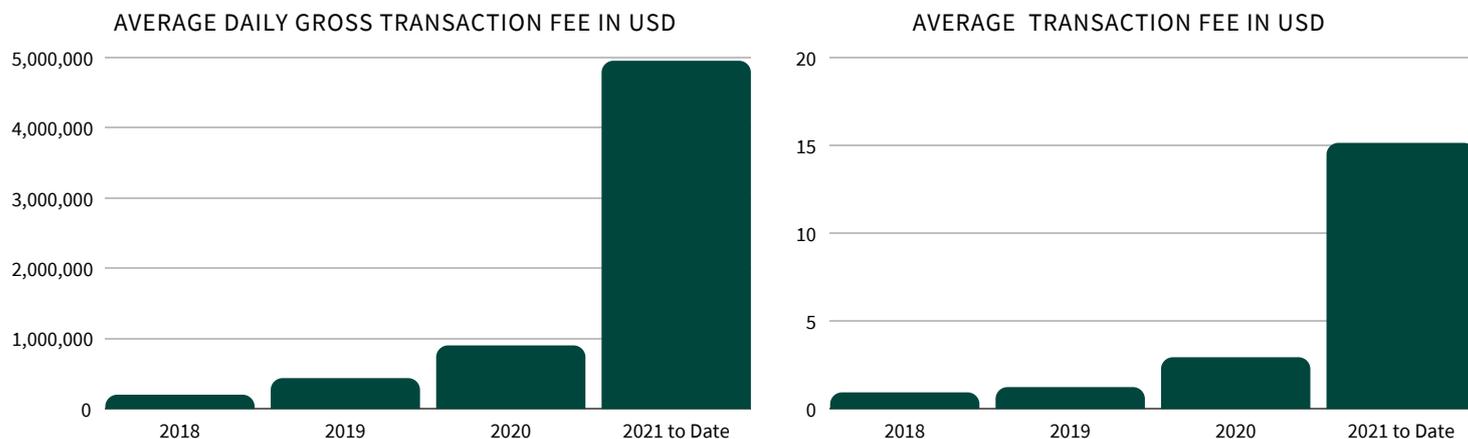
Evaluating Bitcoin as the equity of a new payments network is the only way of understanding the value of Bitcoin. There is surely a possibility that over time that with improvements, it will achieve some success as a transaction network. There are many hurdles to overcome, but whether it will become the only, or even the dominant transaction network is debatable. Even then, it is already being priced as the dominant network as our very generous assumptions show. Perhaps this reflects the valuation framework and narrative around technology investments currently – the desire to price in full value without considering the risks that future developments may bring. Perhaps it is also a consequence of the easy interest rate environment which makes the cost of capital seem deceptively low. The whole Bitcoin scarcity argument is just a narrative applied to the selling of utopian dreams, and many asset gatherers are thriving on this sales pitch. Companies too have a fixed number of shares at any point in time, unless there is a decision taken to issue more shares to plug in capital deficits. We have also seen other scarcity arguments presented in the past in table-thumping fashion – remember Peak Oil?

There are a lot of questions that this whole episode of speculative investing in crypto assets generates that none of the participants even bother to ask or answer. The only discourse we see is around hyperinflation and currency debasement etc. that has hitherto been the purview of Goldbugs. This unfortunately is nothing but Cryptobuggery [12] (with due apologies to everyone wincing right now).

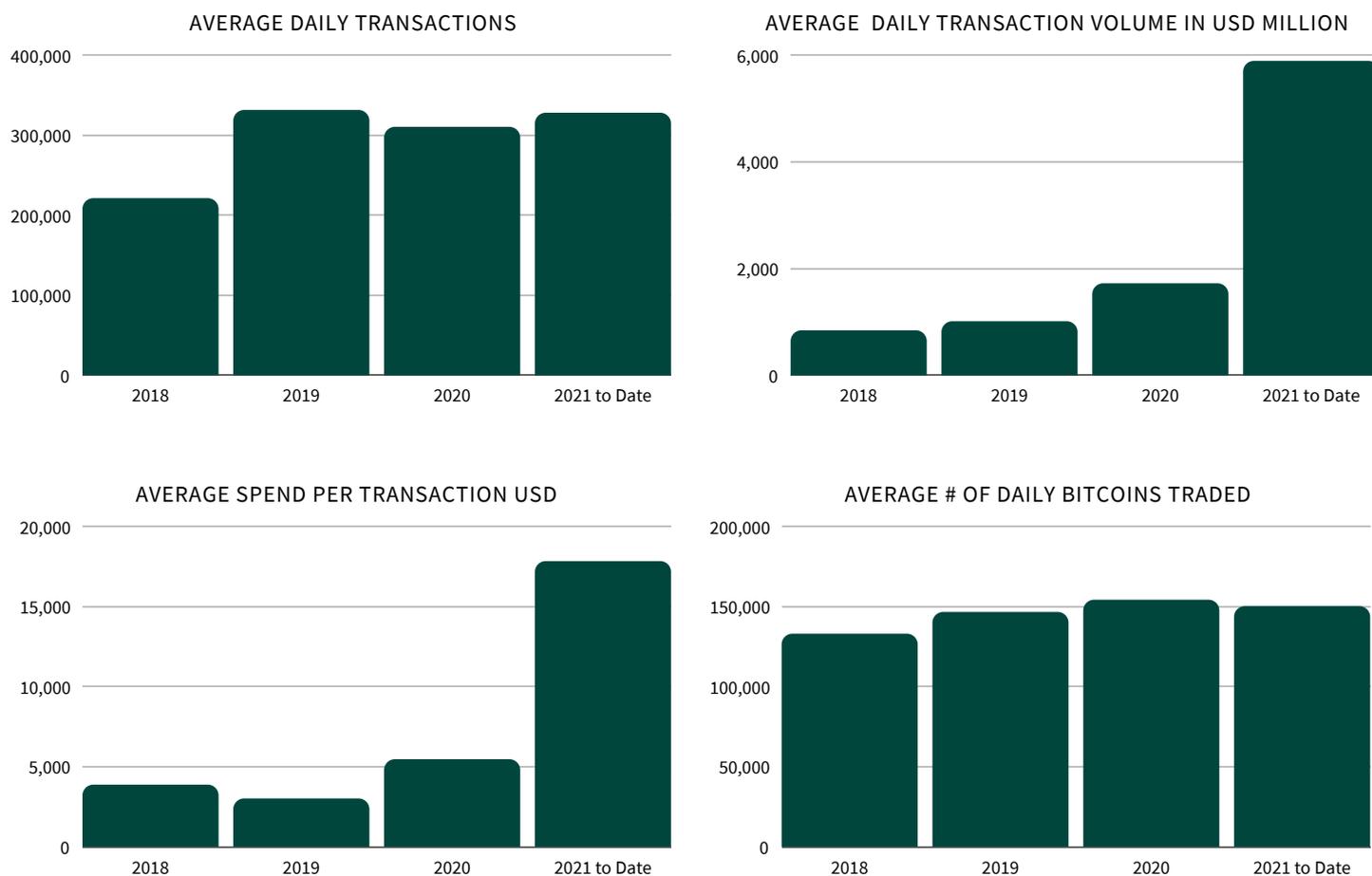
[12] And with due apologies to the sellers of Cryptobug, a beetle that is used as a natural means of destroying other bugs. Maybe this whole episode is just Cryptobugs vs Goldbugs and that is where it will stay forever.

Appendix

A) BITCOIN TRANSACTION FEE (FEBRUARY 2018 TO FEBRUARY 2021)



B) BITCOIN TRANSACTION FEE (FEBRUARY 2018 TO FEBRUARY 2021)



Appendix

C) FREE CASH FLOW MARGIN ANALYSIS (3YR AVERAGE)

FCF BENCHMARKING	NAME	3 YR. AVERAGE FCF MARGINS
V US EQUITY	VISA INC-CLASS A SHARED	52.0%
FLT US EQUITY	FLEETCOR TECHNOLOGIES INC	44.3%
MA US EQUITY	MASTERCARD INC - A	43.5%
FIS US EQUITY	FIDELITY NATIONAL INFO SERV	25.6%
PYPL US EQUITY	PAYPAL HOLDINGS INC	25.0%
GPN US EQUITY	GLOBAL PAYMENTS INC	24.6%
FISV US EQUITY	FISERV INC	20.9%
AVERAGE		33.7%

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