

Farringdon Capital
Management

Bitcoin

Discussion Paper

March 2021
Amsterdam, The Netherlands

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As Bitcoin hits new highs, we find that more reasons are being propagated as to why this cryptocurrency is the future of the monetary system. Many of these views and assertions seem vague and overly simplistic and hence we struggle to follow the logic of the analysis provided. On the other hand, we have studied the monetary system, which is also not simple because of the complex subject matter.

In this paper we attempt to apply our understanding of how the monetary system works and thereby refute some of the claims made by Bitcoin proponents. The views of Bitcoin supporters are not well defined and are not homogeneous, yet we have tried to gather the most bullish arguments and address these highly debatable statements.

This paper describes these bull arguments in turn and attempt to add some objectivity and coherence to the discussion. To conclude from the onset:

- **The view that Bitcoin is a better version of money is oversimplified, probably not true, and completely mischaracterises the nature of Bitcoin and money. Bitcoin is a commodity and money is debt.**
- **Our fiat money system is a far more sophisticated system than Bitcoin because it enables economic growth and wealth creation through credit creation, which Bitcoin does not.**
- **The hypothesis that money printing is good for Bitcoin is ambiguous as there are far more assumptions one must consider.**
- **The erosion of value that currencies have suffered because of inflation is only telling half the story. The compensation that savers have received in the form of interest has historically more than offset these losses.**
- **While the supply of Bitcoin is finite, the demand is fickle. Claims that Bitcoin will be a good store of wealth is entirely dependent on an investor crowd ascribing value to it.**
- **Even if Bitcoin is the new Digital Gold, this does not mean it as an attractive investment.**
- **While the enormous energy consumption of Bitcoin is acknowledged, the environmental impact is largely ignored. We think there is a potential huge win, at little or no cost, to be scored for the environment and a discussion is warranted.**

In the end, one can call us sceptical. As Dutchmen, we are more in the digital tulip camp, believing that the Bitcoin price is driven by a speculative mania rather than Bitcoin being the asset the world was missing. We are surprised by the extremely vocal and negative reactions when an alternative view is presented to Bitcoin proponents. In contrast, we do allow for doubt – indeed, if we all agree that Bitcoin is the store of value for our society, then it may very well be a good investment. Furthermore, if there are fundamental flaws in our thinking then please share these. Our goal is to add a dose of logic and thereby make this a more meaningful debate.

Bull Argument #1: Bitcoin is a better version of Money

As Bitcoin resembles money, we understand that this could lead to confusion regarding the role Bitcoin can play as a better version of money. We will explain why Bitcoin and money are very different, and why this distinction is important.

Part A: Transaction \neq Money

Let us start simple - a famous transaction once took place where someone paid for a pizza with Bitcoin. You can use dollars or Bitcoin to buy a pizza, so what is the difference?

Ask yourself, could the pizza restaurant have accepted an old valuable stamp collection as payment? The answer is yes. The fact that Bitcoin is used to make a payment does not mean, by definition, that it is money.

Part B: Practical Issues

If we define money in its simplest form, then the three generally accepted roles of money are:

1. Medium of Exchange

Bitcoin is extremely slow and there are high costs involved and hence is a poor medium of exchange. Nevertheless, in a hypothetical world it could function as such.

2. Store of Value

We question the attractiveness of Bitcoin as a store of value (we will elaborate on this further in Bull Argument #5) but suffice to say the proponents see it as a far superior store of value.

3. Unit of account

Bitcoin is not a unit of account at the moment, but theoretically it could be.

Consequently, in theory, Bitcoin could fulfil these three traditional functions of money, but we severely struggle with the practical issues. The pragmatic reasons why Bitcoin will not become widely accepted are:

- Transaction costs are extremely high, making every day purchases completely uneconomical.
- The speed and capacity of transactions that can be processed on the Bitcoin blockchain is a tiny fraction of what is required to substitute all transactions that currently take place with money.

Money is widely accepted as a form of payment, which makes it so practical to have and therefore desirable. You can purchase anything that is for sale with money, whilst there is almost nothing you can buy with Bitcoin.

Part C: Money is Debt

A fervent believer could argue that in the future all the practical problems will be resolved. Even then, Bitcoin will not replace money. The reason why Bitcoin proponents believe Bitcoin and money are the same is because they implicitly assume that money is a commodity. This is fundamentally wrong.

WHAT MAKES THE MONETARY SYSTEM UNIQUE IS THAT OUR MONEY IS NOT A COMMODITY BUT A DEBT.

Bank notes and bank balances are ways of keeping track of who owes what to whom in our society, and when we spend money, we essentially pass someone else's debt on to whomever we are paying. The money sitting in your current account is indeed your asset, *and* it is a debt of the Commercial Bank. Similarly, the cash in your wallet is your asset, *and* it is also the debt of the Central Bank.

THE KEY POINT IS THAT ALL MONEY HELD AS AN ASSET, IS RECORDED ON SOMEONE ELSE'S BALANCE SHEET AS A LIABILITY.

This is fundamentally different to commodities, which we contend Bitcoin is. Whether you own a stamp collection, a gold bar or a Bitcoin – all of these are commodities that that can be traded for something else (like a pizza), without any obligation attached to it.

Part D: Money is Required

If we agree that because of the debt-like nature of money that therefore Bitcoin indeed is not the new digital money – the question still arises, can we have Bitcoin as a commodity fulfil the same role as money? The answer to this is also a resounding no.

We need money. Why? We need to pay off our debts. Whether it is business borrowings, mortgages, credit card balances or other debt, they need to be repaid with money. The banking system cannot accept large amounts of Bitcoin to repay mortgages, because depositors at the bank have money entrusted with the bank and expect to get this back. If a bank were to substitute loans with Bitcoins on the asset side of its balance sheet, then the bank would run an enormous mismatch that will bankrupt the bank if Bitcoin were to move lower in price vis-a-vis money.

What about an individual that has no debt? Even they will require money as they are liable for taxes to the government, who only accept money. The fact that debt needs to be repaid in money and that taxes need to be paid in money, means there will always be a demand for this money. The only way to make debt go away is to repay it with money.

Part E: Bitcoin Cannot Replace Money

You can change one commodity for another. For example, if you were using gold you could exchange it all for silver at a certain exchange ratio.

You can also change one currency for another. For example, every 2.2 Dutch Guilders were exchanged for 1 Euro. This meant that all positive and all negative balances were swapped.

What you cannot do is exchange an asset for a currency, which is an asset and a liability.

One person can decide to change all his dollars for Bitcoin, but it just means he pays dollars to the person he purchases the Bitcoin from. The total amount of cash does not change. The amount of cash can only go down when debts are repaid, and this has nothing to do with Bitcoin becoming more and more popular!

Bull Argument #2: Who would ever trust fiat money?

Even outside the Bitcoin community, many are not particularly fond of the concept of fiat money. It is seen as pieces of paper, backed by nothing other than an empty promise from a possibly untrustworthy government.

We think our fiat money system is actually a major evolution from commodity type money systems, of which Bitcoin is one. There are two important points to be made:

- 1) Most fiat money is created by Commercial Banks in the process of providing loans. When a loan is granted, the bank will credit your account with the amount for the loan. You get the money, and the bank has a loan document stating you owe that amount to the bank. For every dollar created there is a loan outstanding that needs to be paid back. The fact that debts are owed in dollars means they have value unless you can renege easily on your debt. You need those dollars to settle your debt. It is not clear to us that the intrinsic value of gold, Bitcoin or any other commodity is always more valuable or more stable than these promises, which are mostly private agreements rather than the government guaranteeing anything. The government can influence the purchasing power of money, and whether this is always a negative depends on how well democracy functions. It is not that we have no worries there, but we think that the soundness of private agreements next to government behaviour needs to be weighed against the value of any commodity staying the same over time. What comfort would you have in a fully Bitcoin backed monetary system, knowing that another cryptocurrency could become much more popular?
- 2) Credit creation results in money creation, which is not possible when the quantity of money is fixed. Economic growth and wealth creation becomes very difficult without credit. Think of the challenge of building a home without being able to get a loan. You need to persuade the carpenter, the plumber and the bricklayer to do the work and be paid over the next 30 years. That home is unlikely to be built. In our sophisticated financial system, the home would be built because credit solves a very important coordination problem.

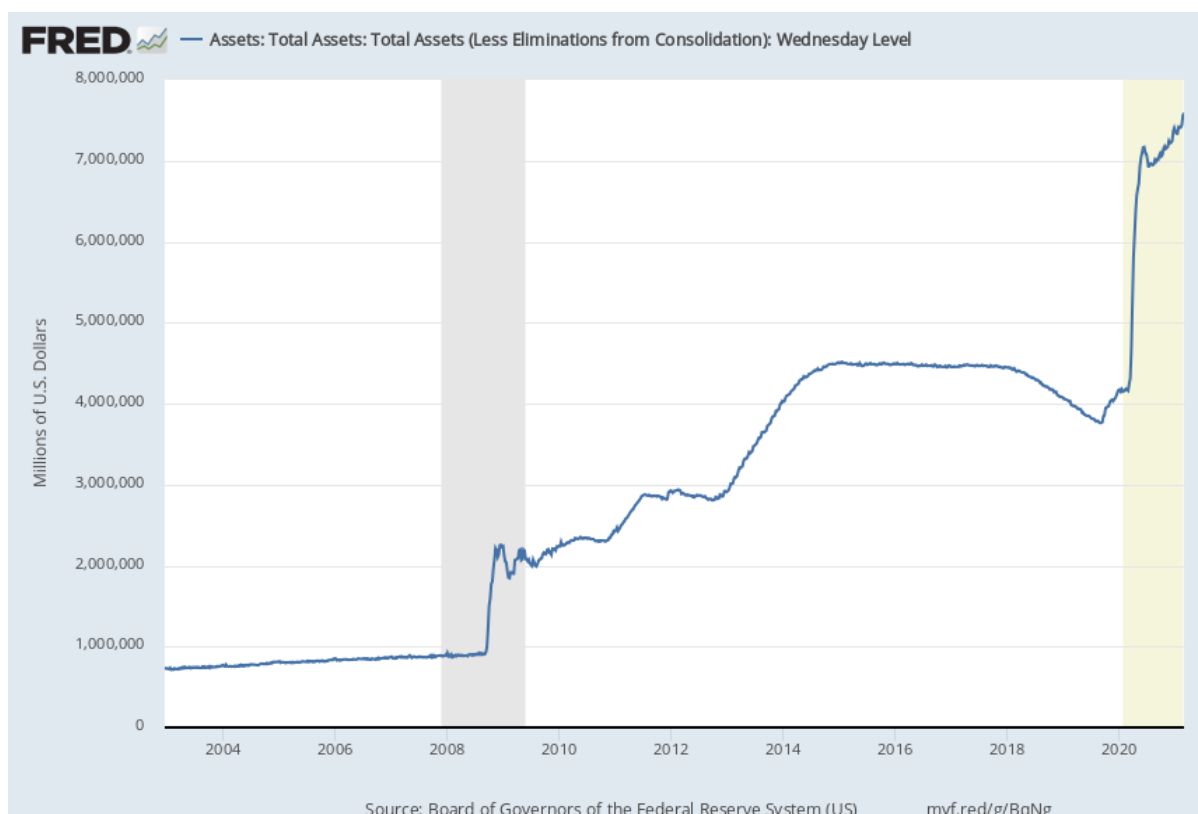
Credit creation with a finite amount of Bitcoin is not feasible. You can lend Bitcoins to others, you can use it as a backing for other currencies, but credit creation with Bitcoin itself is not possible.

If there is no credit creation, then this severely hampers growth and would make Bitcoin arguably even more rigid than the gold standard. Even lending out existing Bitcoins is fraught with difficulties, for example how do you pay interest if you cannot create additional Bitcoins?

Bull Argument 3: Money Printing is Good for Bitcoin

The mistrust for fiat money is partially founded on the notion that the incredible rate of 'money printing' must end badly. In a simple rendition, its more and more dollars chasing the same amount of Bitcoin and given the fixed quantity of the cryptocurrency, it must mean the price of Bitcoin needs to keep going up.

We have seen the chart below which shows the expanding size of the Federal Reserve's balance sheet alongside the rising Bitcoin price suggesting a cause-and-effect relationship. This sounds appealingly simple, but it is wrong.



The term money printing is used often but rarely defined, leading to confusion. We will explain what money printing is by looking at three different flavours of money printing:

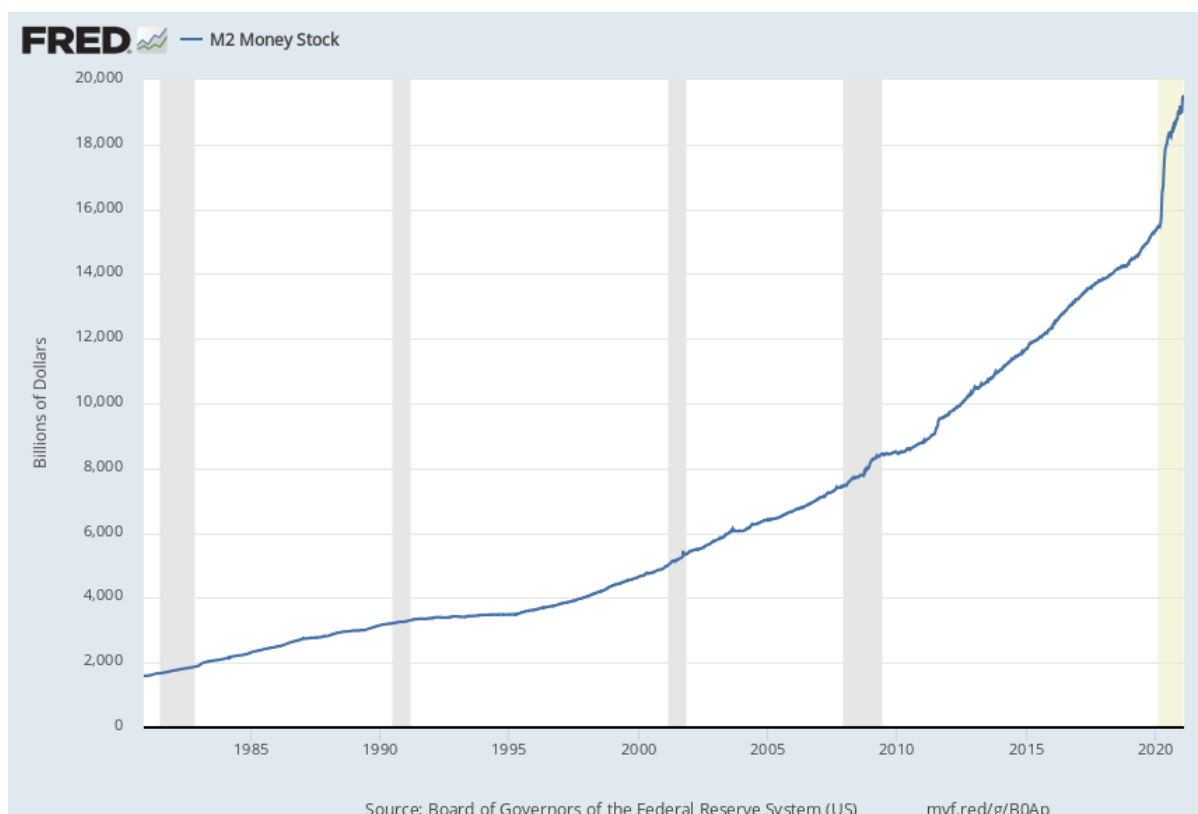
1. The Central Bank purchases assets from the banking system.

When the Central Bank purchases bonds and other financial assets from the banks, it does this by crediting the selling banks reserve account. The reserve account is akin to a current account that banks hold at the Central Bank. This transaction enlarges the Central Bank balance sheet, as it purchases assets, financed by increasing liabilities to the banking system. The balance sheet of the bank does not get larger. The bank simply swaps a financial asset for reserves.

The money supply, which is money held by the public – i.e. excluding the banks and the government – does not change as a result of this transaction.

This first flavour of money printing is what happened to a large extent during the great financial crisis in 2008. Banks wanted to sell assets for which there was no market, so they ended up selling to the Central Bank.

The conclusion of the above is that large scale money printing does not lead to more money. This sounds very counterintuitive, but if you look at the next chart you can see that the increase in the money supply during the great financial crisis was just a blip despite the total size of the Federal Reserve balance sheet doubling as shown in the chart above. The chart below shows M₂, which is a measure of money held by the public, in current accounts, savings accounts and banknotes.



2. The Central Bank purchases assets from the public.

When the Central Bank buys assets from, for example, a pension fund, the Central Bank will credit the reserve account of the pension fund's Commercial Bank. The Commercial Bank will then credit the account of the pension fund.

The end-result is that the Central Bank ends up with an enlarged balance sheet and in this case the money supply does increase. This type of transaction also happened during the great financial crisis but as we have already stated, the money supply did not change much. The reason is that if the public is repaying its debts, this shrinks the money supply. This could exactly be the reason that the Central Bank enters these transactions: to counteract a declining money supply.

The conclusion is that money printing flavour two can lead to more money, but it is not a given because it is the net money supply growth that matters.

3. The Central Bank purchases assets and the government runs large deficits.

The chart above shows that during the Corona Crisis money printing did lead to a discernible jump in the money supply. When the government spends money, which is not financed with taxes, then this money ends up with the public. The government needs to borrow this money from the public. Usually, when the government borrows money, the public pays cash to the government in exchange for these bonds. Government borrowing therefore is a liquidity draining operation.

What is unique about the concerted Corona Crisis response, is that all the money that would have been drained from the public as a result of the borrowing the governments have done, has been offset by Central Bank purchases. The result is that flavour three money printing is the only certain way in

which money printing leads to more money. The claim made by the Bitcoin community that 20% of all the dollars in the world were created in the last 12 months is factually correct. However, any suggestion that this is a normal trend happening for many decades is false, as the historical growth rate was much closer to nominal GDP growth of 6%.

The 20% increase since March 2020, in historical context, is indeed significant. The money supply has increased because of flavour 3 money printing. All the flavour 1 & 2 money printing during the preceding 12 years did not lead to meaningful inflation.

The question is whether flavour 3 money printing will continue in a reckless way, or whether we need to see this as an unusual response to a rather unusual pandemic. We believe the latter, but we acknowledge there are risks.

Currently, we see two risks possibly leading to a higher inflation rate:

1) Too much fiscal stimulus

Politicians were reluctant to spend as much as they probably should have in the aftermath of the great financial crisis for fear of creating unsustainable public debt balances. This time around there seems to be almost no fear, and we think there can such a thing as too much stimulus.

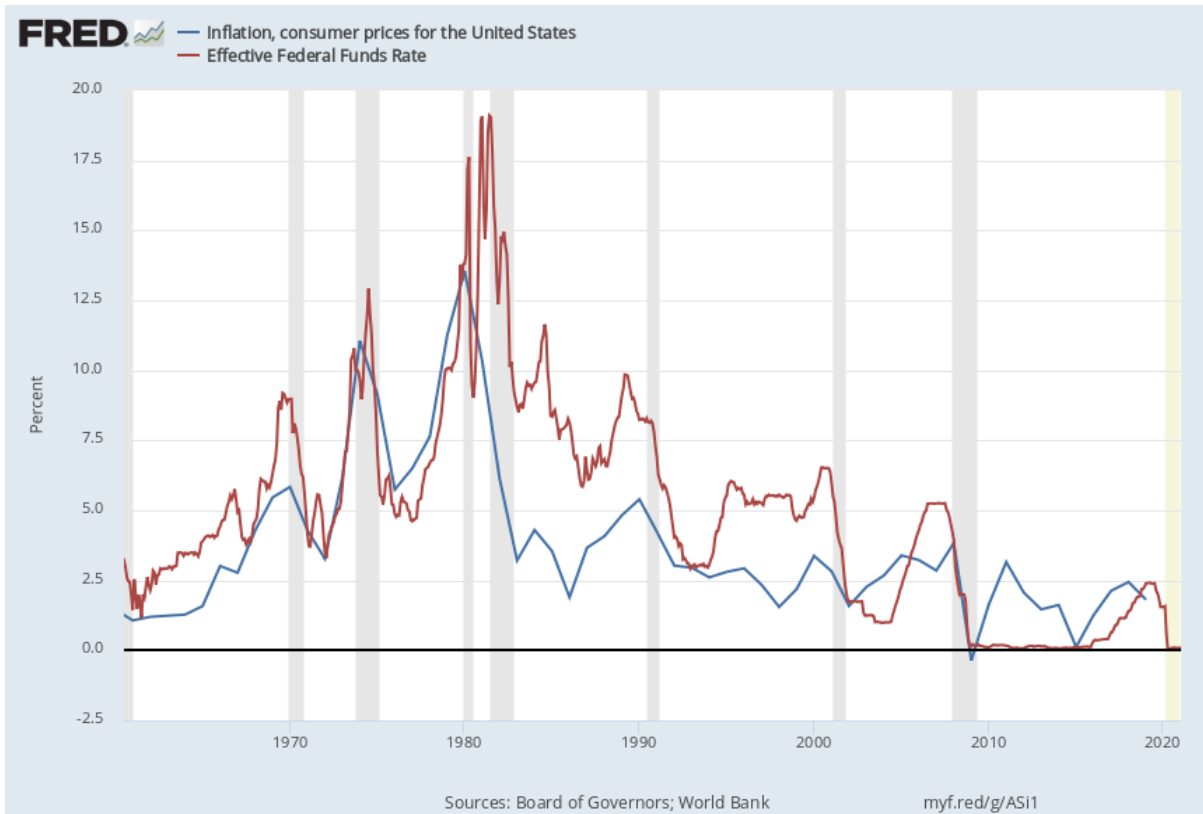
2) Politicians not reversing course

When the economy starts to overheat, it probably makes sense to reverse some of the fiscal stimulus, which will likely mean higher taxes. This requires brave politicians willing and able to take this unpopular step. Trying to please the electorate too much in the short-term may lead to inflation.

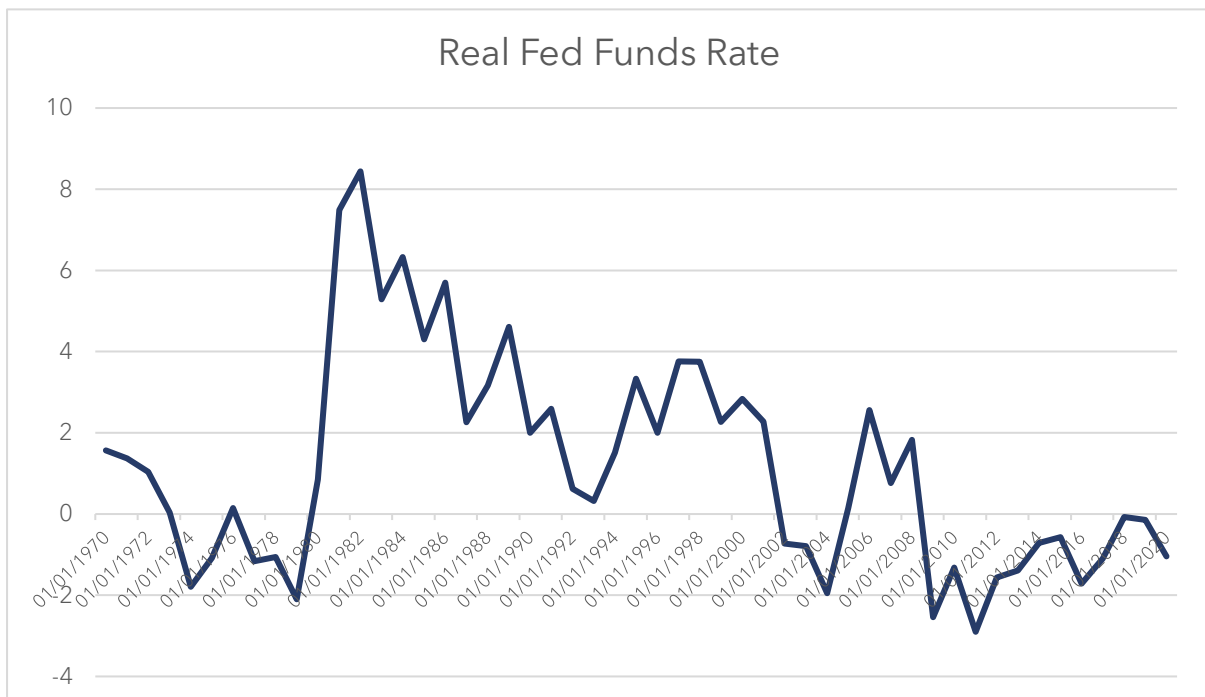
Even if these risks materialise, we think there is a difference between a bit too much stimulus + elevated levels of inflation, and hyperinflation + a collapse of the currency. The exceptional 20% jump in the money supply needs to be balanced against the price risk of Bitcoin. If the 20% jump will not be reversed, and the authorities will make no attempt to offset the inflation that may follow, you may expect the price level to jump 20%. In this context, it is interesting to consider the 300% rise in Bitcoin in 2020 and 77% in 2021 (per March 3rd, 2021).

Bull Argument 4: Bitcoin Is A Better Investment Than The US Dollar

Another reason put forth, which naturally extends on Bull Argument #3, is that money has been a terrible investment because of historical inflation. It is true that inflation has eroded the real value of paper money over time substantially, however, the vast majority of money held are bank deposits, which have historically paid interest rates. The following chart shows that in most years since abandoning the gold standard the interest rate was above the inflation rate. This means that the loss in purchasing power has been more than compensated by the interest rate return.



The following chart subtracts the inflation line from the federal funds rate, which shows the real return an investor holding their cash in a deposit account would have obtained.



Fear of currency debasement has historically been unfounded as most savers have been financially compensated for their loss of purchasing power. Indeed, banknotes under your mattress have lost the vast majority of their purchasing power in the last decades, and this is potentially what the Bitcoin bulls are referring to. However, as shown, the deposit savers are ahead. To put the 'money' figures into context, banknotes in circulation make up about 10% of the US M2 money supply, so at least historically the argument that money, in its entirety, has been a poor store of value is not true as 90% of money held has come ahead. The proportion of currency in the US money supply is as high as 10% because there is a sizeable cash economy, and the USD is popular in other countries. In the UK, banknotes make up only 2.5% of the money supply.

This analysis may seem irrelevant currently, as real interest rates are negative, and it is not unreasonable to think this could remain the case for longer. However, this has not been the norm when considering a longer period and it is the long run that is relevant when thinking about the rapidly rising valuation of inflation hedges.

In summary, the Bitcoin community points to the currency's large loss of real value over longer periods of time because of inflation but fails to mention the interest income that has fully offset this.

Bull Argument 5: Bitcoin is a Superior Store of Wealth

As we laid out in Bull Argument #1, Bitcoin is not money but a commodity. The value of commodities is ultimately determined by how eager consumers are to use it or hold it. The scarcity of the asset in combination with this eagerness determines the price of the asset.

As the number of Bitcoins is fixed, the only thing we need to consider is how eager the public will be to use Bitcoin as a store of wealth. This is impossible to answer, but we do have some thoughts on how to think about it.

Most non-cash flow producing products we ascribe value to are desirable because of the:

- a. Prestige it offers
- b. Use-case
- c. Combination of both

For example, a Picasso painting may have some decorative use, but this does not explain a USD100 million value. This can mostly be ascribed to prestige. On the other hand, grain and oil are valuable because of their use-case. Lastly, gold and silver offer both prestige and have some use-cases as well. We use this framework to analyse the value Bitcoin may potentially offer.

Prestige

It is difficult to see how an owner can derive prestige from a Bitcoin balance. It is possible that in an online world it can be paraded and that a certain status can be derived from it, but we find it inherently difficult to see. In fact, can we take the opposite side of the *coin*: as Bitcoin is terrible for the environment given the excessive energy used to mine it, will Bitcoin holders want to advertise this part of their CO₂ footprint?

Use-Case

Our rebuttal in Bull Argument #1 demonstrates the limited use-case of Bitcoin as digital money. However, one of the attractive traits of Bitcoin transactions is that they are anonymous, which may

provide it as an excellent use-case for criminals. There must be a sizeable risk that society does not want this, which must pose a risk for the use-case and hence the value of Bitcoin in the future.

In summary, we think that Bitcoin has limited value as a store of wealth as it offers little use and no prestige. We acknowledge immediately that we may be overlooking certain reasons for holding Bitcoin. For example, there seems to be a sense of belonging to a community or helping a higher purpose. If this motivates enough people in the long run it could actually make Bitcoin a good store of value.

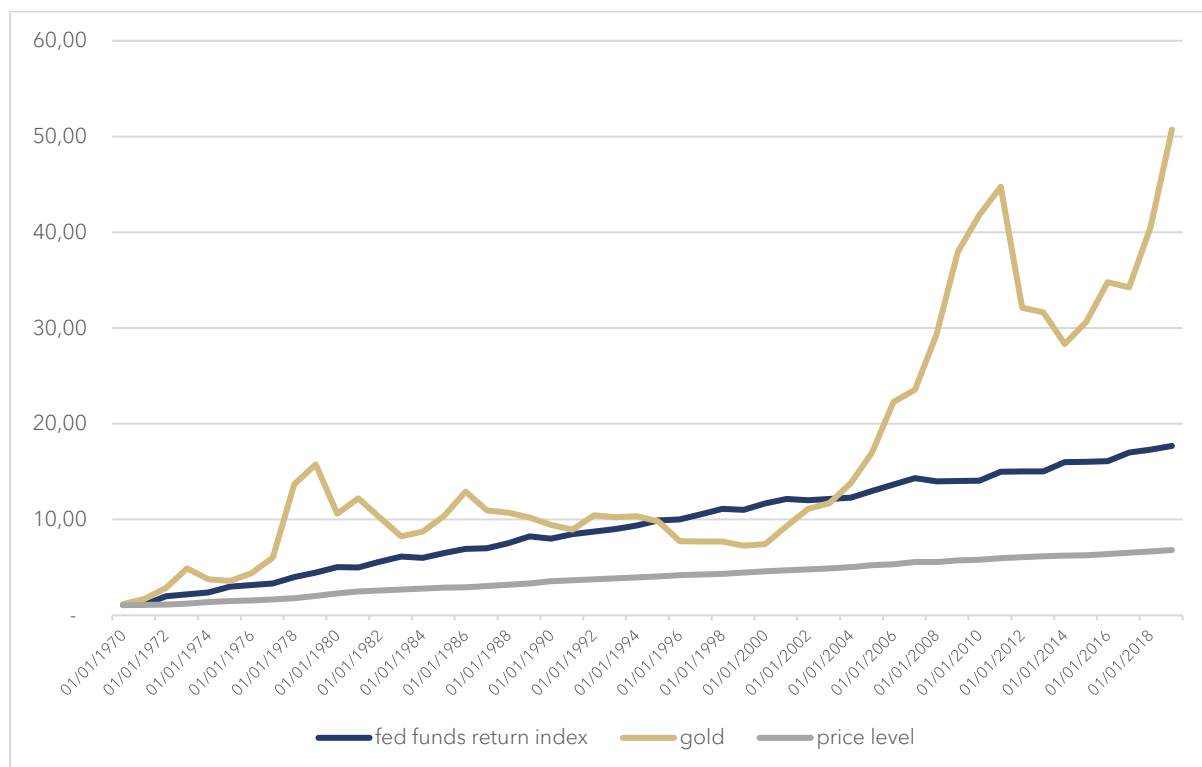
Bull Argument #6: Bitcoin is digital gold, which is better than physical gold

Bitcoin is at time referred to as “Digital Gold”, but then more practical because it can be stored easier and moved digitally. However, one of the attractions of gold is that its physical competition is known – after all, there are only so many elements in the periodic table. For Bitcoin there are many alternatives and many more can and are being invented.

Furthermore, there are some use-cases for gold. If no one wants gold anymore, then it can still be used to make nice and shiny things for which there always has been an interest, or it can be used in industry. If no one wants Bitcoin, then it can really turn out to be worthless. Lastly, the fact that gold has been valuable for thousands of years helps give confidence that it may have some value in the future. In the end, almost anything can be a store of value, if we all agree to it.

THE QUESTION WHETHER BITCOIN REMAINS ATTRACTIVE AS A STORE OF WEALTH IN THE FUTURE DEPENDS WHOLLY ON OUR WILLINGNESS TO SAY IT IS. YOU CAN COUNT US AS SCEPTICS.

We thought it is interesting to make the point that the store of wealth concept does not mean it is particularly safe. Gold has been very volatile and has seen lengthy periods of not being a particularly good store of wealth.



During the last 15 years gold has been a great investment. Which, counterintuitively, were low inflation years. For a Bitcoin investor it is relevant to ask the question: did gold do so well the last 15 years because the 25 years prior it had been a terrible investment? Does the starting point matter?

Secondly, we can see the attraction of zero yielding assets in a low or negative real yield environment. But how will these assets perform if markets were to expect the return of positive real yields?

The value of all the gold in the world is worth about \$10 trillion, which is about 10 times the value of Bitcoin. If investors want to keep a certain percentage of their wealth in zero-yielding assets such as gold or Bitcoin, then Bitcoin could go up 5 times from here while gold halves to keep the total percentage of non-yielding assets the same and have an equal investor preference for gold and Bitcoin. There is no logic behind this calculation and we even deem it to be an unlikely outcome, but it is one way of attempting to quantify what the store of wealth argument could do to the price of Bitcoin.

Spare a Bitcoin for the environment

To us the question of how many Bitcoins there should be is akin to having a discussion of whether it is better to measure the length of the year in weeks or days. The limit of 21 million seems somewhat random, and the number of Bitcoins could also have been limited at 2.1 million or 42 million for that matter. It would not have changed the value of Bitcoin in total.

The key point is that an investor wanting to invest in Bitcoin can always do so because Bitcoins are divisible. What matters for scarcity is that the amount is fixed, and what matters for usability is that this scarce asset can be split in almost infinitesimally small parts. We assume that investors decide which part of their assets they would like to invest in Bitcoin. The price per Bitcoin follows from that decision, and not the other way around.

We find this way of thinking very logical, but it goes against a seemingly popular model to predict the price of Bitcoin called the Stock Flow Model, which stipulates that the smaller the additions to the Bitcoin stock the more valuable Bitcoin becomes. As the Bitcoin algorithm halves the speed at which additional Bitcoins are being created every four years, this supposedly is some guide for future price appreciation. The reason for bringing this up, which to us is a entirely flawed logic, is that this model suggests that the value of existing Bitcoin is influenced by the speed of Bitcoins being mined. Whereas we would argue that if it is scarcity you are after you do not want to see more of it. If we are right in our reasoning, then whether there are 18.6 million or 21 million Bitcoins does not matter for how much Bitcoin is worth in total. This raises the key question:

“IF SCARCITY IS THE KEY ATTRACTIVENESS OF BITCOIN, WHY WASTE ALL THIS ENERGY TO CREATE 2.4 MILLION MORE BITCOINS?”

The annual electricity consumption required, to increase the number of Bitcoins by 2.4 million, is said to be equal to the electricity usage of a sizeable industrialised nation. A number of people have argued that it does not matter because a lot of renewable energy is used. As far as we can tell this is not true, but more importantly, even if 100% of Bitcoin mining took place with renewable energy it is still a colossal waste as this energy could have been used for something useful that is currently relying on fossil fuels.

We are uncertain whether there are vested interests or otherwise technological and/or organisational challenges that prohibit future Bitcoin mining from being stopped. We are uncertain, for example, whether all mining activity is necessary to confirm legitimate transactions, or whether mining happens for the sake of mining. If the latter is true, then we cannot think why this should not be immediately stopped.

There is no need to debate whether Bitcoin benefits or harms society – we can leave that in the middle. Regardless of one's view, the extra Bitcoins do not enlarge the societal benefits but do harm society due to the enormous amount of pollution. Most things that pollute give something in return - extra Bitcoin mining is unique that it does give extra pollution, but nothing in return. If the network really is as energy consuming just to function, and that this energy consumption is set to rise in the future as confirming transactions is algorithmically set to become more energy-hungry, then we move back to a more difficult debate: namely, are the benefits of Bitcoin worth the environmental impact?

In summary, we do not know whether giant energy wastage is a prerequisite for the Bitcoin network to function. We do know that if the energy wastage is mostly linked to growing the number of Bitcoins, then there is a very easy win to be had for those that want a scarce asset and for those that want a clean environment: **Stop Bitcoin Mining!**

Whether it is one or the other, and what a change in the blockchain algorithm technically entails and how to organise it is something we have no expertise in, but we fervently hope to raise this issue and bring the discussion to the forefront. If nothing else, we wish this sparks a dialogue to rally the Bitcoin-believers and non-believers to see whether it is feasible to make a contribution to our planet.

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