

Bitcoin vs Gold vs Fiat

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Bitcoin as a currency

Should bitcoins be adopted on a large scale, will bitcoins have a similar function to fiat currencies?

According to Hayek money needs to be:

1) A store of value and deferral of payments: a currency is an asset whose value is easily stored so that it can be used in the future, provide collateral or pay interest over time. An orange has a short shelf life and takes up a lot of space. A banknote takes up little space and its value over time remains relatively stable, except in cases of hyperinflation or severe deflation. In order to be able to defer a payment for a good or service (like an instalment), a good divisibility of the asset is also necessary.

Bitcoins perform the function of a store of value very well, they do not take up physical space, they do not perish, and they are safe from theft or expropriation. However, if their value is very volatile, it is difficult to use them as a basis for deferring payments. Indeed, such a volatile asset can hardly serve as collateral for the creditor

2) A medium of exchange: goods and services are exchanged via currency

Bitcoins fulfil the function of a medium of exchange very well, since it is possible to send and receive bitcoins worldwide very cheaply and quickly (compared to operations such as bank transfers). However, in a constantly expanding economy, any increase in population, production or the velocity at which goods are exchanged (due to economic and technological growth) will lead to a greater demand for currency. A currency such as bitcoins, which remains in a (almost) fixed quantity relative to other goods or to the population, will appreciate significantly. In fact, if the demand for an asset grows, but its supply is rigid, the asset is relatively scarce compared to other assets and its price will continue to rise. In a scenario where the relative value of bitcoins continues to increase, most users will prefer to hoard them rather than to transact other goods or services. Which could result in bitcoins being (according to Gresham's law) 'good money' and therefore not being used for ordinary transactions by anyone who still has 'bad money' (e.g. euros,

dollars) in their pockets. They will prefer to spend the 'bad money' to get rid of it, rather than the 'good money' appreciating. In this sense, Bitcoin may not replace a fiat currency as a routinely used medium of exchange for a long time.

However, a widespread use of bitcoins does not necessarily mean that they will be used as a currency for the exchange of goods or services. In fact, they could be widespread as a store of value. At the same time, it is difficult to envisage an actual mass adoption if bitcoins are not used as a medium of exchange. It is therefore probable that the two conditions (mass adoption and use as an exchange of goods and services) depend on each other and can only lead to bitcoin being used as a real currency if there is a steady and reciprocal increase in both.

If, however, the expectation of users and financial operators remains that bitcoins will appreciate continuously, it will be difficult to use them as a unit of account (and thus as a medium of exchange) and the incentive to accumulate will discourage users from spending them on goods and services.

3) A unit of account: it is easier to calculate the value of goods and services in monetary units of account than to use other assets. For example, we measure the value of computers and bananas in euros, and not the value of euros and computers in bananas. Euros have the advantage of being a perfectly fungible good, i.e. I can always exchange one euro for another, whereas it is not possible to calculate a unique value for a generic computer and use it as a yardstick. I could calculate the value of a particular Toshiba model, but its value relative to other assets would be too volatile to be a benchmark.

Bitcoins are a fungible asset, but at the moment too volatile to be a good unit of account, because of the highly variable demand. Looking forward, if bitcoins are increasingly popular

and used, their price will continue to soar until demand is saturated, as supply is very tight. It may take many years before demand is saturated, and before then their relative value cannot be expected to remain relatively stable, so they cannot be expected to be used as a unit of account.

The more bitcoin sees mass adoption, the more supply will remain rigid relative to demand.

The conditions for bitcoins to improve in their monetary function are therefore:

- 1 – Widespread adoption of bitcoins among the population
- 2 – Equilibrium between demand and supply of bitcoins. That is, demand has been saturated, the price is rigid and better use as a unit of account as possible.
- 3 – The expected relative value of bitcoins remains constant over time (in the expectations of users and financial operators). That is to say, not only is demand momentarily saturated, but one should also not expect a constant and rapid increase in demand for the same amount of supply.

In the long run towards mass adoption, the use of bitcoins as a currency would be encouraged the more different peoples adopt it, increasing its demand and value. This, however, could raise the expectations of users and financial operators who would expect a constant appreciation, thus causing conditions 2 and 3 above to quickly fall away. This circle of cause and effect may slow down the adoption of bitcoins as a unit of account.

Does this mean that bitcoin may not be the most suitable currency system? One must first assess the suitability of alternatives to Bitcoin itself.

Merits and Flaws of the use of metals as a currency

A metal used as currency has two fundamental flaws

1 – It is not scalable, i.e. it is not divisible into infinite decimal places

2 – It is difficult to transport. Transactions are very slow, expensive and insecure. A large transaction would require a caravan.

For these reasons, gold is totally unsuitable for a modern economy. However, these flaws can be overcome by a gold exchange standard. A trusted institution (the bank) accumulates gold and issues bonds using gold reserves as collateral. In effect, it is no longer gold that is exchanged but securities, i.e. paper money (or numbers on a computer), whose value is linked to gold. Under a pure gold standard the banknote – at least in theory – should be able to be exchanged for gold if presented at a bank (or central bank).

Pros and cons of the gold exchange standard

The gold exchange standard, unlike gold or bitcoin, necessarily requires an intermediary: the bank. This fact, compared to a bitcoin monetary scheme, leads to four problems:

1 – An intermediary entails a cost. For example, the cost of printing banknotes, the administrative management of the institution, security measures against theft, etc.

2 – An intermediary presupposes a relationship of trust: when Alice accepts from Bob 20 paper notes with the signature or stamp of a bank (or a Central Bank), she accepts it because she is convinced that she can exchange those notes for the corresponding amount of gold whenever she wants. On the other

hand, it may happen that the bank is unable to pay back what it owes, i.e. it is possible to trust a wrong bank, which does not have enough gold reserves.

3 – The intermediary is a trustworthy institution, hence in “sight”. It is necessary that many people trust an institution that issues securities such as banknotes, so that everyone accepts to receive them on a daily basis in exchange for their work or goods. This institution must therefore necessarily be important and prominent. Inevitably this subjects it to the influence of strong powers, such as the nation states or the authorities they control (directly or indirectly), such as the Central Banks. Which could be good, or bad, as we shall see.

4 – The intermediary can make credit by creating money. Bear in mind that this can also happen under a gold standard regime, not only under a fiat currency regime.

Money creation under fractional reserve banking

How ‘money creation’ by fractional reserve works

Alice deposits 100,000 in Bank A. The bank keeps a reserve of 40,000 (40%) and 60,000 goes to Charlie as a loan.

Charlie spends it on renovating the house and this money then goes to the builder Bob

Bob deposits the 60,000 into his bank account at bank B.

Bank B keeps 24,000 in reserve (40% of 60k) and makes a loan of 36,000 to Dave.

Now suppose Alice and Bob withdraw all their money from banks A and B, before Charlie and Dave return the loan to the banks.

In circulation right now we have this amount of money:

- o 100,000 Alice

o 60,000 Bob

or 36,000 Dave

So it amounts to 196,000, almost double the existing 100,000. This is in the case of banks A and B holding 40% in reserve. In reality, the reserves today are much lower. The ECB requires banks to hold 2% in reserve (on 18 January 2012 lowered to 1% to give the economy a 'boost' after the crisis [note: this article was written in 2016] so the money in circulation is incredibly larger than the initial base: what is called 'money creation' takes place.

But how do banks A and B pay back Alice and Bob what they owe if they have not yet received the money lent to Charlie and Dave? They borrow from another bank, paying interest on this type of interbank credit.

Generally this is an interest rate called overnight, because a bank only momentarily runs out of liquidity, and by the end of the next day it is already able to pay back what it asked for.

Money creation in gold standard vs fiat currency & filtering

It is not necessarily the case that the bank (the intermediary) doing credit automatically creates money.

If, for example, under the gold standard the bank has 10kg of gold and lends out 10 banknotes worth 1kg of gold each, then it is not creating money.

However, the bank, since it expects to receive 2kg of gold and thus soon have a reserve of 12kg, might decide to lend out 12 notes of 1kg gold and not just 10. In this case it is lending more money than it currently has in reserve, so it creates money.

In gold standard, it was not possible to lend 12kg of gold by

owning only 10kg, but when the currency is a security over gold and not gold itself, it can also become a security over the gold one will own in the future and not only the gold one owns now.

Of course, if in gold standard money creation appears to us as a stretch, so that we would be wary of the bank printing more banknotes than the respective amount of gold it possesses, in fiat currency there is no longer such a 'solid' benchmark, but the mechanism does not change: the bank grants more credit than it currently holds in reserve.

It must be pointed out that, historically, under both the gold standard and fiat currency regimes, banks or central banks have often maintained insufficient reserves of gold to return it simultaneously to all holders of notes or coins (physical or digital). They kept 100% reserves only in exceptional cases (such as the Order of Templars in the late Middle Ages or the Bank of Amsterdam until the first half of the 18th century). Hence, banks have always created money, thus subjecting themselves to a risk of bankruptcy (especially in the event of a systemic crisis and 'bank run').

In the case of fiat money, the amount of money generated through credit is limited by two variables: the money deposited with the bank (d) and the fractional reserve ratio (c). So we have: $\text{credit expansion} = (d / c) - d$ (see for further details H. De Soto – Money, Bank credit and Economic Cycles, ch. 4, and assumed banking system \approx monopolist bank)

Note that in a strongly digital/electronic economy, where money circulates entirely in the banking system, credit expansion is much greater. Indeed, keeping fiat money in the form of banknotes in the wallet or safe means 'filtering' money out of the banking circuit. The central bank will always be able to make expansive monetary policies by putting new banknotes into circulation, but at the very least, commercial banks will not be able to make fractional reserves on those in

our pockets. The 'filtering' allows monetary expansion to be greatly reduced by reducing the value of 'd' in the above formula (see for more details H. De Soto – Money, Bank credit and Economic Cycles, ch 4, p 226 for filtering)

Risks in Money Creation & the Keynesian Theory

If Bank A had not lent the money to Charlie, he would not have had his house refurnished and builder Bob would not have had a job paying 60,000, so Bank B could not have lent Dave another 36,000 to finance his own business, and so on. In short, money creation can temporarily give a positive impulse to the economy.

Alice does not need to consume her money immediately, so she set it aside in the bank. The bank's function is to put Alice's savings to work by lending it to those in need. In this way, those who have an immediate need to use that money can do so: in our case Charlie has the opportunity to spend it on renovation. The bank allows the general 'savings' of the economy, i.e. temporarily unused money, to become 'consumption' or 'investment'. The problem is that in the present case, Alice does not believe that she has 'lent' her money to the bank, but only 'deposited' it!

According to John Maynard Keynes and his contemporary epigones, the more consumption propensity there is in the economy, the more the economy grows, as consumption demand increases output. This mechanism is called the 'Keynesian multiplier' in macroeconomics. It follows that money creation, by stimulating consumption and investment, will also stimulate the economy in general.

However, if a bank is unable to return what its depositors want back, or if it is unable to repay its debts to other banks in the overnight market (or other types of debt), it will probably go bankrupt. Following the previous example:

1 – if Dave's business goes bad and he is unable to repay his debt, bank B will not be able to pay Bob back his money, so he will have to borrow from bank A.

2 – However, if A is in the same situation since Charlie is also unable to repay his debt, it will not be able to lend anything to B. Or bank A might simply refuse to lend money to B, or offer to lend it at too high an interest rate (to compensate for B's high risk of default) for B to be able to afford it.

3 – When B fails, the people who had trusted bank B lose their savings, and the banks that had lent to B will also not get back the money they lent. This triggers a chain reaction, called a systemic crisis. This is what happened in 2007: US borrowers could not repay their debts to the banks, and the bank failures triggered a global crisis.

Excessive money creation can therefore cause cyclical reactions in the economy: a period of economic expansion (stimulated by the availability of credit) is followed by a recession. Our modern economy is typically characterised by this cyclical pattern.

Redistributive effects of monetary expansion

The creation of money does not increase the resources that society as a whole has, i.e. it does not increase the number of physical assets (or intellectual property) that citizens possess. What happens is a simple redistribution of wealth. To give an example:

Let us assume that there are essentially 3 main assets in our ancient tribe: baobabs, houses and carboys. Bob owns 5 baobabs because he is a gardener, Dave owns 4 carboys because he is a craftsman, Charlie owns a house because he is a house builder/seller. In our fictional world, 5 baobabs and 5

carboys are worth the same, and allow you to buy a house. Furthermore, there is a central bank (for simplicity's sake, let us skip the intermediation of the commercial bank) that prints money and is willing to exchange one banknote for each baobab and each carboy.

Both Bob and Dave want to buy Charlie's house. Bob can afford it, Dave cannot. However, before Bob has a chance to pay Charlie, Dave gets an idea: he goes to the BC and asks for 6 banknotes, saying that he can already guarantee 4 carboys he has in stock and that very soon, if he works hard, he will be able to produce 3 more carboys. BC agrees and makes a loan to Dave of 6 notes, with the promise of receiving 7 carboys (one representing the interest rate). Dave goes to Charlie and beats Bob's offer, offering 6 banknotes, worth more than 5 baobabs = 5 banknotes.

If a house used to cost 5 banknotes, it now costs 6. The general inflation index has not increased much, as one banknote always buys one baobab and one carboy. However, houses have increased in price and are now worth relatively more.

This means that the production of houses has an incentive compared to the production of baobabs and carboys, the building materials of houses are more in demand and increase in price, builders can demand higher wages, employ new workers, investors invest in that sector. The entire production sector gains, while the baobab and carboy sector is at a disadvantage because they are products that are worth relatively less.

The credit granted by the CB thus leads to a redistribution of wealth, which, however, may not mean a loss of economic efficiency.

Economic efficiency and monetary policy

Looking back, if all goes well, Dave works hard and manages to produce the 3 carboys in time to pay back the bank. If he had not gone into debt, he would not have worked and produced so much, but the opportunity to buy his dream house was a great stimulus.

The availability of money therefore allowed the tribe to produce more in total: 5 baobabs, 1 house and 7 carboys. What Keynes called 'animal spirit' worked: the availability of credit was a stimulus to Dave's real activities.

In reality, one may question how much this is an indication of greater wealth: to compensate for Dave's satisfaction, one has to say that Bob now does not have the house he wanted, and Dave has worked many more hours and enjoyed less free time (which is in effect a 'resource' taken away from him) and if one were to add up the total utility (if intersubjectively comparable) gained by Dave (net of the loss of utility due to less free time) and Bob's loss of utility, the account might not be positive.

The real problem, however, is when things go wrong and Dave fails to produce the required 3 carboys.

The bank takes Dave's house, who is unable to repay the loan, and puts it back on the market for sale. Bob will buy it for 5 baobabs.

The process was inefficient for a number of reasons:

1. Dave paid a lot of interest on the debt (by working to produce carboys), without really getting anything in return (because the house is taken away from him)
2. Bob gets the house later than he would have liked (which means a loss of utility for Bob)
3. Houses go back to costing 5 banknotes = 5 carboys = 5

baobabs. Relative prices return to the values of pre-money creation. So investors who had moved their capital into the housing market find that they have misallocated their investments and incur a loss and a cost to reallocate their capital, builders return to pre-bubble wages and those employed in the sector risk losing their jobs. The boom period is followed by the recession or crisis period.

Macroeconomic effects of expansionary monetary policy

1. When interest rates fall, the creditor is disadvantaged, the debtor is advantaged. There is therefore an incentive to get into debt and there is a redistribution of wealth from the creditor to the debtor
2. The system is based on the confidence that debtors will repay debts. If this does not happen, by a chain effect the system collapses.
3. In case of a Central Bank acting as a “lender of last resort”, banks and investors are able to make irresponsible financial transactions with low collateral because they can always count on a bailout. Banks are considered ‘too big to fail’, but it is precisely monetary policy that incentivises banks to speculative behaviour.
4. Those who can buy an asset because of the credit they receive (Dave), take that asset away from others who want it (Bob) because of the appreciation of that asset. Monetary expansion can change the relative prices of goods, leading to a redistribution of wealth in different sectors.
5. Some goods or services (those demanded in the sector most awash with liquidity) risk being at the centre of a speculative bubble due to rising prices, resulting in a spillover and systemic crisis (see for example the crisis 2007-2008)

6. Savers, including account/deposit holders (in general the creditors of a bank) will enjoy no or little interest from the loan made to the bank and the cost is possible risks: inability to withdraw i.e.: to get one's money back beyond a certain amount, forced withdrawals by the state, possible bankruptcy and thus loss of one's savings or investments. Nevertheless, intermediation is inevitable as states enact increasingly restrictive laws against cash and moving cash for large amounts would be even more costly.

7. If a monetary expansion produces inflation, i.e. an increase in the relative value of goods relative to money, the first users using the money newly created are at an advantage over the last, who alone will suffer from the loss of purchasing power, since the price increase is not immediate but incremental over time. Those who consume the money first (generally the debtor) have an advantage over those who consume it later (the creditor). In fact, the creditor gains a (low) interest rate over time (zero in the case of the borrower), but loses purchasing power.

Why the Central Bank chooses monetary expansion

Given the effects of monetary expansion, one wonders why the central bank continues to follow a policy of monetary expansion. There are three reasons for central bank intervention: the first is ideological, the other two have political and economic reasons:

1. The dominant ideology, among researchers, academics and bank executives, is still a Keynesian idea that monetary expansion and lower interest rates give a positive impulse to the economy. In fact, a general principle that the FED and ECB have followed to adjust interest rates is the Taylor rule (see below)

2. The Central Bank is an institution "in sight" and therefore

easily affected by political influence. This is true even if the CB is formally independent and not established directly by nation states (early 'central banks' included corporations that arose spontaneously from the aggregation of several banks). Therefore, nation states or supranational communities may have influence on the decisions of the CB. In this regard, it is worth remembering that the nation states are the first debtors, due to the size of the public debt. And the debtor, by definition, benefits from a low interest rate.

3. The Central Bank is owned by the National Banks (such as the Banca d'Italia or the Deutsche Bundesbank), which devolve their profits to the state they belong to (after having made the necessary provisions in the reserves and covered the operating costs including personnel costs). It has to be specified that all the loans the Central Bank grants to commercial banks have a huge economic return (the interest rates paid by all banks), which therefore goes to the state. This is the so-called seigniorage revenue.

Ultimately, the state benefits greatly from the credit created. Keynes thought that money creation was a positive-sum game, because by stimulating the economy (consumption and production) everyone benefits. However, money creation could be a zero-sum game (if not a negative-sum game in the long run), then it is nothing more than a redistribution of wealth from one particular "class" in the society to another. Specifically, from citizens to the state, as a kind of additional tax. In this case, the question of whether or not a monetary expansion is right has to be assessed from other points of view: on the one hand the political and moral philosophy (is such a redistribution right?), on the other hand the analysis of the efficiency and effectiveness of the state's economic instruments: is it economically expedient for the state to decide how to spend the wealth instead of the citizens who produce it? We will not go into this question in depth here, which is instead the focus of other works.

The Taylor formula

The Fed and ECB operate by adjusting interest rates according to principles that follow (or evolve from) the Taylor rule, modified and simplified below to make the fundamental concept more understandable even to those less familiar with equations.

$$i - i^* = f [(\pi - \pi^*) + (y - y^*)]$$

from this, we understand that i must increase if π and/or y increases, ceteris paribus

Interest rate i is the rate applied by the CB. Rate i^* is the real rate in the economy. Recalling the previous examples, rate i is that of the interbank market in the presence of a CB, rate i^* is that which bank B charges Dave for the loan. The difference between the two interest rates must compensate for the difference between the current and the target inflation rate ($\pi_t - \pi^*$) and the differential between current output (which is GDP or income) and the target output ($y_t - y^*$). The target inflation and target income are calculated quite arbitrarily assuming that we know what the desirable level of society as a whole is, which is generally considered to be a stable level with minimal fluctuations and characteristic of a healthy economy (according to some: a full employment level).

Let us assume that the CB has set π^* and y^* according to its estimates, while the interest rate i^* is given in the economy:

1. If inflation π increases with all other variables being equal (thus deviating from π^*) then the CB must increase the interest rate i : in fact a higher interest rate, leading to less money creation and credit, decreases the quantity of money in circulation relative to the quantity of all other goods and services, increasing their relative value (decreasing the prices of goods in the economy and thus bringing inflation back to its target value π^*). Vice versa if

inflation decreases.

2. If income y increases with the other variables being equal (thus deviating from y^*) then the CB must increase the interest rate i : in fact a higher interest rate disincentivises consumption and investment in the real economy (at least according to a typically “Keynesian” assumption), thus leading to a decrease in income and output, which return to the target level. Vice versa if income falls.

If the rule is centred on an equilibrium (albeit a contrived equilibrium, hand-picked by the monetary authorities) why is the rate i constantly kept low, bordering on zero? To answer this question, ask yourself rather: **when has the economy of a modern state ever reached a level of production and income y that is considered ideal by its citizens?**