



Bitcoin

Myths, misconceptions and misunderstandings

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Back in 1924, John Maynard Keynes postulated that a “master-economist must possess a rare combination of gifts. He must be mathematician, historian, statesman, philosopher – to some degree.” And this is certainly not sufficient to really understand bitcoin. A “master cryptocurrency economist” will need specialist knowledge about both software and hardware as well as blockchain technology. That is why traditional economists are finding it difficult to get a grasp on the bitcoin phenomenon. However, bitcoin supporters tend to oversimplify things, too. For example, some of them believe that bitcoin will become a regular means of payment in the long run and simply close their eyes to its disadvantages compared to traditional currencies and traditional banking. After all, many people are wary of using a global, decentralised technology which is outside traditional law.

As a result, the current discussions triggered largely by bitcoin’s spectacular price increases are not very informed or nuanced. All too often, participants only repeat dogmatic claims, for example that “bitcoin will soon be dead anyway” or that “bitcoin will soon dominate the financial sector”. Explaining how improbable either of these two scenarios is already seems to provide an information edge. We hope to make things a bit clearer with this report. However, the issue is so complex that we do not dare to claim that we can conduct a comprehensive analysis. Instead, we will focus on several standard claims, which we will put into context and, if necessary, rectify. This will hopefully help our readers to familiarise themselves with the topic.



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What exactly is bitcoin?

Bitcoin was developed in 2007 – 2009. Back then, a famous white paper titled “Bitcoin: A Peer-to-Peer Electronic Cash System” was published under the alias Satoshi Nakamoto. To this day, nobody knows who hides behind the pseudonym.

Bitcoin is a non-state currency which uses a non-state payment system. The bitcoin system relies on the internet and is therefore decentralised, in contrast to traditional payment systems. In another difference to national and state currencies, new bitcoins are created around the world by private “miners”, who supply the money and receive bitcoin in exchange for doing so. Their task is to verify bitcoin transactions between users, i.e. the transfer of bitcoins from one account to another. In order to do so, the miners need to know about all bitcoin transactions ever made. These past transactions are collected in the so-called blockchain. During the verification process, the new transaction is included in the blockchain. Thus, the miners and the blockchain provide the backbone of the bitcoin system’s infrastructure.

Miners and blockchain form the infrastructure of the bitcoin system

Developers and programmers are at the core of the system. An open-source community administrates and maintains the bitcoin protocol, i.e. the coded rules of the bitcoin system. The bitcoin community, in particular developers and miners, can adapt or reject proposed amendments to the protocol in a democratic vote.

The major innovation on which the system is based is its incentive structure, which rewards programmers, miners and users for compliance with the rules. There is therefore no need for enforcement. Even though the incentive structure has its weaknesses in theory, the system’s stability in practice has exceeded all expectations, which were based on the fate of its predecessors. After all, the first computer or internet currencies were already developed in the 1980s and failed early on.

“Cryptocurrency economists” need a broad range of skills

Back in 1924, John Maynard Keynes postulated that a “master-economist must possess a rare combination of gifts. He must be mathematician, historian, statesman, philosopher – to some degree.” Numerous economists feel that this description is still valid today. And potentially disruptive technologies, from digitalisation to biotechnology, will simply add to the list of requirements, as economists will need to understand just what is innovative about the new procedures. Keynes’s list of requirements is certainly not sufficient to really understand bitcoin. An excellent cryptocurrency economist must have a software background in order to read and understand the bitcoin code. This is necessary, as the code contains the relevant rules, the so-called bitcoin protocol. They must be hardware experts in order to understand the global, decentralised network and the mining process. And they should have an understanding of blockchain technology in order to understand the link between bitcoin transactions and the mining process. That is why traditional economists are finding it difficult to get a grasp on the bitcoin phenomenon. Their forecasts about the future development of bitcoin are often based on traditional, historical patterns. The mantra “this time is different” has always turned out to be wrong in financial market history – just remember the financial crisis of the past decade.

Incentive structure of the bitcoin system rewards rules-compliant behaviour by programmers, miners and users



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Bitcoin supporters tend to oversimplify things, too

This knowledge about the circle of “Manias, Panics and Crashes”¹ is now applied to cryptocurrencies. Consequently, bitcoin is regarded as a digital Ponzi scheme, and traditional economists like to call bitcoin today’s tulip bulbs².

Computer experts are obviously far ahead of economists in the area of IT. However, bitcoin supporters tend to oversimplify things, too. For example, some of them believe that bitcoin will become a regular means of payment in the long run and simply close their eyes to its disadvantages compared to traditional currencies and traditional banking. In addition, they do not take into account clients’ different wishes and needs: while digital natives may be quick to adopt bitcoin, conservatives may never do so. Many people are wary of using a global, decentralised technology which is outside traditional law. Moreover, bitcoin supporters have not really considered the devastating social consequences of an excessively quick mass adoption of bitcoin. In fact, the bitcoin revolution might easily devour its own children.

The current discussions are triggered largely by bitcoin’s spectacular price increases, and all too often, participants only repeat dogmatic claims, for example that “bitcoin will soon be dead anyway” or “bitcoin will soon dominate the financial sector”. Explaining how improbable either of these two scenarios is already seems to provide an information edge. We hope to make things a bit clearer with this report. However, the issue is so complex that we do not dare to claim that we can conduct a comprehensive analysis. Instead, we will focus on several standard claims, which we will put into context and, if necessary, rectify. This will hopefully help our readers to familiarise themselves with the topic.

A list of standard claims about bitcoin

- (1) Bitcoin is overvalued.
- (2) Bitcoin will challenge the predominant role of the USD.
- (3a) Bitcoin will be dead as soon as the regulators intervene.
- (3b) Bitcoin will be dead soon.
- (4) The bitcoin community is hostile to banks.
- (5) The bitcoin system will make traditional payment services obsolete.
- (6) There is a set supply of bitcoin.
- (7) Bitcoin transactions and bitcoin users are anonymous.

¹ See R. Aliber and C. Kindleberger (2015), “Manias, Panics, and Crashes: A History of Financial Crises”.

² In the 17th century, tulip bulbs were for a short time just as valuable as single-family homes.



Claim 1: Bitcoin is overvalued

During the past centuries of financial market history, exponential price rises have always been a sure signal of a boom-bust cycle. The claim “this time is different” was proved wrong almost every time. That is why economists conclude that the bitcoin boom will inevitably collapse, too. However, this time might indeed be different for three reasons:

Bitcoin does not require refinancing

First, bitcoin and the bitcoin system as a whole do not need refinancing, in contrast to traditional investment vehicles. If traditional companies lose their source of financing, for example because investors’ risk appetite changes, the end of the hype – and of the company – will often be near. History provides several examples for this. Remember, for example, the nationally and centrally organised South Sea Company of John Law in the 18th century, the nationally and centrally organised railway companies in the UK during the “railroad mania” in the 19th century, the nationally and centrally organised internet stocks at the end of the 20th century and numerous other well-known misallocations during financial market history.

Decentralised systems have a higher survival probability

Second, while all earthly creation is destined to die sooner or later, decentralised systems are less vulnerable than their traditional counterparts. It might be quite costly and take much effort to try and destroy the bitcoin system. Just like the Hydra, global, decentralised and flexible open-source systems may simply become bigger and even more decentralised – and thus stronger – if they are attacked. This holds true even in case of significant damage to the bitcoin network. In response to every attack on the system, the bitcoin community updates the software and modifies the bitcoin protocol. This makes the network more resilient, which is why bitcoin might considerably outlive the usual length of past boom-bust cycles.

Bitcoin might change the valuation system itself

Third, despite these almost inevitable financial market cycles, some technologies have indeed gone on to change the world. The internet is a top example. Even though many companies went bust shortly after the IT boom around the turn of the millennium, the technology has deeply changed both our society and our economy. Most technological revolutions and boom-bust cycles have taken place outside the financial sector. This is why the valuation of bitcoin is a bit of a challenge: you are effectively trying to determine the value of an alternative monetary system which might change the value of the traditional valuation system itself if it turns out to be a success. These three features – no refinancing needs, high survival probability of a decentralised system and changes to the valuation system itself – already show that any attempts to put a value on bitcoin are quite a complex endeavour.

Standard valuation approaches for assets

Let's assume that bitcoin was an investment asset. Economists regard assets as overvalued if the market price significantly exceeds the fair price. The fair price is usually calculated with the help of (discounted) future payment flows or relative prices. Bitcoin does not offer future payment flows. It is not possible to determine a present value, as in the case of, say, let apartments or dividend-paying stocks. Relative prices, the second common valuation criterion, may point to an overvaluation if they are unusually high compared to either their historical level or to prices in other sectors, regions or countries. For example, if we consider residential property, we compare house prices to rent income, or if we consider equities, we compare market capitalisation to the relevant company's earnings. Once again, there is no benchmark to which the bitcoin price may be compared.



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Currency valuation approaches

Standard valuation approaches are not applicable to bitcoin

So let's treat bitcoin as a currency. Again, it is difficult to identify mispricings. Currency valuations are usually based on growth, interest rate or price differences between currency pairs. None of these can be determined for bitcoin. Growth rates are nationally based concepts. While the global GDP growth rate might be used for bitcoin in the future, this approach appears premature right now in the light of the still small overall number of bitcoin transactions. It is also impossible to determine an appropriate interest rate level for bitcoin. While there have been attempts to create money and credit markets for cryptocurrencies such as bitcoin, the market volumes are small and do not offer a reliable basis for valuation. And determining price differences runs into similar problems. Due to the small number of bitcoin transactions it is not possible to arrive at a sensible definition of a basket of goods, which is, however, necessary for measuring prices. Consequently, it is impossible to calculate relative purchasing power parity, one of the most important measures for long-term balanced exchange rates. Moreover, the bitcoin basket might be quite different from the traditional consumer price basket. Due to the high transaction costs, it might consist mainly of expensive consumer goods, luxury goods and real estate. This would make it difficult to compare the bitcoin basket with traditional baskets, which form the basis for calculating purchasing power parity. Hence, standard valuation approaches cannot be applied right now, and it is uncertain whether they can be used in the future.

Treating bitcoin as a "commodity"

Since bitcoin has neither the characteristics of a traditional security nor those of a currency, it is sometimes classified as a commodity. The analogy seems to make sense, as bitcoin, just like metal, is mined in bitcoin farms and the mining process requires considerable hardware investments and electricity. The small supply of bitcoin also points to similarities with commodities. Supporters of this approach compare bitcoin to precious metals or simply call it "digital gold". However, in contrast to bitcoin, gold and precious metals are used both for jewellery and in manufacturing. Gold, as a scarce resource, has a minimum value that is equivalent to mining production costs. In addition, gold does not weather and can be reused time and again. While production costs for cryptocurrencies are high as well, they are set artificially by the bitcoin protocol. Outside this reference framework, bitcoin is actually worthless; it is just a sequence of digital zeros and ones. It has no intrinsic value. For this reason, it does not really make sense to call bitcoin "digital gold" or treat it as a commodity.

Bitcoin benefits from considerable network effects as a means of speculation and payment

So far, there are no tools to determine the fair price of bitcoin

All in all, there are currently no tools to determine the fair price of bitcoin. It is therefore difficult to say whether bitcoin is indeed overvalued. Rather, from an economic vantage point, the cryptocurrency is a new asset class, which for now is mainly an object of speculation. In addition, it is subject to multiple network effects. The price of bitcoin might therefore rise further. If the number of bitcoin users, traders, developers and miners increase, demand and, in turn, prices might rise as well. Towards the end of 2017, the number of registrations in bitcoin exchanges exploded and temporarily boosted the price. Whether and for how long this effect continues will depend on whether more and more people believe that everyone believes that everyone else believes ... that bitcoin will establish itself as a new store of value and means of payment. Every new registration and every new user will potentially increase the trust in bitcoin, in



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particular if the new users use bitcoin for payment and not just for speculation purposes. If, however, people lose trust in the system, for example due to a hardware or software bug within the bitcoin system itself or due to cyber attacks or regulatory intervention, the fact that it is impossible to determine a fair price might turn out to be a major disadvantage. If everyone rushes for the exits at the same time, prices might collapse indeed.

Claim 2: Bitcoin will challenge the predominant role of the USD

There are no real grounds for this claim, neither in the short nor in the long term. In the short term, high entry hurdles to the bitcoin universe will prevent mass adoption of the cryptocurrency. In particular, the complex handling will keep people from using the currency: users need to open an account with a bitcoin exchange, set up a wallet and take responsibility for keeping their access codes secret. The latter in particular, i.e. the fact that users have to keep their access codes secret themselves and cannot rely on support by a bank or on receiving an automatic replacement for a lost code (as in the case of PINs or TANs), will prevent widespread adoption. Many people reject unregulated, non-state payment means such as cryptocurrencies on principle. And the number of merchants who accept bitcoin payments will be slow to rise at best. If we compare bitcoin adoption to internet adoption, we are probably at the beginning of the 1990s right now. Thus, despite the current hype, bitcoin will remain a marginal phenomenon for some time to come.

Bitcoin unlikely to emerge as predominant means of payment in the foreseeable future

Bitcoin will remain only one of many means of transaction and investment in the coming years, too. If the US dollar was no longer used as a global reserve currency, bitcoin might replace other national currencies to some extent, too. This would raise a host of new questions, however. Would there be demands to switch to bitcoin for private-sector contracts, for example work contracts? If so, at what exchange rate? What would a switch to bitcoin mean for government budgets? What effect might a global, decentralised currency have on taxation? These questions touch upon fundamental issues, which is why a smooth changeover to bitcoin as a predominant means of payment is unlikely. While some bitcoin enthusiasts may be currently regarding the cryptocurrency as the answer to their libertarian dreams, they might soon find that these dreams become nightmares in reality. In all probability, the majority of the global population would refuse to use bitcoin so that politicians would be forced to adopt strict regulation early on. The bitcoin revolution would devour its own children.

Claim 3a: Bitcoin will be dead as soon as the regulators intervene

If the bitcoin community successfully aimed at disrupting the financial sector, bitcoin might indeed be soon a thing of the past (see the preceding paragraph). However, it is much more probable that bitcoin remains a niche product. Regulation is doubtlessly a challenge in this scenario. The cryptocurrency does not really fit into existing patterns. As discussed above, it is unclear whether bitcoin most closely resembles a security, a currency, a commodity, a means of payment or a new asset class. This will make regulation more difficult.



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A global, decentralised currency is difficult to regulate

Any regulation efforts will run into the problem that a global, decentralised currency can simply move from one jurisdiction to another. In fact, such migration has already taken place in the US. In 2014, well-meant regulation in the state of New York caused bitcoin exchanges to move to other US federal states. And strict national regulation will simply make the bitcoin infrastructure move to other countries. Introducing international rules, for example at the G20 level, might be difficult because the countries are already pursuing different regulatory approaches. Canada and Japan, for example, appear to be leaning towards bitcoin-friendly regulation. In addition, uniform regulation at the G20 level might simply result in the bitcoin infrastructure being shifted to smaller countries. For example, Switzerland and Iceland offer a bitcoin-friendly environment, too. Several Swiss cantons already accept tax payments in bitcoin. Moreover, Switzerland has established a “crypto valley” at Zug, where programmers work on cryptocurrencies and blockchain technologies. Iceland is the home of major bitcoin miners. Even if the authorities agreed on a global framework for bitcoin regulation at some point in the future, the implementation will give rise to problems – just remember the efforts to harmonise international financial market and tax rules.

This leads us to four conclusions. First, there are indeed regulatory risks which have an impact on the bitcoin price. Second, bitcoin is likely to survive for the foreseeable future because it can take advantage of different national regulation concepts and approaches. Third, it will be difficult to devise and implement strict and uniform global regulation, as several countries pursue a bitcoin-friendly approach. Fourth, a bitcoin community which aimed to disrupt the current market structure would probably achieve the opposite and quickly cause the regulatory end of bitcoin.

Claim 3b: Bitcoin will be dead soon

Please visit <https://99bitcoins.com/bitcoinobituaries/>. As of 19 December 2017, the website contained 212 links to articles which claimed that bitcoin would be dead soon. The first of them dates back to the end of 2010.

Claim 4: The bitcoin community is hostile to banks

The bitcoin community is doubtlessly critical of banks. It is not a coincidence that bitcoin was created during the global financial crisis, in 2009. Satoshi Nakamoto, the anonymous creator of bitcoin, included the message “The Times 03/Jan/2009 Chancellor on brink of second bailout for banks” in the first bitcoin block. However, in all probability only a minor group of the bitcoin community is really hostile to banks and uses the slogan “unbank the banked”. The core community aims to make banking services available to the poorest of the poor. Providing these people with financial products will be a major challenge for traditional banks for the foreseeable future. Many people in the developing countries are living from hand to mouth, have no access to education and do not even hold an identity card. Thus, they cannot open a bank account and obviously do not have access to other financial products.

“Bank the unbanked”: Can bitcoin supplement traditional banking?

However, these people often own smartphones or will own them in the near future. As soon as bitcoin exchanges and wallets become more user-friendly, they might use bitcoin as a means of payment. This might give them access to other financial products in time. Thus, the focus of the bitcoin community is rather “bank the unbanked”. In this respect, bitcoin can indeed supplement traditional banking. If people in the developing countries had access to financial products, global growth might receive another boost. And this might ultimately



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be beneficial for banks, too, for example if credit demand rises due to large-scale infrastructure projects. Thus, while the bitcoin community may be critical of banks, it is not hostile to them. Moreover, banks, too, might benefit from a successful effort to “bank the unbanked” with the help of bitcoin.

Claim 5: The bitcoin system will make traditional payment services obsolete

The bitcoin community proudly points out that bitcoin transactions take only ten minutes, compared to traditional bank transfers. Bitcoin transactions may be an interesting alternative, particularly for transfers to developing countries, which may take several days and are quite expensive under the traditional system. However, the ten-minute interval is only a theoretical average set out in the bitcoin protocol. In practice, a transaction may take longer. Moreover, traditional payment services will probably accelerate their procedures in the future. For example, the ECB plans to introduce its “TARGET instant payment settlement (TIPS)”, which will offer transfers within seconds, by November 2018. Multi-signature transactions are another advantage of bitcoin. Under this option, bitcoin is not transferred until after several decisionmakers have approved. So far, a similar option does not exist in traditional payment services.

No consumer protection for bitcoin

However, the current bitcoin protocol has a number of disadvantages, too. At the moment, the system can handle seven transactions per second at most. A changeover to “lightning network”, which appears currently attractive and allows micropayments without mining, will probably take some time. This means that the performance of traditional payment systems is several hundred or thousand times better than that of bitcoin at the moment. Moreover, the banks’ systems have proven their reliability and stress resilience time and again over the past few decades. In contrast, the bitcoin infrastructure is still in its infancy. Let us take a look at the hardware of the miners at the core of the bitcoin infrastructure. The bitcoin community itself speculates that a massive security breach might put $\frac{2}{3}$ of the mining hardware out of order. If that happened, a transaction would take considerably more than ten minutes. In fact, the system might even be down for an indefinite amount of time. Bearing this in mind, who would want to entrust large amounts of money to this system? Remember that, moreover, the system operates outside the regular legal environment. There is also a second question: Whom should users sue in case of a loss? The miners around the world or the producers of the mining hardware? Neither appears very attractive. Hackers who successfully invade the system might remain anonymous forever. There is no consumer protection for bitcoin. Bank clients can contact their bank and ask why a transfer was not processed and thus avoid future complications. However, bitcoin users are left alone with any potential problems.

Traditional banking and bitcoin can coexist

Ultimately, bitcoin is an alternative means of payment which has advantages and disadvantages in comparison to traditional banking. Bitcoin will probably fill a niche, at least in the short term. Traditional banking and bitcoin can coexist. At the same time banks are massively investing in blockchain technologies in order to exploit the advantages of cryptocurrencies for themselves.



Claim 6: There is an inelastic supply of bitcoin

The bitcoin supply currently grows by 12.5 bitcoins every ten minutes

The bitcoin supply is not set, neither today nor in the long run. In fact, it currently grows by exactly 12.5 bitcoins, or c. USD 125,000, every ten minutes. This sums up to c. USD 500 m per month, which is roughly equivalent to the amount of liquidity smaller central banks pumped into their economies during the loose monetary policy regime of the last few years. The bitcoin protocol foresees a slowdown in real bitcoin supply growth during the coming years. However, bitcoin mining will not stop until 2140 under the current bitcoin protocol. As in the past, prices might rise more quickly than the supply of newly mined bitcoin. This means that nominal supply would continue to rise exponentially.

In theory, the supply of bitcoin will remain unchanged from 2140. In practice, however, it will shrink many years before that date, as several bitcoin holders have lost their bitcoins during the early years after 2009. Their holdings would be worth several millions of euros today. Since all bitcoin transactions are public, it is possible to determine the number of past ownership changes. A large amount of bitcoin has not been transferred for several years, for example the large holdings of Satoshi Nakamoto. As data losses are an everyday occurrence in the digital world, it is safe to assume that more and more bitcoin will be lost. The supply will shrink accordingly.

Finally, the bitcoin protocol can be modified. This takes place regularly. There have been almost monthly amendments since the first protocol modification in 2011. The bitcoin community might therefore decide to generate more bitcoin. While the community members would certainly refuse such an amendment to the protocol right now, there is no reason to think that they will do so for decades to come, particularly since the open source community is open to everybody.

Claim 7: Bitcoin transactions and bitcoin users are anonymous

Bitcoin transactions are public, and so is their complete history, right from the beginning. It is possible to determine at any time the accounts from or to which bitcoins were transferred. In contrast, bitcoin users can remain anonymous. It is often uncertain who owns which account. However, since the majority of bitcoin transactions is processed via the bitcoin exchanges, the actual number of anonymous users should be limited. Almost all major bitcoin exchanges require users to provide their identity cards or undergo a video ident procedure before they are allowed to trade bitcoins. Moreover, many US exchanges also require new users to produce an electricity or other bill directed to their address during the registration. Basically, bitcoin provides a similar degree of anonymity as other legal means of payment. It is possible to use bitcoin for anonymous payments, for example by printing out bitcoin or the access code to a bitcoin account and exchanging this printout against goods or services. All in all, those who want to remain anonymous can do so by using bitcoin or stick with cash.



Conclusion: It is too early even for a preliminary assessment

Bitcoin opens the door to an alternative, decentralised financial, economic and social structure. The potential disruptive consequences of the blockchain technology are overwhelming, but so is the complexity of the issue. At the moment, there are numerous questionable analogies and erroneous assumptions. It will take some time until the discussion becomes more informed. In addition, it will take several more years for the technology to become established. It remains to be seen whether bitcoin remains the predominant cryptocurrency or is replaced by its competitors by then. On the one hand, developers of new technologies can benefit from particularly strong and self-reinforcing network effects. On the other, however, new technologies may run into unforeseen or unforeseeable problems and be replaced by more efficient follow-up technologies.

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