Why Do Bitcoins Have Value?

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Bitcoin offers an efficient means of transferring money over the internet and is controlled by a decentralized network with a transparent set of rules, thus presenting an alternative to central bank-controlled fiat money.[1] There has been a lot of talk about how to price Bitcoin, and we set out here to explore what the cryptocurrency's price might look like in the event it achieves further widespread adoption. First, however, it is useful to back up a step. Bitcoin and other digital currencies have been touted as alternatives to fiat money. But what gives any type of currency value?

KEY TAKEAWAYS

- Currencies have value because they can be used as a store of value and a unit of exchange.
- Successful currencies have six key attributes—scarcity, divisibility, utility, transportability, durability, and counterfeitability.
- The cryptocurrency bitcoin has value because it holds up very well when it comes to these six characteristics, although its biggest issue is its status as a unit of exchange as most businesses have yet to accept it as payment.
- Bitcoin's utility and transferability are challenged by difficulties surrounding the cryptocurrency storage and exchange spaces.
- However, if bitcoin gains scale and captures 15% of the global currency market (assuming all 21 million bitcoins in circulation) the total price per bitcoin would be roughly $514,000.

Why Currencies Have Value

Currency is usable if it is a store of value, or, put differently, if it can reliably be counted on to maintain its relative value over time and without depreciating. In many societies throughout history, commodities or precious metals were used as methods of payment because they were seen as having a relatively stable value.

Rather than require individuals to carry around cumbersome quantities of cocoa beans, gold, or other early forms of currency, however, societies eventually

turned to minted currency as an alternative. Still, the reason many examples of minted currency were usable was because they were reliable stores of value, having been made out of metals with long shelf lives and little risk of depreciation.[2]

In the modern age, minted currencies often take the form of paper money which does not have the same intrinsic value as coins made from precious metals. Perhaps even more likely, though, individuals utilize electronic currency and payment methods. Some types of currencies rely on the fact that they are "representative," meaning that each coin or note can be directly exchanged for a specified amount of a commodity.

However, as countries left the gold standard in an effort to curb concerns about runs on federal gold supplies, many global currencies are now classified as fiat. Fiat currency is issued by a government and not backed by any commodity, but rather by the faith that individuals and governments have that parties will accept that currency.

Today, most major global currencies are fiat. Many governments and societies have found that fiat currency is the most durable and least likely to be susceptible to deterioration or loss of value over time.[3]

Traits of Money	Gold	Fiat (US Dollar)	Crypto (Bitcoin)
Fungible *(Interchangeable)*	High	High	High
Non-Consumable	High	High	High
Portability	Moderate	High	High
Durable	High	Moderate	High
Highly Divisible	Moderate	Moderate	High
Secure *(Cannot be counterfeited)*	Moderate	Moderate	High
Easily Transactable	Low	High	High
Scarce *(Predictable Supply)*	Moderate	Low	High
Sovereign *(Government Issued)*	Low	High	Low
Decentralized	Low	Low	High
Smart *(Programmable)*	Low	Low	High

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Scarcity, Divisibility, Utility, and Transferability

Aside from the question of whether it is a store of value, a successful currency must also meet qualifications related to scarcity, divisibility, utility, transportability, durability, and counterfeitability. Let's look at these qualities one at a time.

1. Scarcity

The key to the maintenance of a currency's value is its supply. A money supply that is too large could cause prices of goods to spike, resulting in economic collapse. A money supply that is too small can also cause economic problems. Monetarism is the macroeconomic concept which aims to address the role of the money supply in the health and growth (or lack thereof) in an economy.

In the case of fiat currencies, most governments around the world continue to print money as a means of controlling scarcity. Many governments operate with a preset amount of inflation which serves to drive the value of the fiat currency down. In the U.S., for instance, this rate has historically hovered around 2%.[4] This is different from bitcoin, which has a flexible issuance rate that changes over time.[5]

2. Divisibility

Successful currencies are divisible into smaller incremental units. In order for a single currency system to function as a medium of exchange across all types of goods and values within an economy, it must have the flexibility associated with this divisibility. The currency must be sufficiently divisible so as to accurately reflect the value of every good or service available throughout the economy.

3. Utility

A currency must-have utility in order to be effective. Individuals must be able to reliably trade units of the currency for goods and services. This is a primary reason why currencies developed in the first place: so that participants in a market could avoid having to barter directly for goods. Utility also requires that currencies be easily moved from one location to another. Burdensome precious metals and commodities don't easily meet this stipulation.

4. Transportability

Currencies must be easily transferred between participants in an economy in order to be useful. In fiat currency terms, this means that units of currency must be transferable within a particular country's economy as well as between nations via exchange.

5. Durability

To be effective, a currency must be at least reasonably durable. Coins or notes made out of materials that can easily be mutilated, damaged, or destroyed, or which degrade over time to the point of being unusable, are not sufficient.

6. Counterfeitability

Just as a currency must be difficult to counterfeit in order to remain effective. If not, malicious parties could easily disrupt the currency system by flooding it with fake bills, thereby negatively impacting the currency's value.

To assess Bitcoin's value as a currency, we'll compare it against fiat currencies in each of the above categories.

Bitcoin Compared Against Fiat Currencies

1. Scarcity

When Bitcoin was launched in 2009, its developer(s) stipulated in the protocol that the supply of tokens would be capped at 21 million.[5]

To give some context, the current supply of bitcoin is around 18 million, the rate at which Bitcoin is released decreases by half roughly every four years, and the supply should get past 19 million in the year 2022.[6] This assumes that the protocol will not be changed.

Bitcoin Mining

Changing the protocol would require the concurrence of a majority of the computing power engaged in Bitcoin mining, meaning that it is unlikely.

The approach to supply that Bitcoin has adopted is different from most fiat currencies. The global fiat money supply is often thought of as broken into different buckets, M0, M1, M2, and M3.[7] M0 refers to currency in circulation. M1 is M0 plus demand deposits like checking accounts. M2 is M1 plus savings accounts and small time deposits (known as certificates of depositin the United States). M3 is M2 plus large time deposits and money market funds.

Since M0 and M1 are readily accessible for use in commerce, we will consider these two buckets as mediums of exchange, whereas M2 and M3 will be considered as money being used as a store of value. As part of their monetary policy, most governments maintain some flexible control over the supply of currency in circulation, making adjustments depending upon economic factors. This is not the case with Bitcoin.

So far, the continued availability of more tokens to be generated has encouraged a robust mining community, though this is liable to change significantly as the limit of 21 million coins is approached. What exactly will happen at that time is

difficult to say; an analogy would be to imagine the U.S. government suddenly ceased to produce any new bills. Fortunately, the last Bitcoin is not scheduled to be mined until around the year 2140.[8] Generally, scarcity can drive value higher. This can be seen with precious metals like gold.

2. Divisibility
Notably, 21 million bitcoins are vastly smaller than the circulation of most fiat currencies in the world. Fortunately, Bitcoin is divisible up to 8 decimal points.[9][10] The smallest unit, equal to 0.00000001 Bitcoin, is called a "Satoshi" after the pseudonymous developer behind the cryptocurrency. This allows for quadrillions of individual units of Satoshis to be distributed throughout a global economy.

One bitcoin has a much larger degree of divisibility than the U.S. dollar as well as most other fiat currencies. While the U.S. dollar can be divided into cents, or 1/100 of 1 USD, one "Satoshi" is just 1/100,000,000 of 1 BTC. It is this extreme divisibility that makes bitcoin's scarcity possible; if bitcoin continues to gain in price over time, users with tiny fractions of a single bitcoin can still take part in everyday transactions. Without any divisibility, a price of, say, $1,000,000 for 1 BTC would prevent the currency being used for most transactions.

3. Utility
One of the biggest selling points of Bitcoin has been its use of blockchain technology. Blockchain is a distributed ledger system that is decentralized and trustless, meaning that no parties participating in the Bitcoin market need to establish trust in one another in order for the system to work properly. This is possible thanks to an elaborate system of checks and verifications which is central to the maintenance of the ledger and to the mining of new Bitcoins. Best of all, the flexibility of blockchain technology means that it has utility outside of the cryptocurrency space as well.[11]

4. Transportability
Thanks to cryptocurrency exchanges, wallets, and other tools, Bitcoin is transferable between parties within minutes, regardless of the size of the transaction with very low costs. The process of transferring money in the current system can take days at a time and have fees. Transferability is a hugely important aspect of any currency. While it takes vast amounts of electricity to mine Bitcoin, maintain the blockchain, and process digital transactions, individuals do not typically hold any physical representation of Bitcoin in the process.

5. Durability

Durability is a major issue for fiat currencies in their physical form. A dollar bill, while sturdy, can still be torn, burned, or otherwise rendered unusable. Digital forms of payment are not susceptible to these physical harms in the same way.

For this reason, bitcoin is tremendously valuable. It cannot be destroyed in the same way that a dollar bill could be. That's not to say, however, that bitcoin cannot be lost. If a user loses his or her cryptographic key, the bitcoins in the corresponding wallet may be effectively unusable on a permanent basis.[12] However, the bitcoin itself will not be destroyed and will continue to exist in records on the blockchain.

6. Counterfeitability
Thanks to the complicated, decentralized blockchain ledger system, bitcoin is incredibly difficult to counterfeit. Doing so would essentially require confusing all participants in the Bitcoin network, no small feat. The only way that one would be able to create a counterfeit bitcoin would be by executing what is known as a double-spend. This refers to a situation in which a user "spends" or transfers the same bitcoin in two or more separate settings, effectively creating a duplicate record. While this is not a problem with a fiat currency note—it is impossible to spend the same dollar bill in two or more separate transactions—it is theoretically possible with digital currencies.

What makes a double-spend unlikely, though, is the size of the Bitcoin network. A so-called 51% attack, in which a group of miners theoretically control more than half of all network power, would be necessary. By controlling a majority of all network power, this group could dominate the remainder of the network to falsify records. However, such an attack on Bitcoin would require an overwhelming amount of effort, money, and computing power, thereby rendering the possibility extremely unlikely.[13][14]

Bitcoin Challenges

Generally, Bitcoin holds up fairly well in the above categories when compared against fiat currencies. So what are the challenges facing Bitcoin as a currency?

One of the biggest issues is Bitcoin's status as a store of value. Bitcoin's utility as a store of value is dependent on its utility as a medium of exchange. We base this in turn on the assumption that for something to be used as a store of value it needs to have some intrinsic value, and if Bitcoin does not achieve success as a medium of exchange, it will have no practical utility and thus no intrinsic value and won't be appealing as a store of value.

Like fiat currencies, Bitcoin is not backed by any physical commodity or precious metal.[15] Throughout much of its history, the current value of Bitcoin has been

driven primarily by speculative interest. Bitcoin has exhibited characteristics of a bubble with drastic price run-ups and a craze of media attention. This is likely to decline as Bitcoin continues to see greater mainstream adoption, but the future is uncertain.

Bitcoin's utility and transferability are challenged by difficulties surrounding the cryptocurrency storage and exchange spaces. In recent years, digital currency exchanges have been plagued by hacks, thefts, and fraud.[16]

Of course, thefts also occur in the fiat currency world as well. In those cases, however, regulation is much more settled, providing somewhat more straightforward means of redress. Bitcoin and cryptocurrencies more broadly are still viewed as more of a "Wild West" setting when it comes to regulation.[17]

Different governments view Bitcoin in dramatically different ways, and the repercussions for Bitcoin's adoption as a global currency are significant.[18]

Bitcoin Worth vs. Rival Fiat Currencies

In order to place a value on Bitcoin, we need to project what market penetration it will achieve in each sphere. This article will not make a case for what the market penetration will be, but for the sake of the evaluation, we'll pick a rather arbitrary value of 15%, both for bitcoin as a currency and bitcoin as a store of value. You are encouraged to form your own opinion for this projection and adjust the valuation accordingly.

The simplest way to approach the model would be to look at the current worldwide value of all mediums of exchange and of all stores of value comparable to bitcoin, and then calculate the value of bitcoin's projected percentage. The predominant medium of exchange is government backed money, and for our model, we will focus solely on them.

Roughly speaking, M1 (which includes M0) is currently worth about 4.9 trillion U.S. dollars, which will serve as our current worldwide value of mediums of exchange.[19]

M3 (which includes all the other buckets) minus M1 is worth about 45 trillion U.S. dollars.[20] We will include this as a store of value that is comparable to bitcoin. To this, we will also add an estimate for the worldwide value of gold held as a store of value. While some may use jewelry as a store of value, for our model, we will only consider gold bullion.

The U.S. Geological Survey estimated that at the end of 1999, there were about 122,000 metric tons of available above-ground gold.[21] Of this, 48%, or 58,560

metric tons, was in the form of private and official bullion stocks. At an estimated current price of $1,200 per troy ounce, that amount of gold is today worth upwards of 2.1 trillion U.S. dollars.

Since there has in recent years been a deficit in the supply of silver and governments have been selling significant amounts of their silver bullion, we reason that most silver is being used in industry and not as a store of value, and will not include silver in our model.[22] Neither will we treat other precious metals or gemstones. In aggregate, our estimate for the global value of stores of value comparable to bitcoin, including savings accounts, small and large time deposits, money market funds, and gold bullion, come to 47.1 trillion U.S. dollars.

Our total estimate for the global value of mediums of exchange and stores of value thus comes to 52.1 trillion U.S. dollars. If Bitcoin were to achieve 15% of this valuation, its market capitalization in today's money would be 10.8 trillion U.S. dollars. With all 21 million bitcoin in circulation, that would put the price of 1 Bitcoin at $514,000.

Difficulties of Valuing Bitcoin

This is a rather simple long term model. Perhaps the biggest question it hinges on is exactly how much adoption will Bitcoin achieve? Coming up with a value for the current price of Bitcoin would involve pricing in the risk of low adoption or failure of Bitcoin as a currency, which could include being displaced by one or more other digital currencies.

Models often consider the velocity of money, frequently arguing that since Bitcoin can support transfers that take less than an hour, the velocity of money in the future Bitcoin ecosystem will be higher than the current average velocity of money. Another view on this though would be that velocity of money is not restricted by today's payment rails in any significant way and that its main determinant is the need or willingness of people to transact. Therefore, the projected velocity of money could be treated as roughly equal to its current value.

Another angle at modeling the price of Bitcoin, and perhaps a useful one for the near-to-medium term, would be to look at specific industries or markets one thinks it could impact or disrupt and think about how much of that market could end up using Bitcoin. The World Bitcoin Network provides a nifty tool for doing just that.