28 April 2021

RESEARCH NOTE

How to Think About Bitcoin

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What is bitcoin?

Bitcoin was introduced in 2008 as a decentralized, electronic global payment network where transactions do not flow through traditional bank intermediaries, in contrast to systems like PayPal or other e-wallets that do operate through bank transfers. The bitcoin network instead relies on a technology that allows for proof and transfer of ownership without the need for a trusted third party. When the first *block*, also known as a record, was produced in January 2009, there was no value to bitcoin; in 2011, bitcoin's value reached $1.

By 2017, interest had surged, from water cooler conversations to money managers. This year, bitcoin hit a watershed validation moment on April 14, with the first listing of a major cryptocurrency exchange through Coinbase's $76 billion debut on the NASDAQ.

At time of publication, one bitcoin equals about $55,000.

Where does blockchain fit in?

All transactions are recorded in a massive, transparent ledger, called the blockchain. This ledger is maintained by miners, the name given to a collection of users on the network who run software that solves complex mathematical equations to authenticate bitcoin transactions. Miners are rewarded with bitcoins to ensure participation to the validation process.

The word blockchain refers to how the technology operates: it links blocks of around 500 transactions with information that references previous blocks. This iterative process, which utilizes cryptographic hashing, is done through collective verification. The network prevents deletion and alteration of previously validated transactions, offering traceability and security without the need for a central administrator.

What's driving bitcoin prices?

The supply of bitcoin is designed to escape human decision. Hard coded in the bitcoin network source code is a cap of 21 million coins that can ever be minted. The goal of its still-unnamed inventor, known only as the presumed pseudonym Satoshi Nakamoto, was an alternative intermediary of exchange to the fiat currency printed by central banks and de-multiplied through bank credit. A fixed supply is aimed at eliminating the inflation risk associated with fiat money. It's assumed that once all bitcoins are created, miners will want to keep processing transactions on the blockchain for the fees they receive.

Bitcoin creation is programed to slow with time. For every 210,000 blocks mined, rewards granted to miners are halved (called halving), which occurs roughly every four years. Chopping the mining reward in half ensures that the bitcoin supply doesn't grow too quickly. As a result, while about 19 million coins have already been minted, it will take more than 100 years to reach the pre-determined limit.

The rules behind bitcoin supply make demand the only determinant of bitcoin price. Making price the only adjustment variable to changes in demand also results in the high volatility of bitcoin prices in the early stage of its market development. A small percentage of accounts hold most of the bitcoin in circulation—95% of bitcoin is controlled by just 2.4% of the accounts—giving the impression that ownership is highly concentrated. Nevertheless, as adoption increases, there has been a shift towards more dispersed ownership.

What are economists saying about bitcoin?

If there is nothing but trust behind fiat money, their issuers are, for the most part, credible institutions. Its purchasing power doesn't vary much over time or deviate from a sort of fair value determined by economic fundamentals related to demand and supply for the currency. Inflation, if anything, has remained lower than desired in the past few decades. Stability and predictability are what give a currency value.

Since the value of bitcoin has not shown any of these characteristics, economists question its usefulness. Bitcoin is neither anchored on an underlying valuable asset, like gold, nor is it supported by the reputation of a credible issuer, such as a large central bank. Stablecoins attempt to solve this problem by being a different type of unit of account, similar to bitcoin, which can be converted at a fixed rate to a legal tender, like the U.S. dollar. Bitcoin's value is all but stable since it fluctuates with demand on a thin market, where any large transaction has a large impact on its price. This leads a majority of economists to dismiss bitcoin as a fad—or a financial artifact used by a margin of the population to rebel against the system.

Then why is there such demand for bitcoin?

The name *cryptocurrency* associated with bitcoin may be the source of confusion about the significance of its demand. A currency, or money, is defined by the three functions it fulfills: 1) as a unit of account; 2) as a medium of exchange, and; 3) as a store of value. Because its value lacks stability, bitcoin cannot play the role of a currency. Only in a few instances, for example in countries where the official currency is even more unstable than bitcoin and subject to hyperinflation, has the population has made use of it. In Zimbabwe, where foreign units of account such as the U.S. dollar are banned, bitcoin is used to transact. In Venezuela, savings are made in bitcoin to preserve the value. Elsewhere, its volatility represents a major obstacle for its adoption.

More generally, the value of bitcoin can only emerge from the service it provides. Today, we observe demand from a small number of holders using bitcoin to perform peer-to-peer transactions outside the traditional banking system. As more people have been buying it, including a few asset managers who announced entry into the market, a network effect is attracting speculative interest.

Is it easy to use bitcoin today?

PayPal has made it easier for U.S. customers to use certain cryptocurrencies as a form of payment. There is also a growing list of vendors that accept bitcoin payment, including Wikipedia, Microsoft and AT&T. Adoption remains in its infancy given bitcoin's lengthy transaction times (bitcoin can process 4.6 transactions per second; Visa can process 1,700 per second) and high transaction costs averaging $20 per transaction.

And a big question: is bitcoin an asset class?

Simply put, cryptocurrencies may be useful as a diversifier in a portfolio.

So, Bitcoin or Ethereum?

The market for cryptocurrencies is large, with more than $2 trillion at market value; bitcoin represents over 50% of this market.

Ethereum (ETH) is the second-largest cryptocurrency on this market. It is also built as a decentralized operating system of assets, with the advantage that applications can be built on top of it. Many cryptocurrency tokens are issued over the Ethereum network.

What about those NFTs?

Non-fungible tokens (NFTs) are certificates of ownership of digital assets verified on the blockchain. Powered by smart-contract technology on Ethereum's blockchain network, NFTs provide a digital trail of ownership, much like a property deed confers ownership to any real estate asset. Most recently, NFTs have been used as a way of creating tradable digital assets. Crypto Punks—a series of unique 24x24 pixel art images—were among the first NFTs released in 2017. The market has since evolved to include GIFs, video clips, tweets and even entire website pages. The artist Grimes made headlines recently after selling $6 million worth of digital art. In theory, anything can be turned into an NFT. While NFTs are an amazing proof of concept for blockchain, it is not without flaws. The infrastructure it is built on may be trustworthy (i.e. blockchain) but the applications currently built around it may not. For example, the digital files behind NFTs may be duplicated flawlessly, so nothing stops anyone from obtaining a copy of the digital asset in an NFT. As a result, while NFTs show proof of ownership and authenticity, there is yet to be an enforcement mechanism to confirm actual ownership. While blockchain may say you own it, will courts agree? NFTs have left the conventional art world stunned, and there is no denying this new form. And there could be more areas of society that blockchain could change.

What about the energy use bitcoin requires?

It is now recognized that bitcoin requires a tremendous amount of energy, through use of data centers miners rely on to continually verify secure transactions, as well as to power the network on which they exist. By Bank of America estimates, the bitcoin network's annual energy consumption rivals that of small developed countries, such as the Netherlands and Czech Republic, or more than some corporations, like American Airlines. As bitcoin gains further popularity, it's also estimated that a $1 billion of inflow into bitcoin is equal to 1.2 million internal-combustion engine cars being driven over the course of a year. A counterargument is that bitcoin uses a small fraction (10% by some reports) of the energy required to operate traditional financial systems (which also serve a larger proportion of the population). The debate will likely continue, with the expectation that technology will make all systems more efficient through increased use of renewable energy.

What's ahead for this technology?

The renewed interest in cryptocurrencies and the rise of NFTs only help legitimize the underlying technology: the blockchain. Remember, this requires no trust in any of the counterparties one is transacting with; one only needs to rely on the algorithm instead. This decentralized structure means it has the ability to disrupt banks, clearinghouses, payment processors, notaries, and any third party guarantying a transaction or providing authentication services.

Thus, to the extent market participants still trust their counterparties and all involved in a transaction, the push toward blockchain may not provide enough incentive in light of the costs associated with its use. Highly opaque markets, such as physical over-the-counter ones, may stand to benefit, as blockchain creates a central clearing hub that is more transparent and trustworthy.

There has been growing innovation in payment systems mixed with technological progress and new valuable ways of providing payment services. The rise of both applications puts into question the market share of traditional banks, central banks and payment processors by introducing a decentralized transaction system, completely outside the traditional banking system and, for now, government control. If nothing else, both bitcoin and blockchain continue to prove themselves as the great disruptors.

*As of December 31, 2020
21-1624221