

Cryptocurrency: Solution or Problem?

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Abstract:

Cryptocurrencies, as an emerging technology, present both significant advantages and major challenges. As a solution, they offer a decentralized alternative to traditional financial systems, enabling fast, global transactions with low fees. They also promote financial inclusion. Innovations such as smart contracts and decentralized autonomous organizations (DAOs) are paving the way for new forms of governance and financial services. However, cryptocurrencies also pose challenges. Their high volatility can entail considerable financial risks for investors. Anonymity is often exploited for illegal purposes. In addition, security and data protection concerns complicate their adoption and integration into the global financial system. This article explores the current debate surrounding cryptocurrencies, examining their potential as a solution to problems within the financial system or as a problem themselves.

Keywords: Cryptocurrencies, Bitcoin, Blockchain, Smart Contract, Financial Inclusion

Jel Classification Codes: F65, G20

I. INTRODUCTION

Since Bitcoin's emergence in 2009, cryptocurrency has gained worldwide attention and interest-the new form of digital money based on blockchain technology. This financial revolution promises decentralized, secure, and anonymous transactions beyond those made possible by traditional financial institutions. However, all this innovation does not come without its controversies. In this article, I attempt to describe whether cryptocurrencies are a promising solution to modern finance challenges or even created more problems than they could solve.

The originality of this article can be seen in the in-depth analysis that it gives to the newly emerged technologies and their effects on the structure of cryptocurrency: blockchain and smart contracts. This paper explores how these innovations in technology are transforming not only how the very cryptocurrencies operate, but even extends to a variety of economic sectors, showing useful, innovative applications of this new technology. This will add the technological perspective to an analysis of the pros and cons of cryptocurrencies and underpin the contribution that this paper makes-a contribution not confined to the simple financial debate but one that highlights disruptive potential for our modern society.

First, a definition of cryptocurrency will be provided, followed by their advantages and disadvantages. After that comes a description of the future of cryptocurrencies. Finally, in the last section, we will give the conclusion with some recommendations.

II. Definition of Cryptocurrency

A cryptocurrency is a digital or virtual currency that uses cryptography to secure transactions, control the creation of new units and verify the transfer of assets. Unlike government-issued fiat currencies, cryptocurrencies are generally decentralized and operate on a technology called blockchain. The blockchain is a distributed, immutable ledger that records all transactions transparently and securely.

What is the difference between e-money, virtual currency and cryptocurrency?

Digital currency is the umbrella term used to describe all electronic money, which includes virtual currencies and cryptocurrencies

It can only be owned or spent using e-wallets. Virtual currencies are a type of digital currency, usually controlled by their creators, and are used and accepted among members of a specific virtual community. A cryptocurrency is a currency based on several cryptocurrencies as decentralized database-based systems that do not need a trusted third party such as a central bank or credit card company, in which case peer-to-peer transfers are facilitated through the use of private and public keys (Nakamoto, 2008).

III. Advantages of Cryptocurrency

3.1 Decentralization

One of the major benefits that the cryptocurrencies bring about is their aspect of decentralization. It does not require an intermediary function of the central bank anymore; on the other hand, digital currency gives more freedom to owners from the financial point of view. This reduces its manipulation by any financial organization or state. Since cryptocurrencies are from a decentralized nature, they challenge the monopoly of the central banks and conventional financial institutions with more democratic and transparent systems.

For example, Bitcoin operates on a decentralized network of thousands of independent nodes, making a single takeover almost impossible.

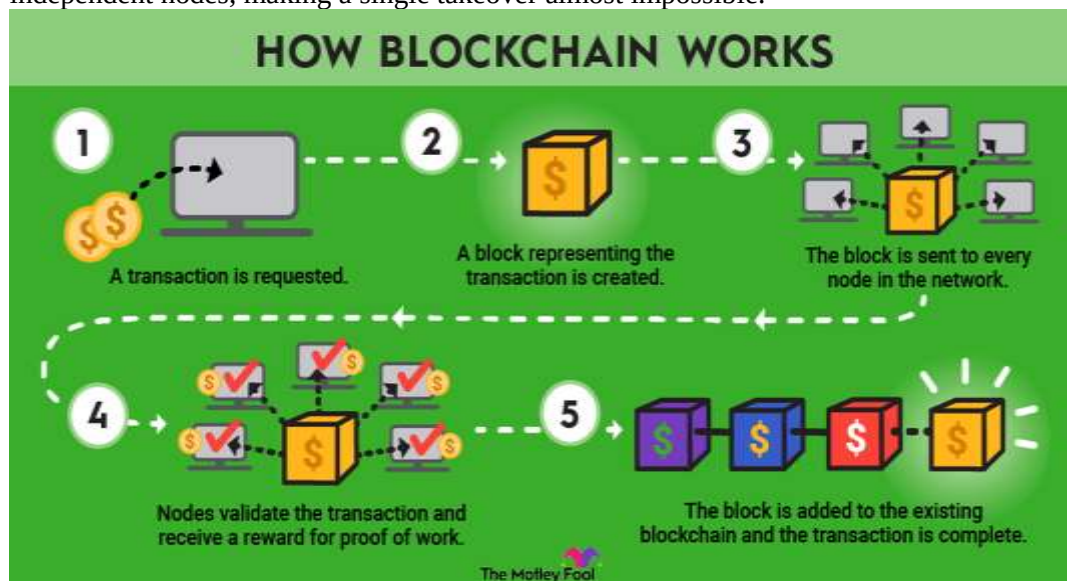


Image source: The Motley Fool ([Andres, 2023](#))

3.2 Transparency and security

The blockchain technology is such that it guarantees complete transparency of all kinds of transactions that take place over it. Every transaction is recorded with a public registry. No scope for manipulation or fraud is allowed by it. Encrypted transactions provide another high-class security to the users against piracy. Ethereum is another renowned cryptocurrency, which implements smart contracts. Smart contracts automatically get executed whenever pre-defined conditions get fulfilled from both the parties. It removes all risks of contract fraud.

A smart contract is a computerized transaction protocol that executes the

terms of a contract (Szabo, 1997).

Smart contracts are pieces of programs running in an automated manner within the blockchain network once certain conditions have occurred. These contracts allow an agreement between parties, automatically executed and without any third-party intermediation. Smart contracts operate in a decentralized manner, securely deployed to perform agreed terms at a very high degree of accuracy with no requirement for absolute trust amongst parties.

How does a Smart Contract Work?

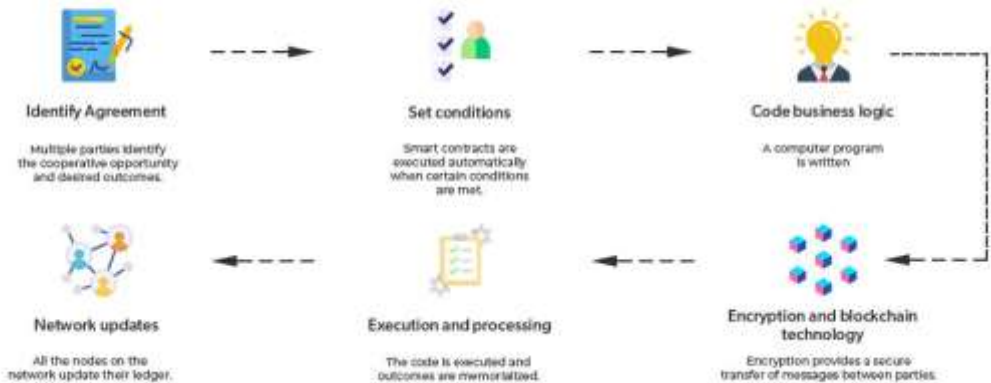


Image source: Geeks for Geeks (2024)

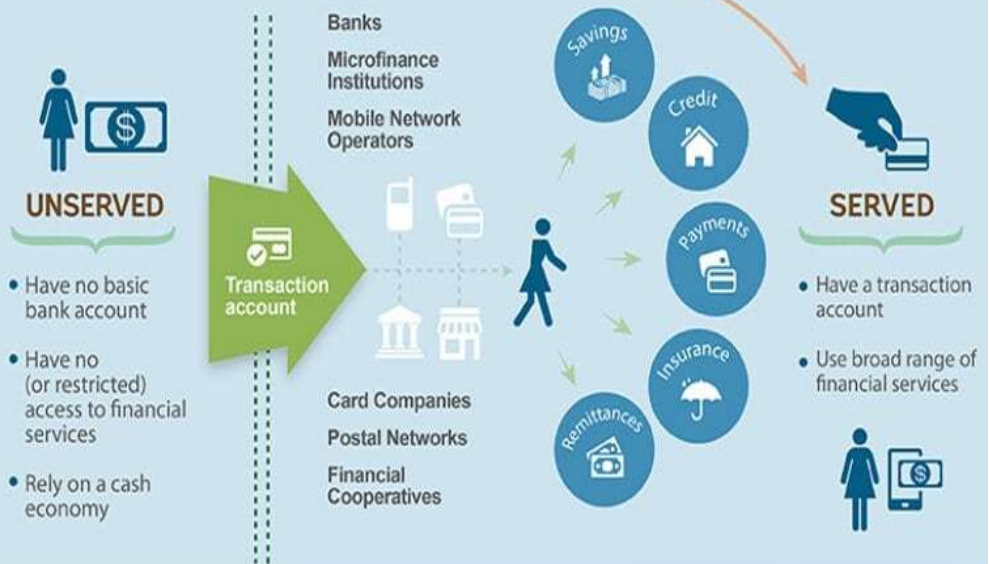
3.3 Accessibility and Financial Inclusion

Cryptocurrencies can be sent and received anywhere in the world, without the restrictions of traditional banking systems. They also offer an opportunity for the unbanked to access financial services, improving global financial inclusion.

According to a World Bank study, Great strides have been made toward financial inclusion – the number of adults without access to an account has steadily declined from 2.5 billion in 2011 to 1.7 billion in 2017 to 1.4 billion in 2021. As of 2021, 76% of the world's adult population had an account, this percentage was 69% in 2017 (Demirguc-Kunt et al., 2018). But because account ownership is nearly universal in high-income economies, virtually all unbanked adults live in developing economies. Digital financial services, including those involving the use of mobile phones, have now been launched in more than 98 countries, with some reaching significant scale. As of early 2021, there are over 1.35 billion registered mobile money accounts worldwide. As a result, millions of formerly excluded and underserved poor customers are moving from exclusively cash-based transactions to formal financial services using a mobile phone or other digital technology to access these services.

Gateway to Financial Inclusion

How to get there?



What's needed to get there?

- Broader inclusion
- Customer-centered product innovation
- Financial capability
- Strong consumer protection
- Better financial infrastructure
- More & interoperable access points
- Enabling legal & regulatory frameworks
- Public & private sector commitment
- Open & balanced playing field

Image source: Drishti IAS (2020)

3.4 Low transaction costs

Sometimes the fee for a cryptocurrency transaction is way lower than the fee paid using any traditional means, such as international wire transfers. That alone could be a great economy for the user. Cryptocurrencies allow fast and affordable money transfers without the intermediaries in their usual sense, which enables lower costs and higher efficiency.

Catalini and Gans (2016) show how blockchain, by eliminating

intermediaries, makes it possible to lower the costs associated with transactions, particularly by reducing cost of verification and cost of networking.

Raskin and Yermack (2018) claim that cryptocurrencies enable microtransactions at very low fees, which is not economically viable with traditional payment systems. For example, Bitcoin transaction fees are often lower than those for international bank transfers, which can cost between 10 and 50 USD.

3.5 Transaction speed

Transaction speed is claimed to be much faster than other systems in most of the marketing related to cryptocurrencies. In reality, the actual time taken by a transaction to get recorded depends on the underlying technology, network, and market conditions pertaining at a point in time. Cryptocurrencies confirm transactions within minutes, while bank transfers can take up to several days. This makes international payments so much more convenient.

Introducing Ethereum, Buterin (2014) explains how consensus algorithms such as Proof of Work (PoW) and Proof of Stake (PoS) impact transaction speed. Ethereum 2.0, for example, seeks to improve transaction speed by switching from PoW to PoS.

Ripple (XRP), for example, is a cryptocurrency designed specifically to facilitate fast, low-cost international transactions, often in just a few seconds.

Shahriar & Mahmoud (2020) introduce PPOW (Parallel Proof of Work) as an enhancement over the traditional PoW. The consensus mechanism of PPOW allows the mining of several blocks simultaneously in parallel chains rather than sequentially. The authors prove that PPOW can significantly reduce confirmation time without noticeable sacrifice in either blockchain security or integrity. That is, PPOW can handle multiple times more speed in transaction processing compared to a conventional PoW system.

3.6 Return potential

As an investment, cryptocurrencies can offer high returns. Although this comes with a great deal of volatility, many investors have made substantial profits thanks to the rapid price growth of certain cryptocurrencies. Cudd et al. (2018) find the measures of cryptocurrency returns and risk to be a very high multiple of those of conventional investments, and the pattern is determined to be robust relative to the time frame.

3.7 Technological innovation

Cryptocurrencies have led to the development of new technologies and applications, such as smart contracts and decentralized finance (DeFi), which may potentially revolutionize many sectors of the economy. A notable example is Ethereum, which has enabled the creation of thousands of DApps on its chain.

Unlike typical applications that rely on high availability from centralized servers, DApps execute themselves in a decentralized network of nodes, normally on some blockchain. That means, by design, they are permissionless

and have no single entity in control, usually resistant to censorship. DApps are usually open-source; their code is public, which provides all the opportunities for the community to see how they work, contribute to them, and make sure they are transparent. For instance, MakerDAO is a DeFi DApp that allows users to create DAI, a decentralized stablecoin, by minting against collateralizing assets. The protocol works in a decentralized manner, and it is also governed by holders of the MKR token pool, otherwise known as Maker.

3.8 Anonymity and confidentiality

Cryptocurrency transactions can be carried out pseudonymously, offering a higher level of privacy than traditional financial systems. [Bunjaku et al. \(2017\)](#) note that any company can create an infinite number of bitcoin addresses without reference to name, address or any other information. Some cryptocurrencies, such as Monero (XMR) and Zcash (ZEC), are specifically designed to offer a high level of anonymity. They use technologies such as ring signatures and zero-knowledge disclosure proofs (zk-SNARKs) to mask information about transactions and the parties involved.

IV. Disadvantages of Cryptocurrency

4.1 Volatility

Cryptocurrencies are very volatile. Their prices might increase or drop tremendously within a very short time, which may be extremely risky both for investors and users. Generally, the volatility of cryptocurrencies is driven by speculations. Since the markets for cryptocurrencies are relatively new and not regulated, many investors tend to be motivated more by the search for quick profits. This may lead to a wild-goose chase for exceptionally high returns in record time, thus causing extreme movements in prices. If investors expect the price of the cryptocurrency to go up, they will buy massively, hence leading to a sudden increase in demand and its exchange rate.

Cheah and Fry (2015) find that Bitcoin prices contain a substantial speculative bubble component and their results show that the fundamental value of Bitcoin is zero.

4.2 Regulation and legality

There is huge variation in how different countries regulate cryptocurrencies, with some banning them, some tolerating them, and others bringing them under regulation. Due to a lack of a clear regulatory framework, it sometimes creates legal problems and may not attract potential investors.

China, for example, banned cryptocurrency transactions in 2021, causing a significant drop in the market.

A government committee made up of regulatory authorities in Saudi Arabia also issued a statement clarifying that cryptocurrency trading is illegal in the Kingdom, as it has negative consequences and significant risks for traders

because it is outside of the government's supervision. The committee further confirmed that cryptocurrencies including, but not limited to, Bitcoin are not approved as official currencies in the Kingdom and no parties or individuals are authorized for such practices by regulators in the Kingdom.

4.3 Security and fraud

Despite the security of blockchain, cryptocurrency exchange platforms can be hacked, resulting in the loss of funds for users. The cryptocurrency sector is also prone to scams and fraudulent projects, representing a considerable risk. According to Jokić et al. (2019), Lack of knowledge in information technologies leads users to the risk of various online frauds. Also, Yermack (2024) states that Bitcoin transactions are risky due to the absence of basic consumer protection, such as the provision of refunds that result from disputes between merchants and customers.

For example, in March 2014, the criminals exploited transaction mutability in Bitcoin to attack MtGox, the largest Bitcoin trading platform. It caused the collapse of MtGox, with a value of 450 million dollars Bitcoin stolen (Li et al., 2020).

4.4 Limited use

However, in as much as more merchants are now accepting digital currencies, their acceptance still remains very limited compared to traditional fiat currency. It pertains to an issue related to the lack of regulation in using and exchanging cryptocurrencies. This, in return, restricts their utility for everyday forms of payment. In a report provided by HSB, only 36% of US small and medium-sized businesses accept cryptocurrency payments.

Zohar (2015) explains how the limited use of cryptocurrencies is partly due to regulatory uncertainty. This uncertainty discourages businesses and individuals from adopting cryptocurrencies due to fears of legal repercussions or changing regulations.

4.5 Technical complexity

Probably the most important challenge with the technology of cryptocurrency is that it can be so complex that many non-techie people would not even bother to try to understand or use it. More specifically, handling a cryptocurrency wallet requires some security knowledge, for example, one must avoid private key compromise. It is at this level that technical complexity will deter many potential users. According to Zakarneh et al. (2022), While Blockchain-based cryptocurrency technology is somewhat complex, the user needs to know about it and learn it well before starting to invest in it. The lack of knowledge about it exposes the user to the risks of hackers.

4.6 Environmental impact

Some cryptocurrencies, such as Bitcoin, use consensus mechanisms (such as proof of work) that require large amounts of energy, which has a negative environmental impact. Energy consumption linked to cryptocurrency mining is a

growing concern. According to Narayanan et al. (2016), the whole Bitcoin network is consuming perhaps 10% of a large power plant's worth of electricity. For example, to validate a single transaction in Bitcoin, electricity consumption in December 2017 was estimated to be 215 kWh, equivalent to six months of work on a computer running day and night (De La Bastide, 2017).

Stoll et al. (2019) determine the annual electricity consumption of Bitcoin, as of November 2018, to be 45.8 TWh and they estimate that annual carbon emissions range from 22.0 to 22.9 MtCO₂. This means that the emissions produced by Bitcoin sit between the levels produced by the nations of Jordan and Sri Lanka.

4.7 Liquidity risks

Compared with traditional financial markets, cryptocurrency markets can be less liquid, which can make trading more difficult and increase price volatility. Sharp price fluctuations can lead to significant losses for investors in the event of a mass sell-off. Any central authority into the various legal currencies, which are necessary to reap the benefits of speculation, cannot guarantee the convertibility of cryptocurrencies. Investors can only get their coins back if other users are willing to buy Bitcoin. Thus, the system can collapse at any time when investors are unable to monetize it. Tymoigne (2015) notes that bitcoins are illiquid and have shown high price volatility, and that the discounted cash value of a bitcoin is zero.

4.8 Risk of loss

The loss of private keys, which are required to access cryptocurrency wallets, can result in the permanent loss of funds. This underlines the importance of secure private key management. According to Chainalysis (American blockchain analysis firm), around 20% of existing Bitcoins, or approximately 3.7 million BTC, are considered irreversibly lost.

According to the Assistant Director at Federal Trade Commission, Elizabeth Kwok (2018), anyone who promises you a guaranteed return or profit is likely scamming you. Just because the cryptocurrency is well-known or has celebrities endorsing it doesn't mean it's a good investment. Also, most cryptocurrency trading platforms do not have insurance on their clients' assets, so in the event of a hack or bankruptcy, clients may lose their funds.

4.9 Illegal use

Such anonymity that cryptocurrencies provide has been misused by certain elements of society through activities like money laundry and terrorist financing. Ransomware demands payment in cryptocurrency because it ensures a high degree of anonymity, apart from the added fact that tracking will be extremely hard. Cybercriminals also use cryptocurrencies to buy and sell stolen items, illicit tools, and services over the dark web. This aspect brings additional challenges for

regulation and control. For example, in the United States, in 2013, an FBI-led legal action led to arrests against transfer platform providers suspected of money laundering and tax fraud. The Silk Road platform, also, was using Bitcoin for illegal transactions before it was shut down by the FBI in October 2013.

Foley et al. (2019) find that approximately one-quarter of all users and close to one-half of transactions are associated with illegal activity, equating to around 27 million market participants with illegal turnover of around \$76 billion per year in recent times.

V. The Future of Cryptocurrency

5.1 Growing adoption

Cryptocurrency adoption among the general public and businesses continues to grow. People and businesses have started using cryptocurrencies for daily transactions, investing, and making cross-border payments. Some governments even show interest in introducing their own cryptocurrency, as that way it would bring modernity to their financial system by issuing CBDCs or, as they are known, Central Bank Digital Currencies.

For example, the People's Bank of China is currently testing the digital yuan. Sweden's central bank, Sveriges Riksbank, has also launched a pilot project to determine whether a central bank-backed electronic currency - eKrona - can make retail payments.

According to European Central Bank, they are working with the national central banks of the euro area to look into the possible issuance of a digital euro. It would be a central bank digital currency, an electronic equivalent to cash. And it would complement banknotes and coins, giving people an additional choice about how to pay.

5.2 Regulation and legality

The future of cryptocurrencies will be determined mainly by whether clear regulatory frameworks are put into place which protect investors yet allow innovation to grow. Stronger legal recognition of cryptocurrencies may also improve their credibility and acceptance. For example, El Salvador became the first country to adopt Bitcoin as legal tender in 2021, thus opening a gateway toward its acceptance by other countries (Pérez and Ostroff, 2021).

5.3 Technology and Innovation

Ongoing innovations in blockchain technology and cryptocurrency protocols (such as proof of stake) (Rauchs and Hileman, 2017) could improve the scalability, security and energy efficiency of cryptocurrencies. New applications of cryptocurrencies, such as smart contracts, NFTs (non-fungible tokens), and DeFi, have the potential to revolutionize many aspects of the economic spheres. For instance, Ethereum 2.0 promises to consume more than 99% less energy compared to the proof-of-work chain currently in use.

VI. Conclusion and recommendations:

Cryptocurrencies present a complex mix of advantages and disadvantages. They represent a revolution in the world of finance because, for the first time in history, a system of finance truly is available that is decentralized, secure, and more transparent than ever before. Of course, the huge potential value of cryptocurrencies is balanced by significant challenges including extreme volatility, facilitation of illicit activity, and regulatory issues. Thus, the technology must be approached with caution, and careful consideration of associated risks should be undertaken before investing. Thus, despite challenges, the potential of this technology has grown significantly. Further ahead, it is in that wider adoption of cryptocurrencies seen by many sectors would eventually help in sustainable economic growth.

Recommendations:

- Clear and harmonized regulation of cryptocurrencies to counter illegal activities and protect investors.
- Development of more energy-efficient cryptocurrency technologies to reduce their environmental impact.
- Education and public awareness to promote responsible use of cryptocurrencies.
- Ongoing research into the economic and social implications of cryptocurrencies.

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