

Future of Money: Cryptocurrencies, Blockchain Technology and Central Bank Digital Currency

Esra Kabaklarlı

Selçuk University, Turkey

Abstract

Technological developments have made it possible to increase the money supply without any central bank decisions. For example, if a government decides to increase money supply, central banks use expansionary monetary policy tools. After the covid 19 pandemic the money supply has dramatically increased through fiat money and cryptocurrencies around the world. CBDCs (Central Bank Digital Currency) are an institutional response to the threat of alternative forms of future money like cryptocurrencies. Central banks will not give up senior age advantage using printing money rights. Economies and central banks monitoring decentralized technologies in finance with the emergence of cryptocurrencies. CBDC's will be based on decentralized databases which is the technological infrastructure underpinning blockchain and cryptocurrencies. This article assesses the cryptocurrencies, and Central Bank Digital Currency from economic and technological perspectives. This paper focuses on the CBDC macroeconomic perspective which will have effects on inflation, interest rates and economic growth. Also in this paper the relationship and connection between the CBDC, cryptocurrency and blockchain technology will be analyzed reviewing the literature.

Keywords: Money, CBDC, Blockchain

1. Introduction

Technology and innovation play essential roles in the progress of blockchain, cryptocurrencies and CBDC. New technological developments in finance (fintech) will enhance monetary system. Technological developments have made it possible to increase the money supply without any central bank decisions. Cryptocurrencies and new way of the digital money increase the money supply without any central bank decisions. So we need to understand the decentralized money systems like cryptocurrencies.

Monetary policy is very important for health of the economy. Monetary policy can produce serious recessions in which output falls and unemployment rises. Central banks which conduct monetary policy use different tactics and monetary policy instruments to maintain price stability. Central banks will need more monetary instruments to solve a debt problem which enlarged the FED assets in 2020 because of Covid 19.

To understand the effects of cryptocurrencies and Central Bank Digital Currencies on the economy, we must understand exactly what Money is. The paper proceeds as follows: After a brief introduction, in this paper money definitions and functions of money will be presented in the first section. It further presents the definitions and features of CBDCs. Then, the paper, it focuses on Cryptocurrencies, Blockchain Technology by studying the potential effects of block chain technology on banking and financial stability. In addition, it provides a thorough analysis of the link between blockchain, CBDC and the cryptocurrencies. Therefore, this article is a guide for policy makers, researchers, and students whose areas of interest are CBDS, blockchain and cryptocurrencies.

1. Central Bank Digital Currency

Economists define money as anything that is generally accepted as payment for goods or services or in payment of debts. Currency, bills, coins are suitable for this definition and are one type of money. Most of people talking about money they refer paper money and coins. (Mishkin, 2016.).

CBDC's are sovereign digital currencies and are managed by a central bank. CBDC has the potential to transform money into a public good, resulting economic growth and more spending due to lower transaction cost. Economists expect CBDC will create more inflation and increase the average price of goods and services. There will be advantages for society as a whole (Steinmetz, 2020). Central banks play an important role in the world economy. Their decisions are followed by many economists and traders to manage their portfolio. Balances held in commercial banks can be exchanged on-demand for banknotes; this support of direct convertibility in terms of central bank liabilities provides trust in the value of such money. CBDC consists of digital form of money issued by central banks (Akinkunmi, 2018).

Monetary base has increased around the world two times in 2008 global financial crisis and 2020 covid 19 pandemic. In addition, most central banks often have supervisory and regulatory powers to ensure financial institutions' solvency, prevent bank runs, as well as reckless or fraudulent behavior by commercial banks. Bank of Canada defines CBDS electronically stored monetary value can be used for payments of goods and services (Engert and Fund,2017). The Bank of England describes CBDS as "A money which is granted by Central bank ,7/24 electronic and universal, national currency dominated, and low cost alternative financial instrument " (Bardear ve Kumhof ,2016) .

The use of blockchain is not required for CBDC infrastructure and operations, but using Blockchain as the backbone of CBDS have many advantages. These advantages are transparency, security and monitoring the money transactions. Central bank money creating money in two different form. ,One of the form is printing physical cash money , second form is electronic central bank deposits . A digital currency issued by Central Bank for the use of general economic transactions by public would represent a complementary digital form of cash (Steinmetz, 2020)

Central banks want to more effective monetary and fiscal policies for themselves and control the local currency's value. China and Sweden are the leader countries that started to use CBDC in their economies. China has its own CBDC and want to build a CBDC partially backed by gold. Because China desired to become world reserve currency with their CBDC (Ryan, 2020). Cashless payments have very high share in Sweden. The prevalence of cashless society in Sweden has made it an ideal country for a transition to CBDC. Another CBDS example is Bahamas. Central Bank of Bahamas issued CBDC project "Sand Dollar" and declared it is not a cryptocurrency and it is a digital version of the existing paper currency (Lewis, 2020). But some attempts about issuing digital currencies are not successful like Facebooks Libra. Facebook has created a digital currency which name is Libra . It wouldn't take very long to get 3,6 billion registered user of Meta group (Facebook, Instagram, Whatsup). Far from Bitcoin, Libra did not have a fixed supply schedule. Bitcoin supply is limited to 21.000.000 Bitcoin. Because of this many economist define bitcoin as digital gold.

Figure 1. Central Bank's Objectives and Instruments

Central Banks' Objectives and Instruments

Policy objectives		Price Stability	Financial Stability				Payment System	Financial Integrity	Consumer Protection	Growth & Employment
			Macro	Micro	ELA	Resolution				
Instruments										
Monetary, Currency, and Payments	For example, OMO, FX reserves management, FX operations, cash currency, payment instruments	●				●			●	
Macro Prudential	For instance, CCB, LTV, DSTI, additional cap. requirements		●						●	
Micro Prudential	For instance, licensing, capital, disclosure, and fit & proper requirements, stress tests			●			●		●	
Crisis Management	For instance, ELA, recovery and resolution planning				●				●	
AML/CFT	For instance, reporting requirements, KYC/CDD		●				●		●	

Source: IMF, 2019, *Update of the Monetary and Financial Policies Transparency Code*.

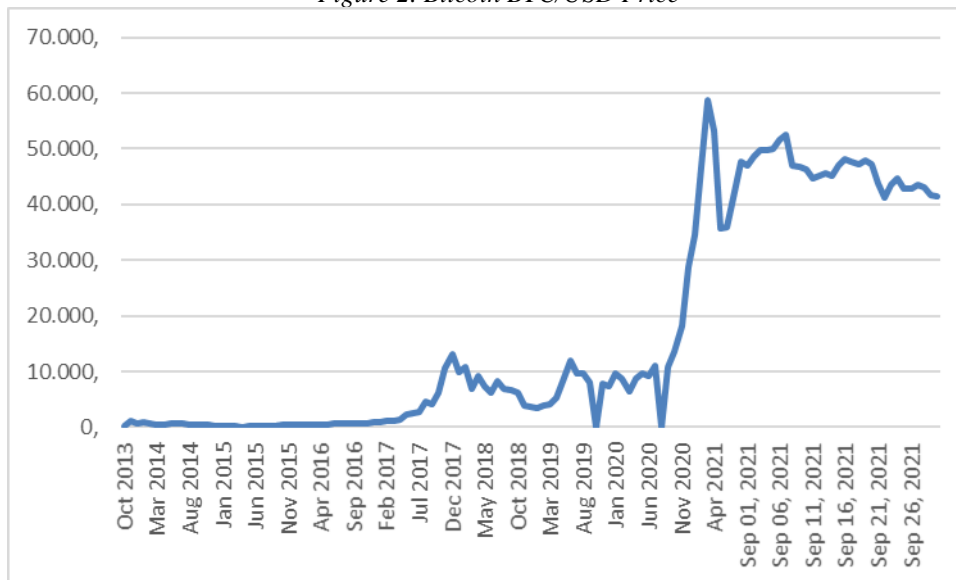
IMF Policy Paper No. 19/011. IMF, 2020, *Sweden Proposed Amendments to the Riksbank Act*. IMF Country Report No. 20/239

Figure 1 shows Central Banks' objectives and instruments. Economic growth and employment are pillar policy objectives which are achieved by monetary currency and payment and all the instruments. CBDC will be important policy tool in achieving the goal of economic growth and employment for the central banks. CBDC can be allocated to the poor people who have not any access to the financial system. Cryptocurrencies are speculative and very volatile assets rather than money, so CBDC can be more stable and can be alternative asset for cryptocurrencies. CBDC's are different from cryptocurrencies because they don't rely on cryptography to secure scarcity and they not aiming to eliminate a third party to allow for peer to peer transaction. Central banks are backbone of the CBDC so they will be trusted by third party that manages these CBDC (Ryan, 2020).

2. Cryptocurrency

Cryptocurrency is a financial product that like stocks, bills, shares and bonds, doesn't physically exist and stored via blockchain system (Lon, 2019). Cryptocurrency is decentralized money which means it does not need any third party for confirming transactions. Cryptocurrency is a type of digital cash, people can buy things or people can invest in it. They are not linked to a central bank a country or a regulatory body (Higgins, 2019). Most popular cryptocurrencies are Bitcoin and Ethereum. Bitcoin has the biggest share in the cryptocurrency market. The central idea of cryptocurrency was first initiated by Satoshi Nakamoto in 2007 by Bitcoin (Billah, 2019).

Figure 2. Bitcoin BTC/USD Price



Source: Statista, <https://www.statista.com/statistics/326707/bitcoin-price-index/> Access Date: 29.12.2021
 Bitcoin price from October 2013 to September 30, 2021 (in U,S, dollars)

One of the biggest problem for cryptocurrency is the volatility of Bitcoin, Ethereum and their peers (Baucherel ,2020). As seen in Figure 2, as a result of the increase in the money supply after the Covid 19 pandemic that broke out in 2020, Bitcoin prices reached the highest value of approximately \$ 58,000 in March 2020, from the levels of approximately \$ 8,000 at the beginning of 2020 before the pandemic. The sharp rise took place after October 2020, and the American payment systems company PayPal's announcement that it would start providing Bitcoin and cryptocurrency trading services to its users was effective in this rise. s acceptance of payment with Bitcoin in the sale of electric vehicles allowed Bitcoin to reach historical highs (\$ 62,000). Announced by Elon Musk as of May 2021, the energy consumption concerns of Bitcoin and the messages that it will no longer be used institutionally have caused Bitcoin to decline to the level of \$ 30,000 (Trading View, 2021).

Figure 3. Ethereum ETH/USD Price



Source: Statista, [https://www.statista.com/statistics/806453/prive-of-ethereum/Ethereum\(ETH\)](https://www.statista.com/statistics/806453/prive-of-ethereum/Ethereum(ETH)) price per day from Augst 2015 to Deceöber 14, 2021(In U,S, Dollars)

Figure 3 shows us Ethereum price development historically. Ethereum prices have been affected by covid 19 monetary stimulus packages. The highest price of Ethereum was in December 2021. FED and many important central bank's monetary policy and Quantitative Easing has increased the price of cryptocurrencies and their volatility.

Cryptocurrencies like Bitcoin and Ethereum are medium of exchange that are secured by cryptography . Medium of exchange is an important feature of the money it means money is used in business and in our daily lives. But cryptocurrencies are not used every day in exchange for food, clothing and services (Lewis,2020).The first digitizing of fiat money is credit cards. Billions of people use credit card in their daily life transactions and payments around the world. Digital money relies on centralized banks and government. PayPal and Alipay define their selves as a trusted third party like middleman banks and financial companies. (Wang, 2018). Mining and miners are very important in cryptocurrency system. Miners contribute their computing records to store and validate transactions. They have chance to collect transaction fees and earn a reward doing so. This process is called as mining (Danial, 2019).

Overall the cryptocurrency market has accumulated \$3 trillion, almost tripled in 2021 (Chinchalkar, 2021). Cryptocurrency technology allows users to send and receive virtual coins without the banking system and central authority. Every user of the network has a wallet that generates and stores cryptocurrency address each provided with personal keys (König, 2019). People can spend cryptocurrency with their physical and digital wallet linkage. Some of the countries have cryptocurrency ATMs in which people can withdraw their cryptocurrency. People can buy limited goods and services by cryptocurrency because many of the shops and

market place don't accept cryptocurrency because of their volatility (Baucherel ,2020). Satoshi used Bitcoin as a tool to preface blockchain to the public .Also blockchain technology can be used for different purposes. Blockchain technology and Blockchain usage areas are conducted in the third section.

3. Blockchain

Blockchain has the distributed ledger technology which enables sharing and updating of records about financial system and many different areas like smart contracts, health, and foreign trade. Blockchain has been used in very wide area. The musicians use the blockchain digital ledger to share information about songs. This enables the practical use of blockchain to stop reducing unauthorizes downloading of music. Blockchain DLT uses methods of storing data in blocks with each block being linked to each other. Date can be added to existing chain and does not allow the deletion of previous blocks (QC, et al. 2019). Peer to peer network enable online payments to be sent directly from one party to another without going through a financial institution. Blockchain system doesn't need any bank or financial intermediary institution to confirm transactions (Lon, 2019).

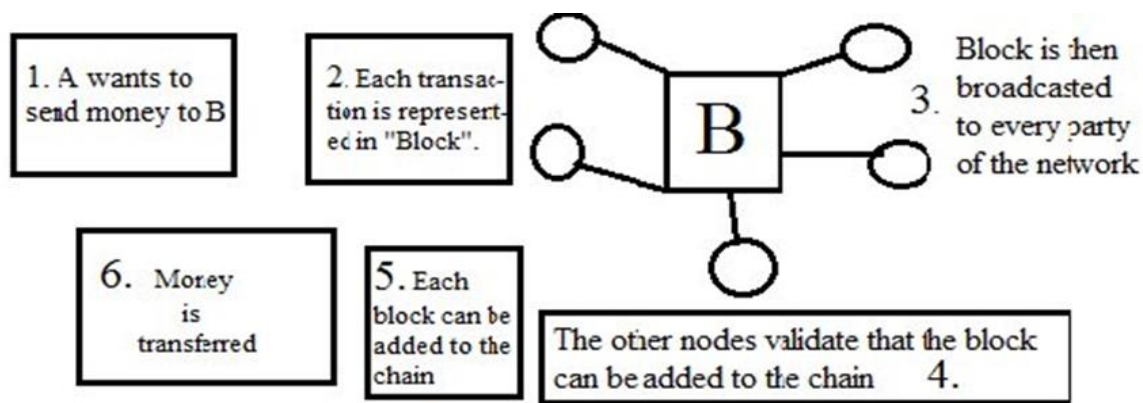


Figure 4. Workflow of the Blockchain Mechanism

Source: Chatterjee, 2017

Workflow of the Blockchain mechanism is shown above (figure 4). In blockchain blocks are linked to each other. And each transaction is represented in block. Blockchain is a decentralized ledger structure (Chatterjee, 2017). Blockchain is the backbone for the Bitcoin protecting it by documenting and securing every single transaction. There are two types of Blockchain, private and public. Private blockchain enables two companies to share data that have been separately saved on each private blockchain. Public blockchain provides a decentralize infrastructure for information to share without barriers (Wang, 2018).

All confirmed transactions are recorded in the blockchain as a proof of transactions. These proofs can be in the different areas like health , smart contracts or banking system. Blockchain technology can be used for digital voting. Digital voting provide transparency that anyone

would be able to see whether something were changed on the network. Blockchain could be used to verify where foods come from. It can be used to track the origin of the food. We can check the food with blockchain technology Whether they are halal, kosher or organic (Danial, 2019). Blockchain is transparent: participants can see all the transactions that have been posted. Blockchain technology can be used across banking and financial service with fintech-specific technologies designed to manage cross-border payments. Dubai has incorporated blockchain

into its Smart Dubai project, intending for a paperless administration. Blockchain can manage cities and citizens with new technologies (Baucherel ,2020).

4. Conclusion

Fourth Industrial Revolution have brought new technological developments and digitization in our life. Artificial intelligence , internet of the things and distributed ledger technology are affecting and changing the financial system very rapidly. Blockchain technology can be used in the different areas like health , smart contracts or banking system. Blockchain , backbone technology for cryptocurrency has become popular with Bitcoin.

Bitcoin, which represents a significant share of cryptocurrencies and cryptocurrencies, is examined within the framework of monetary policies after Covid 19, it was positively affected by the increasing money supply, in the first place, it fell to a certain extent with the panic atmosphere caused by the outbreak of the pandemic, but fell from the level of \$ 8,000 with the effect of increasing money abundance and speculative messages over time. It rose to the level of \$ 58,000. Many economist believe that Bitcoin will be digital a gold in the future but very important point its value is very volatile so financial regulations will help to make its value more stable.

In this paper a comprehensive overview of CBDC, Blockchain technology and cryptocurrencies have been provided with their advantages and its potential. Blockchain technology have a potential to change many sectors, indivial and companies. CBDC would increase financial inclusion and provide digital payments. CBDC is best solution problem of limited financial inclusion.

References

- Akinkunmi, Mustapha (2018). *Central Bank Balance Sheet and Real Business Cycles*, Walter de Gruyter GmbH.
- Barrdear, John & Kumhof, Michael, (2016). *The Macroeconomics Of Central Bank Issued Digital Currencies*, Bank of England working papers 605, Bank of England.
- Bauchere, K. (2020). *Blockchain hurricane : The origins, application, and future of blockchain and cryptocurrency*. Business Expert Press.
- Billah, Mohd Ma'Sum, (2019). *Halal Cryptocurrency Management*, Springer International Publishing AG,..
- Chatterjee, R. and R. Chatterjee (2017). *An Overview of the Emerging Technology: Blockchain*. 3rd International Conference on Computational Intelligence and Networks CINE 2017.
- Chinchalkar A.,(2021). Crypto Barrels Toward 2022 After Adding \$1.5 Trillion in Value, Bloomberg, <https://www.bloomberg.com/news/articles/2021-12-20/cryptocurrencies-and-bitcoin-btc-2021-year-in-charts> , acces: 28.12.2021
- Danial, Kiana. (2019). *Cryptocurrency Investing for Dummies*, John Wiley & Sons, Incorporated.
- Higgins, M. G. (2019). *Cryptocurrency*, Saddleback Educational Publishing, Incorporated.
- König, Lukas M..(2019). *Price formation in the cryptocurrency market. A hypotheses driven econometric analysis of cryptocurrency price determinants*, Hamburg, Diplomica Verlag,
- Lewis, Rhian. (2020). *The Cryptocurrency Revolution : Finance in the Age of Bitcoin, Blockchains and Tokens*, Kogan Page, Limited,.
- Lewis, Rhian. (2020). *The Cryptocurrency Revolution : Finance in the Age of Bitcoin, Blockchains and Tokens*, Kogan Page, Limited,
- Lon, H. Leng. (2019). *Decrypted : A Financial Trader's Take on Cryptocurrency*, Marshall Cavendish International (Asia) Private Limited,.
- Mishkin (2016), *The Economics of Money, Banking, and Financial Markets*, Eleventh Edition, Pearson Education Ltd.
- QC, Dean Armstrong, et al. (2019) *Blockchain and Cryptocurrency: International Legal and Regulatory Challenges*, Bloomsbury Publishing Plc.
- Ryan, Jake. (2020). *Crypto Asset Investing in the Age of Autonomy*, John Wiley & Sons, Incorporated,
- Steinmetz, Fred., et al. (2020). *Blockchain and the Digital Economy : The Socio-Economic Impact of Blockchain Technology*, Agenda Publishing.
- TradingView.(2021), History of BTCUSD, Access: 01.10.2021
<https://www.tradingview.com/symbols/BTCUSD/history-timeline>

Wang, Wanlin Aries (2018). *Crypto Economy : How Blockchain, Cryptocurrency, and Token-Economy Are Disrupting the Financial World*, Skyhorse Publishing.