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## Central bank digital currency and monetary policy

*Merkez bankası dijital parası ve para politikası*

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### ABSTRACT

This study examines the relationships between Central Bank Digital Currency approaches and monetary policy. It directs central banks, which have an essential role in payment systems, to take an active part in these issues due to the decrease in cash usage and the erosion of the effect of monetary policy by issuing stable cryptocurrencies by the private sector. It can be said that Central Bank Digital Currency can be a policy tool that can expand the domain of monetary policy while increasing dollarization and crypto monetization limits the effectiveness of the monetary policy. It is thought that using CBDC as an alternative payment method can increase the impact of the monetary policy.

### ÖZET

Bu çalışmada, Merkez Bankası Dijital Parası yaklaşımları ile para politikası arasındaki ilişkiler incelenmiştir. Ödeme sistemlerinde önemli bir rolü olan merkez bankaları, nakit kullanımının düşmesi ve özel sektörün stabil kripto paralar çıkartarak para politikasının etkisini aşındırması nedeniyle bu konularda aktif rol almaya doğru yönelmektedir. Artan dolarizasyon ve kripto paralizasyon para politikasının etkinliğini sınırlandırırken, alternatif bir ödeme yöntemi olarak Merkez Bankası Dijital Parası'nın kullanılabilmesi para politikasının etkinliğini artırabileceği düşünülmektedir.

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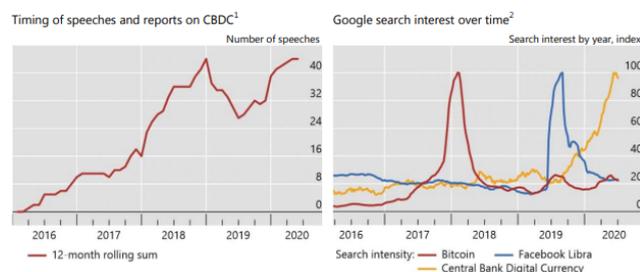
## 1. Introduction

Digitization is causing changes in the structure of money and payment systems day by day. With the spread of cryptocurrencies, paradigm shifts have begun to emerge in the field. Despite the fact that the problems such as high volatility, scalability, and lack of regulation, Bitcoin and other early cryptocurrencies contributed to changing the existing structure. These cryptocurrencies fulfilled some of the functions of money, but their high volatility delayed their acceptance by the masses. Stable cryptocurrencies with much less volatility and cryptocurrencies whose value is fixed to a specific asset have emerged. The power of printing money, monopolized by the states, has begun to erode. The cryptocurrency called Libra, which is planned to be issued by Facebook, which has up to 35 percent of the world's population, was blocked by a letter addressed to Facebook by the Financial Services Committee of the United States House of Representatives due to the possibility of jeopardizing the status of the American dollar as a reserve currency<sup>1</sup>. In the ongoing process, it received the support of the American Federal Reserve, changed its name to Diem, and announced that the Libra Network would support the Central Bank Digital Currency (CBDC) to be issued by the central banks<sup>2</sup>.

[<sup>1</sup>The relevant document can be accessed at:  
[https://financialservices.house.gov/uploadedfiles/07.02.2019\\_-\\_fb\\_ltr.pdf](https://financialservices.house.gov/uploadedfiles/07.02.2019_-_fb_ltr.pdf)]

[<sup>2</sup><https://www.diem.com/en-us/economics-and-the-reserve/#the-libra-reserve-and-protections>]

It is thought that when cryptocurrencies created by private companies begin to be accepted in a wide area, their impact will start to be felt in the fields of monetary policy and financial stability. This may cause central banks to lose control over monetary transmission mechanisms. With these developments, the increasing interest of states in cryptocurrencies has led to research on the issue of CBDC that they can control. According to a study conducted by the Bank for International Settlements (BIS) in 2018, it is stated that 70 percent of the central banks participating in the survey want to issue CBDC shortly (Barontini and Holden, 2019: 7). The interest mentioned above can also be seen in the speeches and reports of central banks and Google searches. Figure 1 shows the 12-month moving total of the CBDC words in the speeches of central bank employees and the 12-week moving average of the worldwide searched words. Bitcoin searches increased in mid-2017, Facebook Libra increased in 2019, and CBDC searches increased since 2019.



**Figure 1.** Timing of speeches and reports and Google searches on CBDC

Source: Auer et al., 2020

The interaction between the Central Bank Digital Currency and monetary policy may vary according to the structure of the CBDC. While some studies focus on the account-based design of CBDC, some are based on the separation of wholesale and retail, and some on its transfer to the private sector. Studies continue in different areas, such as the money

creation process of central banks and the necessity of CBDC (Keister and Sanches, 2019; Jackson and Pennacchi, 2019; Armelius et al., 2020a), the systemic effects of CBDC (Brunnermeier and Niepelt, 2019; Fernández-Villaverde et al., 2020; Kwon et al., 2020; Carletti et al., 2020), the design structures of CBDC (Davoodalhosseini and Rivadeneyra, 2020; Agur et al., 2019; Allen et al., 2020), its effects on payment systems (Milkau, 2019), its effects on exchange rates (Ferrari et al., 2020), and legal perspectives (Hess, 2020; Duque, 2020; Nabilou, 2019b; Belke and Beretta, 2020).

This study, which is thought to contribute to the literature on the Central Bank Digital Currency in this period, where we are witnessing the formation of a new monetary system, has examined the relations between CBDC approaches and monetary policy. In the first part, CBDC is given, and in the next part, CBDC approaches are discussed. In the third chapter, the relations between monetary policy and CBDC are detailed with examples from the literature. In the conclusion part, various assumptions are made with the general evaluation.

## 2. Literature Review

In this chapter, first of all, the availability heuristic is defined and the effect of availability heuristic on investor decisions is included. Then, the importance of the effect of economic news, which has the power to affect financial markets, on investor decisions and the effect of economic news on investor decisions with attention-grabbing effects -by means of availability heuristic- is emphasized.

### 2.1. CBDC Approaches

Central Bank Digital Currency as a definition; It is electronic money that is put into circulation by the central bank, can be used for payments, can be accessed by anyone 24/7, is tied to the national currency, has a nominal currency obligation, and can be used as a store of value (Barddear and Kumhof, 2016; Meaning et al., 2018).

Controversy continues where the Central Bank Digital Currency lies between banknotes and electronic money used in the interbank market. In the first studies on this subject, an approach called Money Flower was revealed by the Bank for International Settlements (BIS) (Figure 2). In the new approach adapted to digital technologies, money is examined in four sections; widely accessible money, digital money, money issued by the central bank, and token-based money (Bech and Garratt, 2017).

As shown in Figure 2, CBDC; is a digital currency issued by the central bank, but it is differentiated according to the size of the payments (small coin, large coin). CADCoin and Jasper and Ubin projects are examples of CBDC, which is planned to be used in large-scale payments. CADCoin; While it is a payment system that uses the distributed accounting system that the Bank of Canada is working on, Jasper and Ubin are projected on real-time settlement systems (Chapman et al., 2017; Dalal et al., 2017).

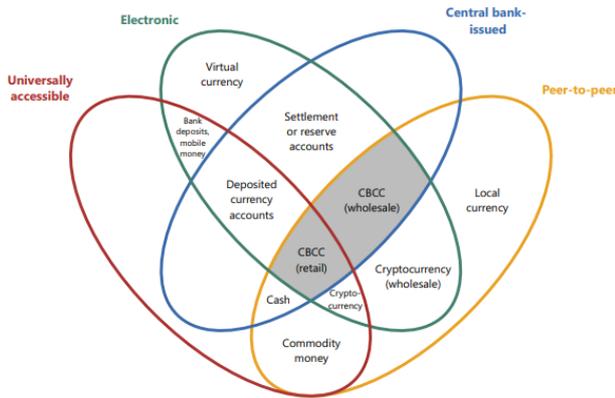


Figure 2. Money flower

Source: Bech and Garratt, 2017

In another definition, the place of CBDC among other assets used as money has been tried to be determined. As shown in Figure 3, called the Control Structure of Currencies, capital is divided into physical and virtual in terms of design, centralized and decentralized in terms of transfer, and monopoly and competitive in production. When we examine cash in this approach, it seems decentralized in terms of money transfer, trust in terms of production, and physical in terms of design. Bitcoin is; competitive, virtual, and decentralized, while CBDC; is decentralized, virtual, and monopoly (Berentsen and Schar, 2018).

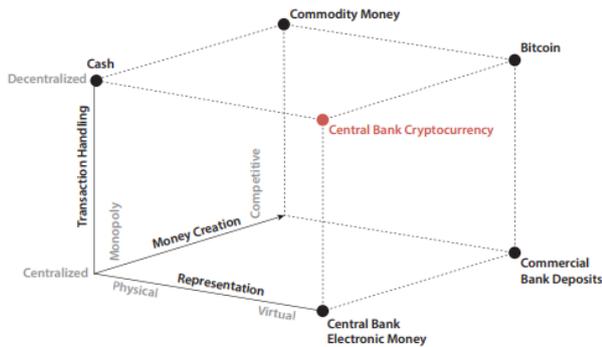


Figure 3. Control Structure of Currencies

Source: Berentsen and Schar, 2018

In recent studies, it has been seen that CBDC is located in a different place. Figure 4 shows the Money Matrix<sup>3,4,5</sup>, an alternative to the Money Flower in the BIS study, prepared by the International Monetary Fund (IMF) employees. According to this, banknotes issued by the central bank are legal, backed by reserves, protected by the state's reputation, and transferable from person to person. There are two distinctions in the CBDC section. The first of these is called Retail CBDC (rCBDC). A programmable feature has also been added for Retail CBDC, the same features as banknotes. It aims to provide the programmability feature with smart contracts<sup>6</sup> organized by computer programs and work automatically, similar to traditional contracts. On the other hand, with Synthetic CBDC (sCBDC), a CBDC with different legal status and jurisdiction is defined. Retail CBDC (rCBDC) definitions are used for small-scale payments, and Wholesale CBDC (wCBDC) descriptions are used for large-volume payments.

[<sup>3</sup>Central bank deposits and the power behind money are emphasized.]

[<sup>4</sup>Person to person, bank to bank, seller to seller, person to seller.]

[<sup>5</sup>While b-money is partially backed by central bank reserves, central e-money may not be partially backed. For example, AliPay and WeChat Pay payment systems used in China are fully supported by the central bank, while M-Pesa used in Kenya is not.]

[<sup>6</sup>For detailed information about smart contracts, Antonopoulos and Wood (2018) and Wang et al., (2019) can be examined.]

Central Bank Issued	Cash	CBDC Retail				
Legal Tender			Optional	Optional	Optional	Optional
Central Bank-Backed (1)		Synthetic CBDC	Depends!			
Fiat Pegged			Electronic b-money and centralized e-money	Asset-Backed Stablecoins (e.g. USDC)		
Peer to Peer (2)					Payment Crypto Assets (e.g. BTC)	
Programmable						

Figure 4. Money matrix

Source: Kiff et al., 2020

sCBDC<sup>7</sup> differs from other forms of money in two aspects. The first is the responsibility of private issuing firms rather than the central bank. Secondly, sCBDC is backed by central bank reserves and differs from cryptocurrencies that are not endorsed by any asset. sCBDC can be considered an alternative for central banks instead of directly issuing CBDC. In addition to being cheaper and less risky, it can stand out with its differences, such as trust, efficiency, and innovation that the private sector will provide for its customers. On the other hand, the fact that users see sCBDC as a central bank branded product and do not understand the limited responsibility of the central bank creates a reputational risk (Kiff et al. 2020).

[<sup>7</sup>For a detailed research on sCBDC, Adrian and Griffoli (2019a) and Pfister (2019) for rCBDC and wCBDC can be examined.]

### 3. CBDC and Its Effects on Monetary Policy

Various evaluations are made about cryptocurrencies, which can take the functions of the exchange tool that allows money to be used in the purchase and sale of goods and services, the value storage function that enables the transfer of purchasing power to the future, and the functions of being used as a common value measure from fiat money (Ali et al., 2014, Lo and Wang, 2014). The most feared scenario among these evaluations is the use of cryptocurrencies as a unit of measurement. When viewed through Bitcoin, which has reached the broad masses, the value of any goods or services began to be evaluated not in US dollars but in Bitcoin and even Bitcoin's cent values, known as sats (satoshi: 1 BTC = 100,000,000 sats), making the global hegemony of the US dollar sign. It will be possible to see countries that are subject to crypto paralysis in general, Hyper Bitcoinization or Libraization in particular, such as countries that have been dollarized (Akdağ, 2019).

With the emergence of CBDC, which is considered a move of central banks against cryptocurrencies, monetary policy, and financial stability approaches may be affected differently. In this section, the effects of CBDC on monetary policy; The effective interest rate lower limit is evaluated over the interest structure of the CBDC, financial stability, monetary transmission mechanism, and seigniorage.

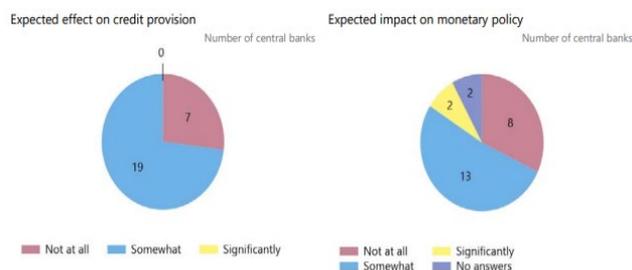


Figure 5. Possible impact of CBDC on credit creation and monetary policy

Source: BIS, 2022

According to the survey conducted by the BIS to Central banks, 19 central banks stated that CBDCs might have some effect on credit provision. At the same time, 13 central banks also expressed their opinion that CBDCs will impact monetary policy. Minesson et al. (2022) suggested that CBDC increases asymmetric spillover in the international monetary system by reducing monetary policy autonomy. The effective interest rate lower limit or zero lower limits is a macroeconomic problem that occurs when short-term nominal interest rates are zero or close to zero, causing a liquidity trap and preventing the central bank from stimulating economic growth (Tunalı and Yalçınkaya, 2016; Sümer, 2020). In recession situations, although central banks want to increase demand by lowering interest rates to stimulate the economy, savers may turn to holding cash to avoid negative interest rates or prefer negative interest rates to avoid the costs of storing and insuring transporting money. In order to increase the effectiveness of the monetary policy, there are approaches to solve the problem of the zero lower limits, the transport tax to be charged according to the holding period of money (Goodfriend, 2000), or the changes to be made in the tax policies (Correia et al., 2013). However, if money is used as a purely electronic unit of account instead of banknotes, this lower zero limit can be eliminated (Kimball, 2013; Dyson and Hodgson, 2016). With the CBDC revealed by the central bank, nominal interest rates can also be determined below zero (Bordo and Levin, 2017). It is estimated that individuals will save less and consume more if CBDC is given a negative interest rate below zero (Jia, 2020).

Whether the CBDC has an interest or not is another matter of discussion (Barrdear and Kumhof, 2016; Raskin and Yermak, 2018). It is suggested that the repo interest rate applied by the central bank can be used within the CBRT and that a single central bank interest rate will be appropriate, and that the interest rate can be reduced in periods when inflation is desired to be revived. Inflation can be reduced by increasing the interest rate (Bordo and Levin, 2017). If the CBDC is interest-bearing, the opportunity cost can be met according to the banknote. Where interest rates depend on balances (high balance-high interest), end users can be encouraged to maintain an efficient level of liquidity. In addition to the official interest rate, the digital currency interest rate can be used as a secondary monetary policy tool. Assuming that digital currencies are not perfect substitutes for fiat and financial assets, a rate varying between the official interest rate and the digital currency interest rate can be used counter-cyclically (Barrdear and Kumhof, 2016).

The issuance of a CBDC with a gradual interest rate is another approach. In this approach, it is thought that the intermediation of banks is eliminated, and interest is paid. It is planned to prevent holding large amounts of CBDC by paying interest up to a certain amount for CBDCs in central bank accounts and zero or negative interest for excess amounts (Bindseil, 2020). On the other hand, due to an interest-bearing CBDC, commercial banks will want to keep CBDC in their reserves. If the CBDC

interest rate is lower than the commercial deposit interest rate, bank activities will not change. Banks will increase the deposit rate if the CBDC interest rate is high but close to the commercial bank deposit rate. If the CBRT interest rate is too high, banks will lose their appetite for deposit collection and lending (Andolfatto, 2018; Chiu et al., 2019).

In terms of financial stability, it is considered that CBDCs may cause sudden deposit withdrawals from banks during crisis periods. In a digital economy, where access to central bank reserves is easy, the elasticity of deposit demand will increase with the rapid movement of funds, and bank bankruptcies may occur (Tolle, 2016). This non-optimal situation, which will be experienced with the conversion of commercial bank deposits to CBDC in times of crisis, has been described as the "destabilizing flight to quality" (Nabilou, 2019a). This situation can be prevented by changing the CBDC design properties. Panic situations can be prevented with technical features such as large-scale withdrawals, high commissions, limited withdrawal rights, and daily transfer limits.

On the other hand, it is thought that in times of crisis, depositors will invest their assets in government bonds instead of holding cash, and they will not have electronic central bank money. For this reason, it is estimated that bank bankruptcies will decrease rather than increase (Koning, 2018). Likewise, it is thought that CBDC can reduce deposits in the banking sector in regular periods but will alleviate bankruptcy risks in crisis periods (Bitter, 2020). The Swedish Central Bank also thinks that if the e-Krona, which is the MBDP that it researches, is revealed, it will have a limited effect on financial stability and states that the Swedish central bank will continue its policy of being the last lender (Armelius et al., 2018, 2020b).

The transmission mechanism of monetary policy emerges as another area that needs to be evaluated. It is thought that CBDC, with an appropriate design, will be beneficial to the current monetary policy and transmission mechanism (Dyson and Meaning, 2018). It is thought that the changes in the policy interest rate will spread more rapidly throughout the economy thanks to the interest-bearing CBDC, and the use of CBDC with negative interest rates will be beneficial for the transmission mechanism (Adrian and Griffoli, 2019b). On the other hand, it is argued that creating CBDC will not be sufficient to determine negative interest rates, and cash should be removed for negative interest rates (Engert and Fung, 2017; Broadbent, 2016).

In cases where taxes and borrowing cannot finance the deficits created by the public, the government can close this deficit by using its monopoly power in printing money. The seigniorage income, which is defined as the difference between the value of the money printed by the central bank and the cost of production, may melt due to inflation (Taşçı and Darıcı, 2008). With the decrease in demand for cash, namely banknotes and coins, seigniorage income will decline. On the other hand, the main problem will not be seen due to the decrease in seigniorage income but due to the loss of influence in monetary control mechanisms as a result of the use of private cryptocurrencies.

#### 4. Conclusion

Technological innovations are changing the payment system day by day, and interest in cash-like assets increases. With the adaptation of cryptocurrencies to payment systems, competition with traditional payment instruments has begun. These developments present opportunities and threats against monetary policy. Central banks, which have an essential role in payment systems, tend to take an active role in these issues. The use of cash decreases, and the private sector erodes the impact of monetary policy by issuing stable cryptocurrencies. CBDC can be a policy tool that can

expand the sphere of influence of monetary policy. While increasing dollarization and crypto monetization limit the effectiveness of the monetary policy, the use of CBDC as an alternative payment method may increase the effectiveness of the monetary policy. The co-existence of central bank money and cryptocurrencies will push all banks to behave more disciplined.

With the CBDC, other economic actors other than the banking sector will have the opportunity to open accounts within central banks, make payments with digital currencies and transfer money to other central banks, as well as (Al and Akyazı (2019) exchange between digital currencies. Thus, the digital money they hold will be centralized and decentralized. Suppose central banks do not issue digital money. In that case, the depreciation of local currencies, especially in developing countries, will lead people to digital currencies (gold, oil, silver, etc.) whose value is fixed to a particular asset. As long as cryptocurrencies do not use the functions of money as a store of value and a standard measure of value, using them as a medium of exchange will significantly affect monetary policies will not act. At the last stage of the use of cryptocurrencies as an exchange function, the process ends with the return to fiat money. The acceptance of digital currencies issued by central banks by economic actors may contribute to financial stability by encouraging real interest rates on deposits to fall below zero. Deposits can be withdrawn from the market, provided that it depends on how central banks issue CBDC. Thus, with the CBDC, which can lead to a transition to a healthier banking system by limiting fractional reserve banking, deposits can be seen firstly out of the banking sector, reducing credit utilization and economic activity. Still, being a reliable monetary policy tool can increase the sphere of influence of monetary policy by positively affecting financial stability. It is envisaged that the studies in the pilot project stage will be followed carefully, and careful research will continue in this area. Most central banks also want to see the pros and cons of the first comprehensive project, considering that the risks in adapting to innovative technologies are high.

### Yazar Katkı Oranı Beyanı

Veri, Murat Akdağ tarafından toplanmıştır. Literatür taraması, Gürkan Bozma tarafından yapılmıştır. Sonuç ve tartışma bölümü yazarlar tarafından ortak olarak yazılmıştır.

### Çatışma Beyanı

Çalışmada yazarlar arasında çıkar çatışması yoktur.

### Destek Beyanı

Bu çalışma için herhangi bir kurumdan destek alınmamıştır.

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