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Görkem Gök
PhD Student in Faculty of Economics and Business,
University of Debrecen, Hungary
ORCID: https://orcid.org/0009-0009-3866-3727

Görkem Gök
Дебреценський університет, Угорщина

DIGITALIZATION OF MONEY AND PROBABILITY OF CENTRAL BANK DIGITAL CURRENCY

Monetary transactions between closely related individuals are simple and have very low costs. However, the internationalization of transactions increases both the time and financial costs of money transfers. The speed and cost of transactions have become important in the transition from commodity money to cryptocurrency. The development of the internet and technology has accelerated the transformation of money. When we look at the development of money, commodity money, coins, banknotes, paper money, representative currencies and finally cryptocurrencies draw attention respectively. In the digital money (cryptocurrency) age, the central bank's digitalization and issuing its own digital money is one of the issues discussed. Algorithmic digital currencies such as Bitcoin seem to be suitable competitors for central bank price currency and their presence in the market forces central banks to pursue tighter monetary policy. This study examines the transformation of money and the central bank's stance on digital money. The study concludes that monetary authorities should not remain insensitive to the financial movements that have developed in digitalization. The issuance of their digital currencies by central banks will reduce the cost of delay and enable them to keep pace with the developing technological age.

Key words**:** *Digital money, Central bank, Bitcoin, Monetary policy, Money conversion.*

Problem statement. This study discusses the virtual money phenomenon that emerged with the developing technology, the transformation of money, and central banks' perception of digital money. In this context, money and the transformation of digital money (cryptocurrency) and central bank digital money are discussed, respectively.

Analysis of recent research and publications. In the era of digital currencies, central banking is at the vanguard of monetary theory and practice. The existence of algorithmic digital currencies like Bitcoin on the market is pressuring central banks to adopt tighter monetary policies as they are credible rivals for central bank-priced money. The blockchain technology that powers digital currencies has the potential to be developed by central banks, which may also act as a launchpad for creating new digital currencies. The relationship might become more limited due to the significant effects that an independent digital currency might have on the banking industry. It might make it unnecessary for people to maintain deposits with central banks and government-run reserve banks. Discussions on these issues have led to a revival of interest in classical monetary economics [3]. In this environment, it seems almost impossible for countries' central banks to remain insensitive to digital money issues. It is not long before the cryptocurrency world, which acts with a decentralized logic, starts to be used instead of deposit money or dematerialized money. A resurgence of interest in classical monetary economics has resulted from discussions on these topics Raskin & Yermack [3]. It appears nearly impossible in this atmosphere for national central banks to continue to be indifferent to problems with digital money. The decentralized logic of the cryptocurrency world suggests that it will be soon that it replaces bank money and other forms of dematerialized money.

Formulation of the purpose of the article. Numerous cutting-edge items in retail payments have emerged in recent years due to quick technical advancement and new business models. These developments raise the possibility of significant shifts in the retail payment environment, including a decline in the use of cash. Central banks must keep track of new developments and carefully consider their consequences in order to perform their essential duties in a changing environment.

Presentation of the main material. This paper discusses the phenomena of virtual money that evolved along with technological advancement, the transformation of money, and central banks' perceptions of digital money. In this context, digital money (cryptocurrency) and central bank digital money are considered in relation to money and the evolution of money.

Every innovation may face various problems when it first emerges and may not even be accepted by society at first. However, innovations are important cornerstones of economic development as they bring new solutions

to the market. In the past, financial innovations were mostly carried out by institutions, but today, with the development of the internet, the way the real economy works has completely changed. The development of technology in every field has led to the rapid development of financial technology. However, like every innovation and development, changes and developments in financial areas have encountered various obstacles.

One of the biggest obstacles to financial innovation studies has been data scarcity. Innovation studies in manufacturing and production have traditionally focused on R&D expenditures and patenting. Given the infrequency financial services firms report R&D expenditures and the fact that financial patents were recently used, these measures are unlikely to be satisfactory in this context [1].

Digital currencies (cryptocurrencies) are new economic and financial instruments with remarkable and innovative features. Their most important components are that they have no underlying assets, are not issued by any government or central authority and do not generate interest or dividends. Initially viewed with scepticism, this brings to mind the possibility of becoming the future currency. Potential investors looking for a safe haven are increasingly interested in this financial innovation. At the same time, the growing popularity of cryptocurrencies highlights the fact that many buyers and sellers are using them for online payments.

Monetary transactions between individuals in close proximity are simple and have very low costs. For example, someone who wants to paint his house can have his neighbour do the work and pay him directly in cash. In this case, there would be no commission for this payment, and the transaction would only involve the exchange of paper money. What if the painter is not a neighbour of the person concerned? For example, what if he is a software developer in China and needs to be paid for a transaction? The simple process of paying for a service is no longer so easy; putting paper money in an envelope and mailing it to China would be too risky and slow. With about a third of the world's population, if not more, conducting transactions online instantaneously, it is both costly and time-consuming to pay for transactions in the typical banking system. In international trade, millions of dollars a year are deducted from payments made with credit cards, bank money, and electronic payment methods.

Digital currencies, which have started to be used, appear as systems that accelerate and facilitate transactions without the phenomenon of real money. The world of cryptology, which shows that payments can be made quickly and costless without any interruption and without being recorded, promises us new money.

Digital currencies propose to move away from the established design of financial system infrastructures. These currencies oppose traditional monetary systems that are centrally coordinated and less transparent. In contrast, technological solutions and information systems such as cryptographic algorithms provide decentralized organization, transparency, and operational security [2].

Nakamoto's design of Bitcoin as a "Peer-to-Peer Electronic Cash System" aimed to allow network members to transfer value directly between each other without any role for a trusted third party, such as a central bank. Few people While in early 2009 we recognized the launch of Bitcoin, today, with its still unknown creator, cryptocurrencies have a clear political agenda [3].

Central banking in the age of digital currencies is at the forefront of monetary theory and policy. Algorithmic digital currencies such as Bitcoin are viable competitors for central bank price currency. Their presence in the market is forcing central banks to pursue tighter monetary policy. Central banks could develop payment and clearing operations, such as the blockchain technology behind digital currencies, and serve as a platform from which they could launch their own digital currencies. An independent digital currency could have profound implications for the banking system, which could narrow the relationship. It could eliminate the need for individuals to hold deposits with central banks and public sector reserve banks. The debate on these issues has led to a revival of interest in classical monetary economics [3]. It seems almost impossible for countries' central banks to remain insensitive to digital money issues in this environment. It is not a long time before the cryptocurrency world, which acts with a decentralized logic, starts to be used instead of deposit money or dematerialized money.

While there are many easily regulated intermediaries regarding traditional securities and derivatives, the emerging Bitcoin-denominated instruments rely less on conventional intermediaries such as banks and securities exchanges. In addition, the blockchain technology first introduced by Bitcoin enables fully decentralized markets and exchanges, thus eliminating the need for intermediaries in complex financial transactions [4].

Bitcoin presents a unique challenge to policymakers. On the one hand, because it is an open protocol and decentralized network, there are no companies or centralized servers that can be regulated; on the other hand, several new intermediaries operating on the Bitcoin network have emerged as absolutely susceptible to regulation and enforcement. These include exchanges, trade processors, and money transmitters that provide Bitcoin services to consumers. Bitcoin-related regulation has focused mainly on applying "know your customer," anti-money laundering rules, and consumer protection licensing to these new intermediaries.

In recent years, rapid technological progress and new business models have resulted in many innovative products in retail payments. These innovations increase the potential for significant changes in the retail payments environment, including reducing cash usage. To effectively fulfill their core functions in a changing climate, central banks need to monitor new developments and closely examine their implications [5].

Evolution of Money. The paradigms of collaborative value creation through trade and barter have a history spanning thousands of years. In this way, money emerged

to overcome a number of challenges in bartering and exchange. The evolution of paradigms for trade and exchange continues today, accelerated both by crises in the major global economy and by new possibilities provided by information technology.

To understand how modern money (digital money) has evolved, it is necessary to understand what money is and what its functions are. Money, which initially emerged as a means of exchange to facilitate people's work as a means of exchange, nowadays has different procedures and has become more complex than just making things easier. Money has become an end rather than a means. In short, while people initially held on to money to cope with the difficulties of the barter economy, today, they want to hold on to money to make money from money.

[6], in one of his studies, states that "fish cannot comprehend the nature of the water in which they live. Similarly, people find it difficult to understand the nature of money. It is so familiar to them that they rarely question what it is about or what it represents. We devote a great deal of our physical, emotional, and mental energy to earning, holding, and spending money, but how many of us really know what money is or where it comes from?" emphasizing how much money has entered our lives and how difficult it is to understand.

The economic theory defines money not by what it is but by what it does – what it functions. The first step is to understand that money is not a thing. It is an agreement within a community to use something as a medium of exchange. However, this agreement is primarily unconscious, as most people accept our monetary system in ways they cannot even imagine as entirely different [6].

In this sense, money is a medium of exchange, a means of accumulating value, and a measure of value. All individuals use money in their social lives for these functions without realizing it.

Money is a medium of exchange. People use the money to obtain goods and services that satisfy their needs. While this was initially done with various items that we call commodity money, this function was later fulfilled with coins, banknotes, paper money, and representative money, respectively. The difficulties created by the barter economy, or in other words, the challenges created by the barter economy, and the fact that the "exchange of goods for goods" has become almost impossible with the increasing population, have led to the need for a means of exchange. This is because finding someone who sells the goods or services that people want to trade or someone who wants the goods or services they offer is too tricky and complex to be realized through a barter economy in an environment with millions of people and millions of different goods and services – using money as a medium of exchange both simplified mutual commercial transactions and made them faster. Money is a liquid asset. A liquid asset is used in the sense of an investment that converts quickly into money; in the same way, money moves very fast in converting into other assets. This means that money has high liquidity. This can be shown as the most important factor that facilitates shopping. On the other hand, using money has also reduced transaction costs.

Money is a unit of account. A unit of account means that money provides standardized terms on which quoted prices and debts are recorded. It is also called the standard of value against which economic transactions are measured [7]. While all kinds of assets are recorded with their monetary value, the value of assets is expressed in money, and money is used as a measure of value.

Finally, money also functions as a means of accumulating value, a store of value. This means transferring the purchasing power of individuals from the present to the future. An individual may decide to hold on to some of the money they receive for their labor for later use. Storing money in this way implies using it as a source of savings. During periods of inflation, when general price levels rise, money could serve better as a store of value. This is the case when inflation is absent or very low.

In earlier times, currency was essentially a receipt for a commodity, which in most cases could be redeemed for physical gold. Today, however, most currencies are known as "fiat" currencies: inherently neither valuable nor redeemable for a commodity, but instead issued and backed by central authorities, such as countries' central banks. The value of such currencies is derived from the trust placed in the central authority by the currency users [8].

While people are often used to thinking of money in its physical form, only a tiny proportion of a country's total money supply is typically in banknotes and coins. In the UK, this is 2.1% of the total money supply of £2.2 trillion. This raises the question of dematerialized money and then electronic money or e-money. Within this rather general definition, one can think of many different forms of e-money, such as bank deposits, electronic funds transfers, direct deposits, and payment processors (including micropayments). When funds are received, electronic money (also known as "e-money") is issued with a claim on the issuer and can be stored electronically, including magnetically. Users accept it for use in payment transactions [9]. Cryptocurrency, often called, can be defined as a sub-branch of electronic money. The most widely known cryptocurrency is Bitcoin, developed by Nakamoto in 2008. Because it does not need financial intermediaries to complete electronic transactions and is not governed by a central bank or other body that sets monetary policy, bitcoin is referred to as a "decentralized" currency.

A subcategory of alternative currencies, more especially digital currencies, are cryptocurrencies. According to Wikipedia, a cryptocurrency is a form of currency that use cryptography to safeguard transactions and regulate the production of new units. In place of centralized digital currency and central banking systems, cryptocurrencies employ a decentralized control mechanism. With distributed ledger technology, most often a blockchain, which acts as a public database of financial transactions, each cryptocurrency's decentralized control is accomplished. The first decentralized cryptocurrency

is frequently regarded as being Bitcoin, which was first made available as open-source software in 2009. More than 6,000 altcoins – alternative versions of Bitcoin or other cryptocurrencies – have been developed since the debut of Bitcoin.

Bitcoin is often described as a "digital currency." While this description is accurate, it can be misleading because it is too broad and too narrow. It is too wide because Bitcoin is a particular digital currency (the first of its kind) called a cryptocurrency. On the other hand, although it is an aspect of the Bitcoin system as a currency, Bitcoin is more broadly an Internet protocol with many applications beyond payments or money transfer, such as recording property titles and authentication documents [4].

The use of Bitcoin and similar cryptocurrencies is rapidly expanding due to their privacy, fast transfer, and low transfer costs.

Central Banks and Digital Currency. A significant portion of the historical discussion about central bank liabilities emerged when monetary policy was very different from what it is today. Nowadays, central banks are more involved in macroeconomic management. To stay up with modern financial technology, monetary policy must carefully weigh the advantages and disadvantages of creating a digital money [10]. Technological advances, changes in the structure of the financial system, and recent monetary policy developments mean that in the future central banks will need to consider whether the current arrangements for access to their balance sheets are optimal.

Central Banks and most people currently involved in the complementary currency movement tend to ignore each other. Central Banks dismiss such alternative currencies with disdain due to their marginal status and scale, while other people involved in currency movements pretend to be completely unaware of the full role and mandate of central banks.

Expanding access to central bank money for businesses and individuals is conceivable, as evidenced by advancements in digital payment systems and digital currencies [11]. When an autonomous digital currency circulates in an economy, it is possible for it to compete with the official currency issued by the country's central bank. Competition between official and private money is nothing new. Likewise, digital currencies have been incorporated into alternative currencies in various societies. Just as precious commodities, such as gold and silver, can compete with the national currency, so can digital currencies. However, in most countries, the biggest competitor to the local currency is the currencies of foreign governments, especially the US dollar. For a central bank, the challenges posed by a digital currency are essentially the same as the presence of a competing currency [3].

The proliferation of digital payment networks, the development of e-commerce and e-payment systems, and the 24/7 circulation of digital currencies in electronic environments at minimal cost have significantly reduced the use of cash. In this environment, central banks can't remain insensitive to the situation. As a result, central banks have started to feel pressure to take steps toward digital currencies.

There needs to be clarity about what alternative currencies and cryptocurrencies, in particular, are, and discussions often take place without a shared understanding of what is being offered. For clarity, the question is: what are central bank digital (crypto) currencies? To this end, there is a classification of money based on four key characteristics:

– Issuer (central bank or other);
– Form (electronic or physical);
– Accessibility (universal or limited);
– Transfer mechanism (centralized or decentralized).

This classification defines a central bank digital currency (CBDC) as an electronic form of central bank money that can be exchanged in a decentralized manner. With this money, transactions take place peer-to-peer, i.e., directly between payer and payee, without the need for an intermediary [12].

In this sense, the rationale for central banks to legally use digital money could be to provide a safe central bank instrument as an alternative in the event of an extreme reduction in the use of cash. In recent years, technological advances have significantly improved the convenience and efficiency of digital private sector payment instruments compared to central bank paper money. In Sweden, these developments have led to an absolute reduction in the amount of cash in circulation. The Riksbank has researched whether an e-krona could provide the public with continuous access to central bank cash and increase the flexibility of the payment system [13].

Various central banks worldwide have been discussing digital currency (CBDC) for the last few years. Ecuador's central bank launched a digital currency in 2015 and ended the failed project three years later [14].

According to White, central bank digital money could be created in two models. The first model could take the form of a digital currency, such as Bitcoin, that passes peer-to-peer without going through an interbank clearing system, possibly validated by a distributed ledger blockchain system; the second model could take the form of account balances that individuals and businesses could hold directly on the central bank's books in the same way that commercial banks hold money for interbank payments. The latter model is not an acceptable currency; it is a deposit transfer system, but it falls under the umbrella of "digital currency." This is because it resembles fiat currency notes as a central bank liability and is a "final" means of payment, and transactions are made almost instantaneously on a single balance sheet.

In her speech at the Singapore Fintech Festival, Christine Lagarde (2018), the head of the IMF, stated that it is essential to keep up with the winds of change and that it is vital for central banks not to remain insensitive to digital currencies and to work on this issue. She went further in an environment where some people say that the state should take its hands off money. She expressed

whether the state should remain in the money market as an active player rather than a regulator and whether it will fill the gap left by cash withdrawal. Lagarde justifies her remarkable progress by claiming that central banks can achieve shared goals with a Central Bank Digital Currency (CBDC) and that private companies need to be more motivated to succeed. Lagarde stated that CBDCs could help people without bank accounts or provide services and financial solutions to poor or rural areas. She noted that countries such as Sweden, Norway, and Canada are considering issuing a CBDC and mentioned the work of various central banks in this area.

However, three key issues were emphasized in a study by the European Central Bank. First, there has been a sharp decline in the demand for cash in some nations, most notably in Sweden and Norway; second, central banks today should be able to benefit from new technologies based on what is commonly known as "token-based" currency, a distributed ledger technology, or comparable encryption technology; and third, at least from a long-term perspective, the role of central banks in setting monetary policy and, more recently, the emergence of negative rates [10].

The Central Bank of China (PBOC) announced that the digital Yuan could be launched soon. The PBOC official stated that after five years of work, the digital currency has now come to an end and that the proliferation of cryptocurrencies has caused concern among global central banks, which means that the digital asset should be placed under central bank supervision to prevent potential currency risks and protect monetary policy authority. The PBOC intends to launch digital currency to influence credit and monetary policy by replacing M2 with M0 or cash in circulation. The digital currency is also intended to support the circulation and internationalization of the Yuan [15].

The optimality of the current arrangements for access to central banks' balance sheets will need to be evaluated in the future due to technological advancements, modifications in the financial system's structure, and recent monetary policy developments. It concerns how and to whom central bank money is produced. This evaluation will aid in understanding how digital currencies issued by central banks can be used generally in financial structures. Potential effects, particularly on the stability of bank deposits. Giving more financial market actors access to the liabilities side of the central bank's balance sheet could be a medium-term further change, provided that doing so improves the transmission of monetary policy in a situation of excess liquidity [10].

The only form of central bank money that the general people can now own is cash. Let's say someone wants to execute these currency transactions electronically, or digitize them. In that situation, they must deposit funds in a bank in order to convert the central bank liability into a commercial bank obligation. Consumers would be able to hold central bank liabilities digitally thanks to central bank digital money. But this would also be feasible if the general public were given access to central bank accounts, a proposal that has long been proposed [12].

Conclusion. The development of technology has led to the Internet of Things and the Internet of Money. In an environment where everything happens online, it is natural for monetary transactions to take place electronically with digital data and cryptology infrastructure. If central banks are responsive to this process, it will only cause a waste of time. The transformation of money, which has undergone a great transformation over the centuries, into a digital form is an inevitable end for all financial institutions in this financial technology environment.

In this context, governments should further scrutinize cryptocurrencies, especially Bitcoin, and regulate businesses that exchange Bitcoin. In doing so, monetary authorities should do so without trying to suppress or slow down these emerging currencies and without attacking individuals who transact in these currencies and act within the law. As Turpin argues, governments should not outlaw or try to stop cryptocurrencies for three reasons: 1) cryptocurrencies are currently not illegal and thrive under existing legal frameworks in almost every country; 2) cryptocurrencies offer significant economic advantages over traditional currencies and payment methods, and 3) governments cannot directly target cryptocurrency networks. As such, the development of the system's legal infrastructure by central banks would prevent uncontrolled development.

While it seems unlikely that Bitcoin or its derivatives will replace sovereign currencies, they have demonstrated the viability of the underlying blockchain or distributed ledger technology. Algorithmic digital currencies like Bitcoin are viable competitors for central bank fiat currency, and their presence in the market is forcing central banks to pursue the tighter monetary policy. It is concluded that monetary authorities should be open to the monetary movements that are evolving in digitalization. The issuance of their digital currencies by central banks will reduce the cost of delay and enable them to keep pace with the developing technological era. The fact that access to central bank digital money will be open to authorized banks and individuals will create a controlled cryptocurrency future.

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ДІДЖИТАЛІЗАЦІЯ ГРОШЕЙ ТА ЙМОВІРНІСТЬ ПОЯВИ ЦИФРОВОЇ ВАЛЮТИ ЦЕНТРАЛЬНОГО БАНКУ

Діджиталізація грошей – це процес перетворення традиційних форм валюти, таких як готівка та фізичні монети, у цифрові формати. Вона передбачає використання електронних транзакцій, онлайн-банкінгу, мобільних платежів та інших цифрових платформ для проведення фінансових операцій. Імовірність запровадження цифрової валюти центрального банку (ЦВЦБ) варіюється в різних країнах і регіонах. Хоча кілька центральних банків вивчають концепцію CBDC, фактична реалізація та прийняття залежать від різних факторів, включаючи економічні, регуляторні та технологічні міркування. Деякі країни досягли значного прогресу в розробці та пілотуванні CBDC. Наприклад, Китай активно тестує свою цифрову валюту, відому як електронні платежі в цифровій валюті (DCEP), і вже провів масштабні випробування в кількох містах. Багамські острови також запустили піщаний долар, ставши першою країною, яка офіційно запровадила CBDC. Грошові транзакції між близькими особами є простими і мають дуже низькі витрати. Однак інтернаціоналізація транзакцій збільшує як часові, так і фінансові витрати на грошові перекази. Швидкість і вартість транзакцій стали важливими при переході від товарних грошей до криптовалют. Розвиток інтернету і технологій прискорив трансформацію грошей. Коли ми дивимося на розвиток грошей, то виділяють товарні гроші, монети, банкноти, паперові гроші, репрезентативні валюти і, нарешті, криптовалюти. В епоху цифрових грошей (криптовалют) одним з обговорюваних питань є діджиталізація центрального банку та випуск ним власних цифрових грошей. Алгоритмічні цифрові валюти, такі як біткойн, є гідними конкурентами для валюти центрального банку, а їхня присутність на ринку змушує центральні банки проводити жорсткішу монетарну політику. У цьому дослідженні розглядається трансформація грошей і позиція центрального банку щодо цифрових грошей. У дослідженні зроблено висновок, що монетарна влада не повинна залишатися нечутливою до фінансових рухів, які розвиваються в умовах цифровізації. Випуск центральними банками власних цифрових валют зменшить вартість затримки і дозволить їм йти в ногу з технологічною епохою, що розвивається.

Ключові слова: *цифрові гроші, Центральний банк, біткойн, монетарна політика, конвертація грошей.*