

12-2022

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Recommended Citation

Egbuna, N.E. (2022). Digital Currencies: emerging trends, challenges and the future of the monetary system. CBN Economic and Financial Review, 60(4). 97 - 119.

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Digital Currencies: Emerging Trends, Challenges and the Future of the Monetary System

Ngozi E. Egbuna*

I. Introduction

The 21st Century witnessed rapid advancement in Information and Communication Technology (ICT) with a strong knock-on effect on the financial system leading to innovative financial services and opening ways for state-of-the-art payments system. This advancement led to the emergence of digital currencies, programmable money which comprise any structure of payments that is available purely in electronic form without tangible apparatuses like coins, cheques, or notes. This kind of money is accessible via various electronic devices and can be used to purchase goods and services as well as other utility similar to physical tangible currencies. The process of payment using digital currency is convenient, particularly in cases of long-distance economic transactions. Payments with digital currencies are fast and easy due to their network-based nature. There are broadly two types of digital currencies, viz centralised and decentralised. Centralised digital currency is issued by central authority mostly the central bank and referred to as Central Bank Digital Currency (CBDC). On the other hand, decentralised is digital currency issued by private without third party central repository.

The use of digital currencies is increasing rapidly across the globe. According to Huang and Mayer (2022), there are nearly ten thousand different digital currencies across the world with estimated volume of over US\$1.90 trillion as at March 1, 2022. The use of this mode of payment or type of money is growing fast across the globe as evident in the volume of transactions. Digital currencies are easy to use and extremely fast in accomplishing transaction, almost instantaneously. Most often, transactions are between customers operating in the same platform; thus, transaction cost is zero, and even when it is between different platforms, the cost is minimal. Digital currencies are

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immune to physical defects or damage. The cost and stress of manufacturing or printing currencies are completely absent in the case of digital currencies.

Despite the numerous advantages associated with the use of digital currencies, the innovation is laden with considerable challenges. Among them is the significant risk of hackers stealing from digital wallets. The deficiency of required infrastructure such as secure internet facilities is also a major challenge for the use of digital currencies particularly in developing countries. The rate of exchange of digital currencies, particularly privately issued ones, usually fluctuates drastically when compared with conventional currency, hence they are highly volatile.

This paper discusses the nature and types, trends, prospects and benefits, challenges and demerits of digital currencies, as well as, the link between digital currencies and the monetary system.

II. Digital Currency and its Types

Digital currency is an electronically created virtual currency storable on the operational architecture of distributed ledger technology which allows a currency to be used in a decentralised payment system and to be applied to a variety of other distributed data systems, with applications ranging from transaction monitoring to certification (Foster et al., 2021). Digital currencies comprise different categories which are Cryptocurrency, Virtual Currency and the Central Bank Digital Currency (CBDC) (Zhong, 2022). This has opened a new world of opportunities and improvement to the global financial system. However, it also brought huge problems detrimental to its general acceptability and adoption.

With the continuous global spread of internet and technology especially the FinTech, it has led to radical movement away from the traditional system of value exchange and the creation of new currencies which facilitate instantaneous peer-to-peer transfers of value in a way that was previously impossible (Brunnermeier et al., 2019). This is in line with the general consensus that it facilitates transfer of value through the internet without the involvement of traditional banks.

II.1 Private Digital Currencies

These are digital goods provided by businesses that resemble money, providing a unit of account, a means of exchange, and a store of value.

Examples include Amazon Coins, Microsoft Points, and Facebook Credits (Gans & Halaburda, 2013). They are digital since they don't have a physical counterpart and don't represent a claim on actual assets. This is different from a digital transaction of a contractual agreement to transfer real money between accounts (Gans & Halaburda, 2013). Cryptocurrency is classified as private because it is not issued by the monetary governing body of the state but by a group of developers, or organisations. While this may be true, some of the cryptocurrencies are public because they rely on public owned distributed ledger network like Bitcoin.

II.2 Cryptocurrency

This is a significant revolution in the global financial system, built on the idea of decentralisation (decentralised ledger technology) rather than depending on trusted bodies and central banks to maintain the system's self-sufficiency and independence from the influence of strong entities or organisations (BIS, 2022). According Perkins (2020), "cryptocurrencies are digital money in electronic payment systems that generally do not require government backing or the involvement of an intermediary, such as a bank. Instead, users of the system validate payments using certain protocols". This is based on the theoretical underpinning of synthetic commodity money characterised by a limitation in absolute quantity (Tomić et al., 2020). The emergence of cryptocurrencies appeared to revolutionise the payments system as it cuts out the inefficiencies and added costs of intermediaries like central banks, commercial banks, and the credit card institutions (Prasad, 2022).

The first known cryptocurrency in the world was Bitcoin developed by an unknown programmer under the name Satoshi Nakamoto following the publication of its white paper in 2008. Since then, cryptocurrencies have transformed from obscure specialised technological curiosities to quickly spreading financial products that are the focus of considerable public attention (Perkins, 2020). Other forms of cryptocurrency include, Ethereum, Litecoin, Solana, Cardano, and Stablecoins (like USDT, USDC, and BUSD) whose values are pegged to some currencies. But the widespread use of cryptocurrencies has raised speculation on digital currencies displacing fiat money or being a façade of the present monetary system.

While the speculation is still an ongoing phenomenon, it is important to note that the future value and the significance of cryptocurrencies will likely be

greatly influenced by how effectively they perform the conventional functions of money as compared to the current financial systems.

II.3 Virtual Currency

United States legislative actions define virtual money as a means of trade that functions like a currency but lacks all the characteristics of actual cash, highlighting the lack of legal tender status in any jurisdiction (Dibrova, 2016). Virtual money is an uncontrolled digital currency that is managed by a founding agent or developing agent made up of multiple stakeholders (Zhong, 2022). According to the European Central Bank (2012), "virtual currency is a type of unregulated digital money, which is issued and usually controlled by its developers, and used and accepted among the members of a specific virtual community." In so far as the currency being used as the unit of account has no physical equivalent with legal tender status, it is referred to as virtual currency.

II.4 Other Private Digital Currencies in the World

One of the complex issues concerning digital currencies are on the supply side (Dwyer, 2014). As the world becomes more digitalised, the use of physical money is tapering, and major tech companies are creating digital currencies that make it possible to transact quickly and easily without using fiat money, undermining the ability of central banks to maintain their monopoly on currency creation (Kriwoluzky & Kim, 2019).

Among the private digital currencies that are now in use and share the same basic technology, Bitcoin and Ethereum are the most well-known. Their supply and demand is a strong foundation for their functionality. Other ones include, Cardano, Solana, Binance Coin, Dogecoin, Bake, Cake, Ripple, Litecoin, etc. All of which are based on Blockchain technology.

II.5 Central Bank Digital Currencies (CBDCs)

CBDCs are a type of digital currency that is a direct liability of a central bank and is denominated in the national unit of account which can either be account-based and rely on identification or token-based and allow for anonymity in payments using distributed ledger technology (DLT) or more traditional technological infrastructures (Auer et al., 2021). With this new kind of fiat money, the general public now has digital access to central bank reserves rather than only commercial banks. It would blend cash's utility in

peer-to-peer transactions with deposits' digital nature to create a hybrid system (Agur et al., 2019).

The emergence of cryptocurrency or private digital currencies like bitcoin has sparked discussions regarding CBDCs on a worldwide scale (Ozili, 2022). Governments started considering a government-issued digital currency and evaluating if there is a compelling argument for developing a central bank digital currency as a result of citizens' increased usage of cryptocurrencies (Ozili, 2022). Bahamas became the first country in the world to roll out a CBDC named Sand Dollar and this happened in October 2020 during the COVID-19. Nigeria is the first African country to launch a CBDC called eNaira.

II.6 eNaira: The Operational Structure

The Central Bank of Nigeria issued the eNaira in 2021 (in accordance with Section 19 of the CBN Act) as a digital version of the naira. By its design, it is at par with the physical naira, a direct responsibility of the Bank, a legal tender, and included in currency-in-circulation (Central Bank of Nigeria, 2021a). The eNaira will serve as a supplement to the traditional naira as a more, efficient and secured method of payment. Additionally, it will increase the efficiency of monetary policy, strengthen government ability to implement targeted social initiatives, and increase remittances through official channels (Central Bank of Nigeria, 2021a). It is an account based CBDC model to fast-track financial inclusion, which is one of its core principle.

The overarching goals of the eNaira are encapsulated in the design principles. They define its fundamental tenets as a form of payment and as a medium of trade which must adhere to three standards set forth by the Bank for International Settlements which are: Do no harm, Coexistence, Innovation and Efficiency. This spelt out the architecture and the operational structure in line with the recommendations of Bank for International Settlement (BIS), World Economic Forum, and Coalition of Central Bank (Central Bank of Nigeria, 2021b).

The operational structure involves Central Bank of Nigeria, Financial Institutions, International Money Transfer Operators (IMTOs), and Agents. The CBN will continue to be in charge of the eNaira payments system and remain in charge of creating the digital money, overseeing the wallet, and keeping track of all transactions. The general framework for execution, monitoring, and promoting further innovation will be provided by the CBN. Financial institutions

and other payments service providers will manage and process retail payments in addition to offering other payments services that are stacked on the eNaira payment system (CBN, 2021a).

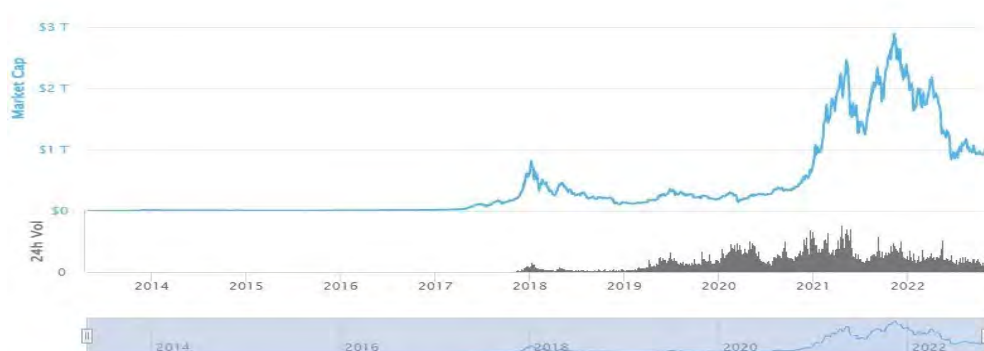
All these are carried out on a platform on which financial institutions and providers of payment services may innovate and build layered payment services to enable a variety of use cases for eNaira. This is an open system accessible based on tiered know-your-customer (KYC) structure which are individual and merchants.

III. Trends of Digital Currencies

Privately issued digital currencies have gained traction because of its enormous speculative profit and decentralised blockchain-based distributed ledger technology that uses cryptography (Bhowmik, 2021). The demand for cryptocurrency has been on the upward trajectory (Bhowmik, 2021). Global financial markets are evolving as a result of financial technology, and a market for digital currencies is starting to emerge as more people adopt digital currencies.

India is leading the adoption of cryptocurrency globally, with 29.0 per cent adoption rate, followed by Nigeria with 27.0 per cent, Vietnam 25.0 per cent, Australia, 22.0 per cent, and Ghana 20.0 per cent. The United States of America has 13.0 per cent adoption rate which is equivalent to 33.7 million of the total population. The global cryptocurrency adoption rate was 4.2 per cent. As of November 2022, the global crypto market capitalisation is US\$1.01 trillion (Coinmarketcap, 2022).

Figure 1: Global Crypto Market Capitalisation



Source: Coinmarketcap.

The chart above shows the overall market capitalisation of the crypto market. Total market capitalisation was very negligible between 2014 and mid-2017. It remained significantly below US\$1.00 trillion during this period, after which it momentarily assumed an upward trajectory. It was characterised by volatility from 2018 but on average maintained a steady trend. Afterwards, it assumed an upward trend in 2021 and rose steadily, reaching US\$2.38 trillion amidst volatility. The sharp rise in overall market capitalisation could be attributable to heightened choice of the use of cryptos for investment/transactions owing to the COVID-19 pandemic, as lockdown restrictions necessitated the use of online medium of investment as alternative to physical investments/transactions impeded by measures in place to curb the spread of the COVID-19 virus. The crypto market witnessed a massive plunge in mid-2021 as normal economic activities resumed following the relaxation of restriction measures, which provided alternative face-to-face investment options. The sharp plunge in 2021 and 2022 could also be attributed to the rise of Ethereum, adoption of Bitcoin as a legal tender by El-Savador, capital investment in crypto and distributed ledger technology (DLT) companies, crypto regulation, etc. (Kaloudis & Oosterbaan, 2022). But overall, 2021 marked the best year so far in the crypto ecosystem with market capitalisation peaking at over US\$2.80 trillion.

In Nigeria, over 13 million people are crypto holders which makes Nigeria the number one in Africa in crypto adoption. As of 2020, the value of cryptocurrency transaction was more than US\$400.00 million and as of 2021, it was US\$316.90 million. While this might have reduced, the number of the people going into cryptocurrency in Nigeria keeps growing. Among the likely reasons for the continuous adoption of cryptocurrency by the citizens in the country include: continuous drop in the value of naira, inflation, new opportunities, etc.

Nigeria's growing participation in the crypto market as shown by its huge market capitalisation was perceived to be a threat to the Nigerian financial sector, hence, the Central Bank introduced its CBDC, known as the eNaira. According to the CBN Governor, since the launch of the eNaira, it had recorded about 840,000 downloads of the speed wallet application, with about 270,000 active wallets comprising over 252,000 consumer wallets and 17,000 merchant wallets. In addition, the volume and value of transactions on the platform had been remarkable, reaching above 200,000 and ₦4.40 billion, respectively.

III.1 Prospects and Benefits of Digital Currencies

The use of digital currencies provides a number of (micro and macro) opportunities to individual users, the monetary authority and the entire country. The benefits to consumers include 24 hours access to transaction services, uninterrupted operation, and user anonymity. The speed of transaction is all the same in 24 hours of the day in 7 days in a week. The ease of operation presents an opportunity to drastically reduce the number of non-account owners particularly in Africa; hence, promoting financial inclusion. The benefits to the financial system include the absence of transaction fees, low cost of exchange, quick transfer to anywhere in the world and higher security against counterfeiting. Another financial benefit is that digital currencies provide effective instrument for crowdfunding. All these benefits make digital currencies attractive to younger generation of the population.

Specifically, Ozili (2022) listed several opportunities that the CBN eNaira will provide to the Nigerian economy. These include the:

- enhancing of the transmission mechanism of monetary policy;
- promotion of the cashless policy;
- provision of cash alternatives and reduced dependence on cash;
- enabling of direct payments to citizens from the government;
- ensuring of diversified payment options in the country;
- facilitation of faster, simpler, and cheaper cross-border payments;
- boosting of financial inclusion as bank accounts are not required to hold CBDC
- improvement of trust and efficiency in the management of the Nigerian currency;
- reduction of the cost of cash management by lowering the cost of handling cash, cutting the cost of printing cash, and moderating the cost of cash destruction, thereby saving cost for the government;
- lowering of settlement risk;
- reduction of illegal activities such as fraud and money laundering. This is because digital payments and transfers using the eNaira will be easier to identify and trace back to the unique ID of the originator, thereby reducing fraud risk and money laundering risk. It will also prevent funds from being hidden and transferred outside the financial system;
- easing of access to financial services at remote areas that have suffered financial exclusion for many years;

- forestalling of tax evasion in Nigeria as it will make taxable assets traceable and will enforce transparency in the taxation system, thereby increasing tax revenue to the government; and
- engendering of cheaper and safer diaspora payments.

III.2 Challenges and Disadvantages of Digital Currencies

Though the advent of digital currencies has revolutionised the monetary system around the world with many benefits attached, it is not without its challenges and disadvantages. The disadvantages of the digital currencies ranges from macroeconomic instability, loss of monetary control by the monetary authorities, systemic risks, threat to environmental sustainability, acceleration of digital bank runs and hindrance to bank infrastructure innovation.

Macroeconomic instability: One of the challenges and disadvantages of digital currency is the susceptibility of the economy to instability. If all payments in an economy are based on privately-issued digital currencies, the economy may be subject to indeterminacy and there may not be a unique equilibrium to maintain stable prices (Fernández-Villaverde & Sanches, 2017). The veracity of the submission was equally affirmed by Nicolaisen (2017) who warned about the risks associated with a scenario in which the Norwegian economy no longer has any functional legal tender.

Loss of monetary control: Privately issued digital currencies without regulatory framework could cause a loss of monetary control. Virtual currencies not backed by any sovereign currencies attract zero interest rate. Central banks typically steer monetary policy through the interest on reserves (IOR). Since monetary base in the modern system is linked with the level of reserve at the Central Bank (where the IOR serves as floor for the market interest rate) the **central bank's use of interest** rate to control the supply of digital money within the economy becomes impracticable. An attempt to reverse this led to the advent of CBDCs with interest bearing framework which can be held by anyone, an enterprise that enhances **the central bank's ability to manage** market interest rates over time. Since traditional monetary policy influences only the supply and interest rates of sovereign currencies, it would not affect economic activities undertaken in crypto-assets.

Systemic risks: Unregulated digital currencies expose the economy to systemic risks. Generally, the payments networks typically exhibit substantial externalities and increasing returns to scale. In that connection, since the

market prices of digital currencies have exhibited high volatility and very sharp fluctuations in recent years, there are risks of consistent operational problems. Being privately denominated, the entire payments system could become quasi-monopolistic. Under such circumstances, any significant operational problem within the payments network could pose substantial risks to the entire financial system and to the macroeconomy.

Threat to Environmental sustainability: One of the challenges associated with digital currencies is the turnout of environmentally devastating effects. Through the implementation of green monetary policy, central banks have frequently transformed into proponents of environmental sustainability. In certain countries, the central bank's mandate now includes promoting environmental stability in addition to price and financial stability (Bank of England, 2021). As of November 2018, Bitcoin used roughly 45.8 TWh (Terawatt hour) of electricity annually, which is equivalent to 22-22.9 million metric tonnes of CO₂ emissions (Stoll et al., 2019). Emissions associated to all cryptocurrencies are projected to drastically rise, in part due to the "proof-of-work" nature of crypto mining. Jiang et al. (2021), for instance, reported that China's annual energy consumption of the Bitcoin blockchain will reach a peak of 296.59 TWh in 2024 and produce around 130.50 million metric tonnes of CO₂ emissions. Mora et al. (2018) equally opined that digital currencies may significantly contribute to countries failing to meet the goals of the Paris Agreement.

Encouragement of Money Laundering: Cryptocurrencies, as their name would suggest ('crypto'), evade state monitoring and control. As peer-to-peer systems help to by-pass central bank oversight, there is high possibility of money laundering and financial theft such as stealing from digital wallets and other forms of financial crimes.

Accelerating Digital Bank Runs: One of the features of unregulated digital currencies like bitcoin is that anyone can use them at no cost, anywhere and anytime, via computers and smartphones. A seamless interface with banking apps, makes them potential enablers of bank runs. In this regard, if rumours or other events cause financial markets to become unstable, depositors would rapidly convert their funds from deposits to digital currencies. Since depositors don't need to be present in person at the bank or ATM to take money, such digital bank runs might be much quicker than conventional bank runs. In a challenging environment, digital bank runs may thereby hasten the international spread of liquidity issues. The implication of this is that central

banks or financial markets will find it difficult to cover up the source of a liquidity crisis within a very limited timeframe.

Hindrance to Banks' Infrastructure Innovation: The present payment and settlement systems share characteristics with major payment infrastructure and innovative products such as checks, credit cards, debit cards, ATMs and wire transfers that were created through private initiatives. In this regard, the dominance of digital currencies which eliminates intermediaries in the present two-tiered monetary system could hinder innovation by private entities especially with regards to payment and settlement infrastructure.

IV. Digital Currencies and the Future of Monetary System

The modern monetary system consists of the central bank as a single issuer of sovereign currency and a two-tiered structure. The two-tier system currently being operated by countries around the world may be impaired by digital currencies, depending on the form of digital currency adopted. Money and payments often involve intermediaries, both bank and non-bank, which issue private forms of money and provide access to payment services. The digital currencies, including the first-generation crypto-assets (Virtual currencies) like Bitcoin, are inherently outside the scope of nation states and are not underpinned by sovereign currency units. Another form is the stablecoins which is a form of cryptocurrencies that seek to stabilise their value against **sovereign fiat currencies or another safe asset**. Facebook's Libra was launched more recently with the objective of pursuing credibility by pegging the value of the currency against a basket of stable currencies like the US dollar and euro. There are, however, serious governance concerns if a private entity issues its own currency and is responsible for maintaining its asset backing. As a result, the digital revolution, irrespective of its form, may disrupt the current two-tiered structure of the monetary system around the world. This is because those forms may deviate from an appropriate asset backing especially in the face of pressure to invest in riskier assets aimed at achieving higher returns. In this regard, unregulated digital currencies cannot serve as the basis for a sound monetary system as they are not always credible.

It was argued that for digital currencies to remain credible and facilitate sound monetary system, they need to, at least, be heavily regulated and supervised, and be part of existing financial system by building on the foundations and trust provided by existing central banks. With this, digital currencies would serve as a technologically superior representation of central bank money. This aligns with the submission of Milton Friedman (1960, p. 8)

that “something like a moderately stable monetary framework seems an essential prerequisite for the effective operation of a private market economy. It is dubious that the market can by itself provide such a framework. Hence, the function of providing one is an essential governmental function on a par with the provision of a stable legal framework.”

Generally, a system of money and payments should have design features that protect the inimitability of the currency, support financial stability, preserve credit creation, minimise the risk of illicit financial transactions, and promote environmental sustainability.

IV.1 Structure of Monetary System

The digital currencies is expected to eliminate the intermediary in the payment system which may disrupt the current two-tiered monetary system. Recent digital innovation has brought about various new changes to the system, and these innovations metamorphosed into crypto-assets, the entry of big technology companies into payment services, and ambitious projects like the Facebook's Libra. The monetary payment flow will be directly from the consumers to the Central Banks and vice versa. How these affect the monetary system in the future is hinged on the structure of the digital currency pursued. The authorities' efforts to maintain the controllability of the monetary system by utilising digital technologies independently led to the recent conception of CBDCs. Nonetheless, CBDCs in turn might influence two-tiered structures of the modern monetary system. The case in which CBDCs transform the current two-tiered structure into a single-tiered structure is similar to the idea of narrow banking in which there would not be any intermediary.

Using the case of CBDCs for instance, if CBDCs substantially replace not only banknotes but also bank deposits, it would squeeze credit intermediation **through banks and inflate the central bank's balance sheet instead**. It should be recalled that neither granting of loan to firms or individual directly nor evaluation of the risks and returns of various projects are within the mandate of central banks. This suggests that replacement of bank deposits with digital currency in a way that is similar to the CBDCs could distort resource allocation within the monetary system. An alternative scenario to this is for banks to pay interests on their deposits to boost their competitiveness and enhance their attractiveness over CBDCs. In low interest rate environment, however, this may not work as they may find it difficult to offer sufficiently high interest rates to retain demand deposits.

Though the development may mar continual innovation in payments system, including the use of smart contracts to facilitate each business need, or management of anti-money laundering (AML) in combating the financing of terrorism (CFT), there will be more diversification in the payments architecture. In particular, the participants in this two-tiered structure will become more diversified, and not only banks but also non-bank payment service providers and big technology firms are expected to play important roles in the payments infrastructure. In this regard, if the central bank allows a larger range of direct participants in their settlement systems and extend their operating hours, they might reap some of the potential benefits of regulated digital currencies.

IV.2 Payments System Efficiency

A core mandate of monetary authorities is the attainment of efficiency in the monetary system. The digital revolution in the currency architecture has implications for the efficiency of the payments system, depending on its design. Digital currencies issued by private entities could contribute to enhancing the efficiency of economic transactions by making use of digital technologies while securing inter-operability of various payment platforms. The implication is that a two-layered digital currency issued by private entities will not impair the effectiveness of monetary policy if it is regulated and facilitate inter-operability among the participants. Consumers typically pay fees (sometimes above 2.0 per cent) for withdrawing cash from an ATM, while retail businesses incur substantial costs for sorting, cleaning, and verification of cash as well as interchange fees for taking payments via debit and credit cards. Digital currencies will put competitive pressure on contemporary intermediaries, pushing for more efficiency, lower costs and better service in payment markets. Digital currencies that are regulated, for instance, would be particularly beneficial for lower-income households, who tend to rely heavily on cash, and for small businesses, which incur substantial costs for handling cash or substantial interchange fees for taking payments via debit and credit cards. The efficiency gains from establishing account-based digital currencies such as the case of CBDC will be substantial in this regard.

In particular, the digital currency not backed by sovereign currency unit could greatly affect the stability of monetary system. Specifically, if crypto-assets not denominated in sovereign currency units become widely used for transactions, the effectiveness of monetary policy could be substantially impaired. Theoretically, this situation is similar to dollarisation, where foreign

currencies are widely used instead of domestic currencies. However, the monetary policy framework could foster true price stability, that is, the real value of CBDC would remain stable over time in terms of a broad consumer price index. Such a framework would facilitate the systematic and transparent conduct of monetary policy.

IV.3 Trust and Confidence in Monetary System

Traditionally, the existing laws of nation states and banking regulation as well as supervision by the deposit insurance serves as basis for institutional framework which uphold the trust and credibility of the modern monetary system. The framework of nation states continued to be the trust machine backing up the modern monetary system. The modern monetary system is characterised with scenarios under which the central bank is the sole issuing authority of the sovereign currency while commercial banks provide deposits as convenient private money.

This suggests that digital currency without technological innovation to guarantee trust will weaken trust and confidence in future monetary system. Taking bitcoin, a first-generation crypto-asset, as a case study, its trust foundation is not based on a nation's existing laws and legislation but on other form which is at a higher costs in terms of electricity consumption required for its mining (Criddle, 2021). The fact that the first-generation crypto-assets have not been used widely as payment instruments implies that a framework for creating trust and credibility that works better than nation states has not yet been found.

Later developments have, however, tried to incorporate the issue of trust in their structure. Example of such are the stable coin, which uses DLT platform, as well as Facebook's Libra, and the CBDCs. These later digital currencies are required to be fully backed by safe assets denominated in credible sovereign currencies (Diem Association, 2020). By implication, the later digital currency hinged their stability on the trust of national currencies. In this regard, Libra, stable coin and CBDCs could be regarded as a combination of crypto-assets and sovereign currencies which are schemes that borrow the framework of nation states to create trust and credibility. With such arrangement in place, the future monetary system is unlikely to operate outside the nation states. As long as nation states maintain trust and credibility, it could be difficult for crypto-assets to replace sovereign currencies. In this regard, the DLT behind crypto-assets such as blockchain may have great potential. If these technologies are successfully combined with the trust and credibility of

existing currencies, they could contribute to enhancing the efficiency of payments, settlements, and the economy. This is the core of the two-layered digital currency which the Digital Currency Forum in Japan envisaged as a way of achieving these goals.

IV.4 Cross-border Transaction

The current payments system is dominated by card networks, which rely on the correspondent banking system to settle cross-border payments with each transaction requiring the issuing bank of the payer and the acquiring bank of the payee. Remittance service providers also rely on correspondent banking networks to send funds to their destination, especially when the payment destination is an affiliated entity. Financial technology companies are increasingly entering the cross-border payments space, particularly for peer-to-peer payments. For example, financial technology companies are entering the remittance market, allowing consumers to fund "mobile wallets" online with their bank accounts and credit or debit cards and to send money directly to foreign mobile wallets.

Adopting common technical standards and legal frameworks could reduce frictions in cross-border payments. Digital currencies could increase the settlement speed of cross-border payments and foreign exchange transactions. By reducing the number of intermediaries involved in cross-border payments, appropriately designed currencies such as stablecoin arrangements could also offer similar cross-border payments benefits. There could, however, be incidence of operational and cyber risks attached. Hence, there is need for regulatory authorities to limit the extent of cyber and operational risks exposure of such system. Also, they could have destabilising cross-border effects, allowing large and sudden shifts of funds between economies. To correct this, there is need for identification in digital payments.

In addition, digital currency which is regulated, such as in the form of CBDCs, could enhance the efficiency of cross-border payments. Such digital currency design could tackle frictions in today's correspondent banking system, such as differences in opening hours, varying communication standards and a lack of clarity around exchange rates or fees. This was affirmed by the IMF in a recent study which showed that the introduction of a regulated digital currency (CBDC in this case) would facilitate more rapid and secure settlement of cross-border financial transactions.

IV.5 Privacy, Human Rights and Democratic Values

With digital currencies, monetary authorities are likely to have more access to information on the data attached to daily transactions carried out by anonymous consumers. Digital currencies in their regulated forms could threaten the privacy of the users, which may violate their human rights and democratic values. With digital currency, the payment system may be used by some countries or other individuals who have access to the transaction history to spy on users, exert influence or pressure on political opponents, or control economic activity. Political activists are more likely to be highly affected by such arrangement as their transactions can easily be tracked. This, however, depends on the extent to which monetary authorities are able to integrate their platform to incorporate digital innovations. Without this, data would continue to be exploited mainly by private hands. With digital-based transactions entailed by e-commerce, financial and non-financial data are increasingly interlinked with each other. As digitised payment instruments develop, they play a greater role in collecting and processing a variety of data attached to payments and settlements. The accelerating accumulation and utilisation of customer data with financial and non-financial data are bound to become more closely inter-linked with each other. This is why many big technology firms are penetrating digital payment services.

The foregoing indicates that, while digital revolution in the payment system would produce payments instruments, it is an organ for conveying and processing a variety of data. Yet, issues of data security, privacy and anonymity may be critically affected in the new payments system. This may, however, be overcome with a collaboration of the central bank, private entities and other regulatory agencies in a two-tiered monetary system arrangement. In such an environment, whether the monetary system can facilitate the utilisation of data in a safe and effective manner will substantially influence the efficiency of the economy.

The danger of data breaches or abuse by public authorities warrants a careful approach. But there are designs where some level of individual privacy can be preserved. Private intermediaries could (temporarily) record and guard user data. In this regard, there is the need to enable technical designs that prevents the central bank from uncovering the identity of users, and equally limit their access to retail transaction data. Hence, the future monetary system will not be affected negatively if the design of the optimal style and distribution of roles regarding the use of the data attached to economic transactions are taking into consideration.

IV.6 Dominance of Private Money in the System

Future payments system is more likely to be dominated by the private money than the public money even with technological innovation by the monetary authorities. Public money are fiat currencies, which are currently only accessible to the general public as paper currency or coins. Private money can be more convenient for the public to use to make payments. While public and private money may often be interchangeable in their uses (allowing consumers to pay for goods and services using cash or bank deposits with equal ease) the safety and liquidity of public and private money differ. Central bank money presents no credit or liquidity risk. Because of this, settlement in central bank money eliminates uncertainty in transactions, supporting economic activity and financial stability. By contrast, private money may present credit or liquidity risk, depending on the solvency and liquidity of the issuer, as well as the availability of a government backstop (e.g. a central bank lender of last resort or deposit insurance).

Private money usually promises conversion on a one-to-one basis into public money, on demand. Because of this feature, private money is susceptible to runs which may happen when the solvency or the liquidity of the underlying assets or liabilities of the private money issuer come into question, and holders of private money seek to convert to public money. The risk of runs at federally and state-chartered insured depository institutions is mitigated substantially through prudential supervision and regulation, eligibility to access the discount window, and federal deposit insurance. But not all private money enjoys similar safeguards and therefore some issuers of private money may be more susceptible to runs.

IV.7 Financial Inclusion and Equity

Financial inclusion is about overcoming inequality, in particular by reducing information asymmetry. Digital currencies may facilitate financial inclusion and equity by expanding equitable access to financial services, particularly for those underserved by the traditional banking system, promoting greater and more cost-efficient access to financial products and services, ensuring that the benefits of financial innovation are equitably enjoyed by everyone, and mitigating any undermining impacts of financial innovation.

In the context of declining cash use and a lack of universal access to the banking system due to the advent of first-generation digital currencies, there is the need to introduce regulated digital currencies, like CBDCs, to maintain

public access to a safe sovereign issued substitute to physical cash. Taking advantage of the digital technologies will enhance and promote financial inclusion. The inclusion may be enhanced by linking the digital currencies to a government issued means of identification. By availing digital identification to the unbanked, authentication can help to support inclusion in the long-term and formalise the informal economy. While this appears to create trade-offs, as citizens also value their privacy and enjoy the anonymity of cash, there can be long-term gains from overcoming this.

The implication is that digital currencies without identity (virtual currencies or token-based CBDCs) will not help much in achieving financial inclusion. They may, in fact, undermine efforts to enhance it, which are based on good identification and building up an information trail for access to other financial services.

IV.8 Singleness of the Currency

Future developments within the digital currencies sphere could potentially erode the singleness of the currency. The emergence of private forms of money, including digital assets that are not subject to effective prudential oversight could introduce significant levels of risk into the payments system. Fragmentation of the payments system also could result from the growth of private forms of money that are not inter-operable. This could erode confidence in money and the regulated financial system, given that banks must exchange deposits and other short-term liabilities for cash. Inconvertibility of monies has proven to amplify shocks in times of crisis. While well-designed and regulated sovereign issued digital currencies could support the singleness of the currency, they are not, however, subject to appropriate regulation and oversight on a comprehensive and consistent basis, and, therefore, are vulnerable to runs. Legislation to establish such a framework would mitigate these risks and help ensure that they remain in place over time.

IV.9 Credit Creation

Banks are major providers of credit to households and businesses. While non-bank institutions can participate in instant payments systems through a bank, their ability to offer direct access could provide additional competitive or access benefits. Because some digital currencies are currently privately issued, their effects on financial intermediation would depend more on how they are issued and the extent to which the assets backing them include loans or other private credit. Since digital currencies will reduce bank deposits, the

credit creating ability of banks will be limited, in addition to potential increases in banks' liquidity risk. The effect of digital currencies on financial intermediation depends on the types of entities that grant access to these systems: whether the ability to participate in the service is limited to banks or extended to non-bank institutions. Limiting participation largely to banks, as is the current state, could minimise disruption to credit creation, but doing so would also dampen potential benefits arising from increased competition or access to payments systems, including to underserved communities.

The potential effect of digital currencies on credit creation may, however, be limited for digital currencies designed as a wholesale CBDCs. This is because the form of such digital currencies is made available only to institutions that have access to reserve balances. The implication is that the eventual effects on banking intermediation may be uncertain.

IV.10 Movement of Illicit Funds

One of the characteristics of digital currencies is that it typically lacks identification. The anonymity of first-generation digital currencies could be accompanied by a larger propensity for money laundering, arms proliferation financing, and terrorism financing risks above those for physical cash in the current monetary system. The liquidity of widely adopted digital currencies could also make them attractive to criminals and the design of a digital currency arrangement (use of permissioned blockchain in the case of stable coin). These risks could be easily mitigated in an identity-verified system, in which intermediaries collect and verify customer information. In addition, the even implementation of global AML/CFT standards for digital assets could also lower the risks of money laundering. Some form of identification could also be helpful in this regard to facilitate the safety of the payments system, prevent fraud, support anti-money laundering efforts, and combat the financing of terrorism.

IV.12 Financial Stability

The impact of digital currencies on the future of monetary system could also be assessed in terms of how such innovation affects the central bank's capacity to retain its role as the lender of last resort. When a central bank does not issue its own digital currency and all payments are made using privately-issued money (including virtual currencies), its role as the lender of last resort is impaired as transactions take place outside its regulatory sphere. Hence, its ability to stabilise systemic liquidity is limited. The implication of such design on

financial stability was well reported in a recent study by Fernández-Villaverde and Sanches (2017), which showed that an economy with digital currency only issued by private non-banks may be subject to indeterminate equilibrium that lacks stable prices. It was, however, revealed through their submission that stability can be assured by the issuance of regulated digital currency (e.g. CBDCs) in conjunction with an appropriate monetary policy framework.

V. Conclusion and policy recommendation

Technological revolution is changing the narrative in the financial system including the payments system. The emergence of digital currencies is one key innovation in the financial system. The rate of growth in the use of digital currencies in terms of number of platforms, number of participants and volume of transaction, attracts the interest of researchers, monetary authorities and other policymakers. Research has shown that digital currencies brought a number of benefits to the individual customer, the financial system and the economy as a whole. The benefits include 24 hours access to transaction services, uninterrupted operations, absence of intermediary and its associated economic rent, fast transfer system, low cost of exchange, effective instrument for crowdfunding, and potential of closing the financial inclusion gap. On the other hand, there are several challenges and disadvantages associated with the use of digital currencies. The challenges range from loss of monetary control by the monetary authorities, systemic risks, money laundering, threat to environmental sustainability, acceleration of digital bank runs and hindrance to bank infrastructure innovation which could lead to macroeconomic instability.

The emergence and growth of digital currencies have significant implications for the conventional monetary system. Given that digital currencies are largely issued by private organisations with almost zero control from any central authority, this can constitute a big challenge to the monetary authority. Therefore, central banks should promote research on how their traditional functions can be performed in the contemporary financial system. Financial intermediation function which is the bedrock of financial institutions is becoming more and more irrelevant with the emergence of digital currencies. This pose a serious challenge to the conventional two-tier system and the existence of banks and non-bank financial institutions. The high rate of volatility of digital currencies is another key challenge of the innovation.

Different models for the operation of digital currencies have been suggested and tested. Future research should focus on what is the optimal technology

to operate digital currencies. Research should also be directed to how to maintain monetary sovereignty, safe financial assets, and efficient domestic payments, among others.

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