DIGITAL CURRENCIES FOR CENTRAL BANKS

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ABSTRACT

Many central banks around the world have begun studying and implementing projects to develop their own digital currencies. They have increasingly collaborated with each other to implement actual evaluation. However, the development of a central bank digital currency should be done with the consideration of many aspects, in which security is the most critical factor. This research paper presents the fundamentals of central bank digital currencies such as their definitions, functions, roles, legal issues, different formats, and whether central banks should issue a digital currency?

Keywords: Block-chain, Central banks, Digital currencies, Vietnam

1. BLOCKCHAIN: THE CORE TECHNOLOGY OF DIGITAL CURRENCIES

The strong advancement of science and technology has promoted strong development and transformation of currencies catch up with social development. With the invention and widespread use of computers and the internet in recent years, a whole new form of currencies has arisen which is known as the digital currency.

Blockchain was created by Satoshi Nakamoto, who is also the creator of Bitcoin. Blockchain technology is considered a technology of the 4.0 industry and a technology of the future world.

The most popular application of blockchain in financial and banking activities includes payment and money transfer. By using blockchain technology, customers can transfer money directly and securely to anyone in the world almost instantly and for very low fees. There are no intermediaries who may slow down the transfer. The second application of blockchain is global payments. For example, ripple is a blockchain network providing global payment solutions by connecting banks, payment service

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providers, businesses and digital asset transactions, therefore facilitating immediate, on-demand payment worldwide.

Cryptocurrencies are directly traded between senders and receivers via a peer-to-peer network based on blockchain technology without the need for a trusted third party.

2. DEFINITIONS AND CHARACTERISTICS OF DIGITAL CURRENCIES

According to Bis 2015, digital currencies are assets in the digitalized form, meaning that they are not issued under no certain physical shapes like banknotes or coins. Digital currencies are divided into two types: electronic currencies and virtual currencies.

According to ECB 2018, from an economic perspective, current digital currencies are not highly liquid and they have not reached the desired level of acceptance.

According to WB 2015, cryptocurrencies have their own units, which are different from electronic currencies and they are based on cryptographic techniques to reach consensus. The most prominent representative of cryptocurrencies is Bitcoin while alternative coins to Bitcoin are called altcoins which include Ethereum, Litecoin, Ripple. These altcoins are also becoming increasingly popular.

Bofinger 2018 maintains that the future of money will be more digital than it is today and digitalization will change the traditional forms of money and credit, leading to changes in the theory and practice of monetary policies. Possible changes may include (i) The replacement of cash by electronic currencies; (ii) The replacement of traditional bank deposits and banknotes by electronic currencies; (iii) The replacement of bank deposits and bank debt notes by electronic currencies; (iv) The replacement of bank credit with peer-to-peer digital lending platforms.

Characteristics of digital currencies

According to BIS's committee on payments and market infrastructures, three main characteristics of digital currencies are:

Based on digital platforms: The maximum money supply and methods, when the virtual currency units are added to the system are determined by computer protocols (algorithms).

They are not a liability of anyone.

Peer-to-peer transaction: Digital currencies are directly traded between the sender and the receiver via a peer-to-peer network without the need for a trusted third party. To rule out the presence of a trusted third party, digital currencies are operated on the blockchain technology. This technology allows transactions on the system to be processed by the participants themselves.

Table 1. A comparison between traditional and digital currencies of central banks

Factors	Central bank traditional currencies		Central bank digital currencies	
	Cash	Reserve and payment	General-purpose	Trading
24/7 availability	Currently available	Unavailable	Currently available	May have
Anonymity	Currently available	Unavailable	May or May not have	May have
Peer-to-peer	Currently available	Unavailable	May or May not have	May have
Interest	No	May have	May have	May have
Limit	No	No	May have	May have

Source. BIS 2018

3. FUNCTIONS OF DIGITAL CURRENCIES

According to Ammous 2018, digital currencies function as a store of value due to their tight commitment to limited supply. In addition, centralized control over the remaining digital currencies and their use as specialized applications make it impossible for these types of currency to function as traditional currencies.

Similar to Ammous, Selgin 2014 maintains that cryptocurrencies are not real money and will not be a currency in the future.

Research of Mikolajewicz - Wozniak and Scheibe 2015 suggests that cryptocurrencies are reflecting the current trend and will become a popular means of payment, changing the way financial services are provided, and reducing and eliminating the role of financial intermediaries.

Studying central banks in the digital economy, Prasad 2018 suggests that central banks may face technical and operational challenges in their core monetary policy activities or at least they will need to adapt to the development of financial technologies.

Financial institutions, especially banks, may face challenges to their traditional business models because new technologies enable organizations (or decentralized mechanisms) to perform financial intermediation functions and overcome information asymmetry problems. The emergence of new institutions and mechanisms may also improve financial intermediation, but at the same time will pose significant challenges to regulatory and financial stability.

According to Claeys et al. 2018, distributed ledger technology has enabled cryptocurrencies to become a new form of currencies which is privately issued, digital, and based on peer-to-peer transactions. However, these digital currencies cannot replace the official fiat currencies because:

(i) Cryptocurrencies do not perform the role of currencies well as their value is very volatile and not guaranteed;

(ii) The management of cryptocurrencies is too simple compared to the requirements of modern currencies;

(iii) The most important issue lies in legal constraints, especially regarding the central bank's privilege to issue money and the profit from this activity.

4. THE ROLE OF CENTRAL BANK DIGITAL CURRENCIES

Central bank digital currencies will provide people with the convenience of cash and the security of a bank account (Dyson and Hodgson 2016).

Comprehensive finance is a factor in which emerging economies are considering when issuing central bank retail digital currencies. There are still a large number of low-income people or rural areas who are unable and difficult to access commercial banking and internet services. Therefore, cash still remains as the main payment method (Riksbank Sveriges 2018).

Central bank retail digital currencies can promote digitalization of the economy and thus promote social and economic development. However, when considering issuing central bank digital currencies, emerging economies focus on comprehensive finance more than developed economies (Barontini and Holden 2019).

Central bank digital currencies can improve payment systems, inter-bank payment, and cross-border payments in the following ways:

(i) Central bank digital currencies can provide an alternative to banknotes, checks, debit cards and credit cards or online transfers, etc.... Central bank digital currencies can create competitiveness.

(ii) Central bank digital currencies can also be used for large-value payments between banks and companies and thus may become more competitive in large-value payments.

(iii) Central bank digital currencies can also enable many financial institutions or even non-bank enterprises to access the balance sheet of the central bank, thus helping these companies to easily participate in the payment industry and this will promote the competition of the industry.

(iv) Central bank digital currencies help speed up and streamline clearing processes and can reduce transaction costs, and costs of the development and upgrade of information technology systems.

5. THE RELATIONSHIP BETWEEN DIGITAL CURRENCIES AND FINANCIAL STABILITY

Nelson 2018's study examines the relationship between cryptocurrencies and financial stability, primarily as financial investment assets. The research focuses on two main directions: the price bubble of cryptocurrencies and the benefits of investment diversification. The research results show the existence of asset price bubbles for Bitcoin and Ethereum markets during the period of 2009-2017. Thus, the emergence of cryptocurrencies leads to the existence of asset price bubbles, which reduces financial stability.

A study of Katsiampa 2017 shows that the Bitcoin market is highly speculative and GARCH econometric models can be used to predict Bitcoin price movements. Bitcoin is also a useful tool in risk management to help investors make better decisions. One of the relationships of Bitcoin emergence is the possibility of price bubbles like other financial assets.

However, there are also other studies evaluating the positive relationship between cryptocurrencies and financial stability.

Research of Demir et al. 2018 analyzed the ability to predict economic policy uncertainty (EPU) based on Bitcoin's daily rate of return using the Bayesian Structural Vector Autoregressive model with OLS estimates and Quantile - on - Quantile regression. Research results show that EPU can predict the profitability of Bitcoin and Bitcoin is a tool against uncertainty.

Urquhart and Zhang 2018, assess the relationship between Bitcoin and currencies of some countries on an hourly basis and find that Bitcoin can be a daily hedging tool for currencies like CHF, EUR, GBP but acts as a diversified tool for AUD, CAD, JPY. The research also shows Bitcoin as a safe haven during times of crisis for CAD, CHF, GBP.

6. LEGAL ISSUES RELATED TO THE ISSUE OF DIGITAL CURRENCIES

According to Dodgson et al. 2015, apart from benefits, cryptocurrencies also bring management risks and challenges such as reducing privacy and potential insecurity in individual transactions. For enterprises, the risks involve increasing uncertainty and complexity in the business environment, and for society, the development of blockchain-based cryptocurrencies raises the issue of the balance between freedom and the need for surveillance and regulation, as well as cybersecurity issues and digital crime.

In the world, governments of various countries have responded differently to cryptocurrencies. However, all countries are aiming to prevent the use of blockchain-based cryptocurrencies for illegal activities such as money laundering, drug trafficking, tax evasion, terrorist financing to protect financial security.

Countries such as Belarus, Mexico ... have issued specific laws to approve and manage the cryptocurrency market with the aim of combating money laundering, financial terrorism, and organized crime.

Argentina treats income from trading cryptocurrencies similar to income from stocks, while Switzerland treats cryptocurrencies as foreign currencies and taxes cryptocurrency transactions as foreign exchange transactions.

In some countries, such as Thailand, there is no regulation on the operation of cryptocurrencies and considers the operation of cryptocurrencies in the financial market illegal. Indonesia claims that the use of Bitcoin violates many laws of Indonesia.

In general, countries around the world prohibit trading cryptocurrencies at different levels such as: (1) prohibiting transactions of cryptocurrencies with value exceeding a certain limit; (2) prohibiting the use of cryptocurrencies in retail transactions; (3) prohibiting the use of cryptocurrencies as financial instruments; (4) prohibiting trading cryptocurrency; (5) prohibiting financial intermediaries from trading cryptocurrencies.

7. AN OVERVIEW OF LAWS RELATED TO CRYPTOCURRENCIES

Silk Road is an online black market used for drug trafficking. The website was put into use in 2011 and it requires sellers to buy an account through auction but would be later turned into a fixed fee. By 2013, Silk Road had been upgraded to version

2.0, but its CEO was also captured by FBI. Silk Road accounted for nearly 5% of the total size of Bitcoin.

ICO (Initial Cryptocurrency Offering) was hacked online, while crypto exchanges and wallets were hacked in 2017.

DAO (Decentralized Autonomous Organization) exchange raised $ 150 million for the Ether token in May 2016 but was stolen in June 2016.

Bitfinex, a Hong Kong-based cryptocurrency exchange, was hacked in 2016 and stolen a number of cryptocurrencies worth $ 72 billion. Also, in 2016 Coincheck Inc was hacked and stolen $ 500 million of NEM cryptocurrency.

Gandal's study (2018) states that "because of the anonymity of cryptocurrencies, they can be related to many types of crimes, including" facilitating markets for assassins, attacks to businesses, child abuse, corporate espionage, counterfeit money, drugs, forging identity documents and passports, high-profit investment plans, sexual exploitation, credit card theft, and war weapons.

Li (2017) proposes a framework for greater transparency for cryptocurrency users by reducing sensitive information such as transaction volumes using the Paillier encryption system to encrypt and decode to reduce attacks.

In general, the nature of cryptocurrencies is not appropriate when current anti-money laundering regulations between countries have little coherence and the uneven ability to apply science and technology between countries.

Therefore, countries around the world have issued warnings about the risks when trading cryptocurrencies. Central banks of countries like Germany, the Netherlands, and France have issued warnings about Bitcoin and the risks of Bitcoin such as the lack of security and supervision of the authorities.

8. DEFINITIONS AND FORMATS OF CENTRAL BANK DIGITAL CURRENCIES

Definitions

BIS (2018) defined central bank digital currencies as a digitized form of the central bank currency but it is different from the balance on the reserve account or traditional payment.

The central bank digital currencies currently being mentioned are the fact that some central banks will issue new types of currencies using blockchain technology (distributed ledger technology platform) used by individuals and non-bank organizations as a fiat currency. Until then the central bank digital currencies will be deemed as national cash.

Formats of central bank digital currencies

Central bank digital currencies are represented in two types of model: account-based and value-based.

Account-based model: individuals and businesses will have accounts at the central bank and transactions between accounts will be verified and processed by the central bank. The central bank digital currency is considered as an application of the

interbank payment system at the scale of the whole economy. The central bank acts as an intermediary as a commercial bank performing transactions for accounts on the balance sheet.

The value-based model of the central bank digital currencies will be related to the values and can be transferred directly from the payer to the receiver and the transaction is verified by a third party.

Therefore, the central bank digital currency is issued in digital forms by the central bank, not in physical form, and the central bank digital currency may be the account at the central bank (those are accounts of the public opened at the central bank) and central bank digital currencies can be accounts of financial institutions, which are only used for interbank payments.

According to Shirai (2019), central bank digital currencies are categorised into the following groups:

(i) Central bank retail digital currencies which are based on accounts without distributed ledger technology;

(ii) Central bank retail digital currencies which are based on value without distributed ledger technology;

(iii) Central bank retail digital currencies which are based on distributed ledger technology;

(iv) Central bank wholesale digital currencies which are based on distributed ledger technology.

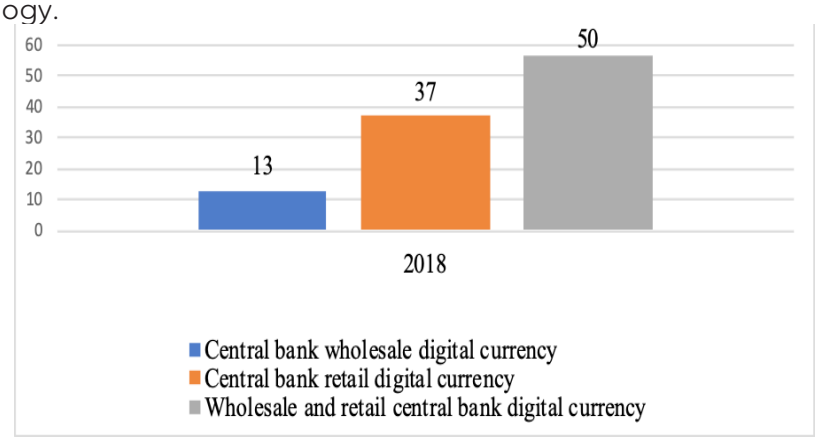

Figure 1. Different formats of central bank digital currencies issued in 2018

Source: Barontini và Holden (2019).

Research by Barontini et al. (2019) shows that more than half of the central banks in the world are considering wholesale and retail central bank digital currencies. Only one-third of the central banks are interested in retail central bank digital currencies and one eighth central banks are interested in wholesale central bank digital currencies.

9. CHALLENGES INVOLVED WITH THE ISSUE OF CENTRAL BANK DIGITAL CURRENCIES

According to Prasad 2018, it is expected that central banks will face technical and operational challenges to their core monetary policy activities or at least they will need

to adapt to the development of financial technologies. In a rapidly changing industry like financial technology, regulations and monitoring activities must be flexible in order to encourage projects to innovate and improve, avoiding barriers that could hinder the development of hi-tech services in the future.

The creation and development of digital currencies also involve the rapid development of cybercrime in two respects:

(i) Crime stemming from the use of cryptocurrencies;

(ii) Crime affects the structure of the cryptocurrency itself.

The emergence of both types of crime has affected transactions of cryptocurrencies around the world, and it is necessary to put in place strict legal regulations related to cryptocurrencies.

One of the challenges in issuing central bank cryptocurrencies is related to the balance between freedom and the need for surveillance and regulation, as well as cybersecurity and digital crime.

Central banks need to ensure that they have enough money for the public to respond to the decline in cash use, ensure sovereignty and the monetary ratio of the central bank in the monetary system. According to Singh (2018), more and more retail stores do not accept cash payments which accounts for 13% and it is forecast that cash will be completely eliminated by 2025. If some of the private sector issuers or cashless payment providers go bankrupt, people will suffer a great deal if there is not an appropriate payment system. Therefore, central banks need to provide an equal, secure payment instrument for all financial institutions and citizens.

When issuing digital currencies, central banks will reduce banknotes and then profit from the issuance of banknotes because the profit of issuing banknotes will decrease when the value of banknotes declines. At this time, central banks usually rely on government funding, thus weakening their independence.

Central banks need to determine the optimal trade-off between promoting the development of cryptocurrencies for the effects of monetary policy and limiting the creation of new risks to financial stability.

10. RISKS INVOLVED WITH THE ISSUE OF CENTRAL BANK DIGITAL CURRENCIES

According to Meaning et al (2018), issuing central bank digital currencies involve risks related to the conversion between cryptocurrencies and deposits, and risks related to mass conversion to digital currencies. Specifically, these risks reduce the intermediary role of banks.

Allowing depositors to withdraw central bank digital currencies on demand affects banks' funding and liquidity as they lose both deposits and digital currencies. Central bank digital currencies are transferred to the digital currency account of non-bank groups at central banks.

Central banks need to consider the risks of reducing the intermediary role and depends on the readiness to replace the traditional role of commercial banks in providing electronic payment facilities.

When customers withdraw bank deposits and transfer to central bank digital currencies, it will reduce funding and reduce the liquidity of the central bank digital currencies, forcing the central bank to compensate for their capital lost. This situation will affect the attractiveness of the central bank digital currencies and limit the ability to replace bank deposits.

11. SHOULD CENTRAL BANKS ISSUE DIGITAL CURRENCIES?

The recent development of cryptocurrencies has sparked debate about whether central banks should issue cryptocurrencies or not. If they do, the central bank cryptocurrencies will be understood as the national cryptocurrency.

There are main reasons for the need for central banks to issue cryptocurrencies as follows:

- Ensure sufficient money supply of the central bank for the public;
- Reduce the cost of printing and managing cash, and prevent violations;
- Promote comprehensive finance;
- Increasing efficiency and financial stability;
- Promote the competitiveness of the payment systems;
- Promote technology development.

However, when issuing the central bank digital currency, the central bank will lack an amount of cash to perform its functions. Therefore, the central bank may continue to provide cash or government agencies can adjust the operations of suppliers to ensure competitiveness and reliability. The central bank can provide cash or people can invest in government securities as a safe store of value. Therefore, the central bank should consider carefully in issuing digital currencies.

12. CONCLUSION

The issue of central bank digital currencies can contribute to financial stability and promote comprehensive financing. In a modern banking system, commercial banks mobilize deposits and provide loans and investments through term conversion. If mass withdrawal occurs at a bank, they may not be able to meet the needs of depositors due to lack of liquidity. Such a mechanism explains why central banks play the role of the last lender and deposit insurance is necessary to maintain financial stability.

If a central bank issues a digital currency and replaces bank deposits with this type of currency, banks will no longer perform the term conversion function. Therefore, the issue of central bank digital currencies can eliminate instabilities derived from banking term conversion, thereby promoting comprehensive finance.

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