



E-CNY FROM AN INTERNATIONAL PERSPECTIVE

E-CNY SOB UMA PERSPECTIVA INTERNACIONAL

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ABSTRACT

Objective: This study aims to examine the digital currency e-CNY, focusing on its definition, characteristics, design, and development process. It addresses the need for global understanding and the hurdles hindering its usage and promotion.

Methods: The research employs a comprehensive methodology combining theoretical principles with empirical observations. Methods include historical-legal analysis, comparative analysis, and statistical evaluation, supported by a broad review of relevant literature, surveys, and official documents.

Results: Key findings highlight the significant impact of inadequate knowledge of the legal and regulatory framework managing e-CNY among operational personnel, and the limitations within the regulatory frameworks themselves.

Conclusion: The study proposes improvements in the global understanding of e-CNY and suggests enhancements in the regulatory frameworks to support its broader adoption and effectiveness.

Keywords: E-CNY; Digital currency; Financial technology; Regulation.

RESUMO

Objetivo: Este estudo visa examinar a moeda digital e-CNY, focando em sua definição, características, esquema de design e processo de desenvolvimento. Aborda a necessidade de compreensão global e os obstáculos que impedem seu uso e promoção.

Métodos: A pesquisa utiliza uma metodologia abrangente que combina princípios teóricos com observações empíricas. Os métodos incluem análise histórico-jurídica, análise comparativa e avaliação estatística, apoiados por uma ampla revisão da literatura relevante, pesquisas e documentos oficiais.

Resultados: Os principais resultados destacam o impacto significativo do conhecimento inadequado do quadro legal e regulatório que gerencia o e-CNY entre o pessoal operacional, e as limitações dentro dos próprios quadros regulatórios.





Conclusão: O estudo propõe melhorias na compreensão global do e-CNY e sugere aprimoramentos nos quadros regulatórios para apoiar sua adoção mais ampla e eficácia.

Palavras-chave: e-CNY, moeda digital, tecnologia financeira, regulamentação.

Keywords: E-CNY; Design scheme; Benefits; Challenges; Countermeasures.

1. INTRODUCTION

In order to safeguard the sovereignty of the national currency, enhance the international status of CNY, ensure financial security, improve the efficiency of the financial system, and provide better financial services for the real economy and the public, the People's Bank of China (PBC) has launched e-CNY and released the White Paper on the Research and Development Progress of China's e-CNY (hereinafter referred to as the White Paper) in July 2021 (The People's Bank of China, 2021), marking a new stage in its development. However, there are still many Chinese and most foreigners who are not familiar with it. While the White Paper provides some introductions to the development of e-CNY and is relatively authoritative, the content is not comprehensive enough, and it does not comprehensively analyze the benefits and challenges of e-CNY's development. Although some new articles in recent years have been devoted to analyzing those and proposing corresponding countermeasures, none of them mention the design scheme of e-CNY and even do not provide an introduction to e-CNY itself, such as those written by Xie Shenghang (2023), Yang Yuanpan (2023), and Ji Jianping (2023); and even though Gao Yanbin and Wang Fenfen (2022) have elaborated on its characteristics, the contents are still not comprehensive enough, including the lack of contents on cross-border payment, international cooperation and exchange, and other aspects. In short, the above materials are not very systematic and comprehensive and more or less lack some important contents. Especially, these authors lack a certain international perspective that would allow people all over the world to have a good understanding of the overall picture of e-CNY itself and its development. Therefore, in order to improve the level of global people's understanding of e-CNY, break through its development bottlenecks, and facilitate its use and popularization, this article comprehensively researches and analyzes various aspects of e-CNY from an international perspective, including its definition, characteristics, design scheme, development process, reasons for its birth,





benefits that it brings, and challenges it faces in development, and puts forward corresponding countermeasures.

2. METHODS

This research comprehensively applies a series of research methods, including the literature survey, thinking, induction, historical analysis, comparative analysis, qualitative analysis, quantitative analysis, dialectical analysis, and so on. Firstly, based on a careful study of the White Paper, this article combines relevant literature to conduct a systematic study on the basic situation and development overview of e-CNY, methods of which include but are not limited to the literature survey, thinking, induction, and comparative analysis. Methods such as historical analysis are also involved in describing e-CNY's development process. Secondly, the data and some information involved in this research come from the PBC, and the methods used here include qualitative and quantitative analysis, comparative analysis, and so on. Finally, methods such as thinking, dialectical analysis, and induction are used in analyzing the benefits and challenges of e-CNY's development and proposing corresponding countermeasures.

3. OVERVIEW OF E-CNY

3.1 Definition of e-CNY

E-CNY is a legal tender issued by the PBC in digital form with value characteristics, operated with the participation of designated operating institutions based on a broad account system, supporting loose coupling of bank accounts (The People's Bank of China, 2021).

3.2 Characteristics of e-CNY

The characteristics of e-CNY include, but are not limited to, the following six:

1) Legal tender





E-CNY, like physical CNY, is a legal tender issued by the PBC as the liability of the central bank to the public, supported by national credit, with legal compensation. It is only the digital form of legal tender, and it has consistent basic functions and issuance and circulation management mechanisms with the physical CNY, but its value transfer is realized in digital form.

2) CENTRALIZED MANAGEMENT

Unlike the decentralized nature of the blockchain, the operation of e-CNY is centrally managed by the PBC in order to ensure the uniqueness of the central bank's currency issuance rights as well as its monetary macro-control function, to prevent threats to the country's monetary sovereignty, and to avoid currency over-issuance. However, the central bank will not intervene in the technical route selection of commercial institutions (Liu, 2019); it can be accepted as long as it meets the central bank's normative requirements.

3) DUAL-TIER OPERATION

E-CNY adopts a dual-tier operation model, with the first tier being the issuance of legal digital currencies by the central bank to designated commercial institutions for full-life-cycle management, and the second tier being the provision of e-CNY's exchange and circulation transaction services to the public by designated commercial institutions. The issuance, cancellation, cross-institutional interconnection of e-CNY, and ecological management of its wallet are the responsibility of the PBC, under whose centralized management, commercial institutions with certain conditions in capital, technology, and other aspects are carefully selected and designated to take the lead in providing e-CNY's exchange services; they jointly provide e-CNY's circulation services.

4) CATEGORY OF M0

E-CNY has the same economic value and legal status as physical CNY, and both belong to M0, which means the cash in monetary circulation. It will be issued in parallel with and coexist with the latter for a long time due to the temporary





irreplaceable payment advantages and demand of the latter. However, its issuance cannot affect the original monetary policy transmission mechanism.

5) LOOSE COUPLING OF ACCOUNTS

E-CNY is based on a broad account system with a loosely coupled function of accounts. The biggest difference between it and the traditional banking system is the determination of identity. Under the broad account system, anything that can prove identity (such as a real name authentication phone number) can be used as an account, and users can build their wallets through e-CNY's APP. When the wallet generates a key at the terminal, the person who holds the key can control it. Small transactions between users can no longer rely on the traditional account system but can be conducted through peer-to-peer transfers, similar to the loose coupling of cash.

6) A RETAIL-TYPE DIGITAL CURRENCY ISSUED TO THE PUBLIC

According to different users and uses, central bank digital currencies can be categorized into two types: wholesale and retail. The former is mainly issued to institutional entities such as commercial banks, mostly for large settlements, while the latter is issued to the public for daily transactions. E-CNY, which is mainly used to meet the daily retail payment needs of the public, is a retail-type central bank digital currency issued to the public. It is based on a modern payment system, focusing on improving the efficiency of the retail payment system so as to reduce the cost of retail payment for the whole society. In the digital retail payment system, e-CNY and electronic account funds of designated commercial institutions are universal and together constitute cash-based payment tools (The People's Bank of China, 2021).

3.3 Design scheme of e-CNY

E-CNY was designed by the PBC, and the following mainly introduces several important aspects of its design scheme:





3.3.1 Design concept

E-CNY's design follows the concept of "security and inclusiveness, innovation and ease of use, and long-term evolution".

3.3.2 Design principles

The design principles of e-CNY mainly include the following three aspects:

1) Legal and compliant

E-CNY has a relatively perfect legal foundation and a stable operational system (Liu & Li, 2022). The design of its system strictly complies with relevant regulations, such as CNY management, anti-money laundering and counter-terrorism financing, data and privacy protection, foreign exchange management, and cross-border payments. Its operation has been incorporated into the regulatory framework.

2) Safe and convenient

E-CNY's design does not jeopardize the monetary sovereignty of other central banks and their policy independence and is conducive to promoting the healthy development of the international monetary system and financial stability, protecting consumers' legal rights and interests, and facilitating fair competition (Guan, 2022). Its system loosely coupled with bank accounts, adapting to various online and offline payment environments, minimizing usage barriers caused by factors such as technology and network, and meeting the public's requirements for the security and ease of use of payment tools, as well as requirements for high concurrency, high scalability, and business continuity of its operating system.

3) Open and inclusive

The PBC allows designated commercial institutions to give full play to their respective strengths and professional experience, maintain the progressiveness of the overall technology through technological competition and technological iteration, and





avoid over-concentration of e-CNY's system's operational risk. The design of e-CNY supports the interaction between it and the traditional electronic payment system by fully utilizing the existing financial infrastructure and fintech means to achieve interconnectivity between the wallets of different designated commercial institutions, between the e-CNY's wallet and the traditional financial market infrastructure, and between the digital currency systems of different central banks, so as to improve the interactivity of payment tools.

3.3.3 Technical route

The technology route of e-CNY is guided by market demand and is a continuous updating process that requires regular assessment, continuous optimization, and improvement. Designated commercial organizations can choose their own technology routes based on their actual needs and technological advantages and fully maintain their insight and foresight into future technologies.

The technology used in e-CNY's system has the following characteristics: firstly, it combines the characteristics of centralized and distributed architectures to form a hybrid technical architecture that integrates the two; secondly, it adopts distributed and platformized design to enhance the flexibility and scalability of the system, so as to support massive payment transaction volumes; thirdly, it comprehensively applies trusted computing and special encryption technologies for software and hardware integration to ensure system reliability and robustness; fourthly, it carries out the construction of a multi-level security system, designs various preparatory data center solutions and provides round-the-clock uninterrupted services to ensure the city's post-disaster recovery capability and business continuity.

3.3.4 Design characteristics

Physical RMB is characterized by payment-as-settlement, anonymity, and no interest payment. Electronic payment tools are characterized by low cost, high security, and strong convenience. E-CNY has been optimized by combining the advantages of both and has the following characteristics:

1) Payment-as-settlement





E-CNY is loosely coupled with bank accounts, and fund transfers based on e-CNY's wallets can realize payment-as-settlement.

2) Controllable anonymity

E-CNY's transactions follow the principle of "anonymity for small amounts and legal traceability for large amounts". Designated commercial organizations classify and manage e-CNY's wallets according to the strength of customer identification, with the lowest-privileged wallets not requiring identification information, which can later be independently upgraded to higher-privileged real-name wallets as needed. It collects less information than traditional electronic payment modes and strictly enforces information security and privacy protection management. Unless explicitly stipulated by laws and regulations, no one is allowed to inquire and use the information arbitrarily. The business risk characteristics and information processing logic under the existing e-payment system are also fully taken into account. The transaction of e-CNY must adhere to anti-terrorism financing and anti-money laundering requirements, and it is strictly prohibited to be used for illegal activities such as telecommunications fraud, money laundering, tax evasion, and online gambling.

3) No interest payment

E-CNY is the same as the physical RMB that belongs to the M0 category, and no interest will be accounted for on it.

4) Account and value characteristics combined

E-CNY, which adopts the variable denomination design, can reflect account and value characteristics, and its value transfer is achieved in the form of cryptocurrency strings.

5) Low cost





The PBC does not charge e-CNY's exchange service fees to designated commercial institutions, and designated commercial institutions also do not charge individual customers, which is the same for physical RMB.

6) HIGH SECURITY

In order to ensure the security of the entire lifecycle of e-CNY and that its risks can be controlled, it comprehensively utilizes technologies such as digital certificate systems, digital signatures, and secure encrypted storage to achieve characteristics such as non-repeatable expenditure, non-illegal copying and forgery, non-tampering of transactions, and non-repudiation, and has preliminarily established a multi-level security protection system.

7) PROGRAMMABILITY

E-CNY achieves programmability by loading smart contracts that do not affect the functionality of the currency, enabling automatic payment transactions based on conditions and rules agreed upon by both parties while ensuring security and compliance, and facilitating business model innovation.

3.3.5 Principles of operation

Under the dual-layer operation model, designated commercial institutions, under the quota management of the PBC, build different types of e-CNY's wallets for customers based on their identification strengths and provide them with exchange services. At the same time, both of them are responsible for the management of e-CNY at the retail level and providing circulation services.

The dual-layer operation model was adopted because the public was accustomed to handling financial businesses through commercial institutions. To maintain the financial system's stability and a fair competitive environment, enhance social acceptance of e-CNY, promote its safe and efficient operation, and ensure that the market plays a decisive role in resource allocation (Xi, 2013), the PBC has made full use of the resources, talent, technology, and other advantages of commercial





institutions and has fully mobilized the enthusiasm and creativity of the various parties involved, which is also conducive to achieving market-driven, promoting innovation, and competitive selection.

3.3.6 Digital wallet

The digital wallet is the carrier of e-CNY and the medium for connecting with users. Under the premise of e-CNY's centralized management, unified recognition, and anti-counterfeiting, the PBC has formulated relevant rules to jointly build mobile terminal apps with designated commercial institutions in accordance with the principles of co-construction and sharing to manage wallets and verify the authenticity of e-CNY, forming a matrix of e-CNY's wallets according to different dimensions. An e-CNY's wallet ecosystem platform has been built to achieve online and offline full-scene applications, visual systems, and unique functions, meeting the diverse needs of users, ensuring the inclusiveness of digital wallets, and avoiding usage barriers caused by the digital divide.

3.3.7 Compliance supervision

The design, research, and development of e-CNY comply with China's legal framework. The currently released revised draft of the PBC Law (for soliciting opinions) further clarifies that "the CNY includes both physical and digital forms." E-CNY is subject to existing international standards and domestic legal requirements in anti-terrorism financing, anti-money laundering, and risk supervision. The designated commercial institutions responsible for the exchange and circulation of e-CNY are the main body responsible for fulfilling anti-money laundering obligations, and they assume corresponding obligations. At the same time, it protects commercial secrets, personal privacy, and personal information in accordance with the law and shall not disclose customer identity information or transaction records. The PBC is responsible for coordinating anti-money laundering supervision and promoting and supervising all parties to implement anti-money laundering responsibilities. The consumer rights protection and responsibility allocation of e-CNY are consistent with cash. The PBC and designated commercial institutions are responsible for verifying the authenticity of e-CNY, with the latter properly resolving all possible disputes and user losses in





accordance with the corresponding dispute resolution mechanism and the former conducting regulatory assessments of them (The People's Bank of China, 2021).

3.4 Development process of e-CNY

The development process of e-CNY can be divided into the following two stages, during which international exchanges and cooperation were also carried out.

1) Theoretical research stage

In 2014, the PBC established a Legal Digital Currency Research Group and began to conduct research on legal digital currency, including but not limited to its issuance and business operation framework, key technologies, issuance and circulation environment, and relevant international experiences. In 2016, the Digital Currency Research Institute was established and completed the prototype system construction of China's first-generation legal digital currency based on the theoretical achievements of the first stage.

2) Pilot promotion stage

At the end of 2017, with the approval of the State Council, the PBC began organizing commercial institutions to jointly carry out e-CNY's research and development experiments. In order to test the theoretical reliability and design validity of e-CNY, the PBC began its pilot tests in Shenzhen, Suzhou, Xiongan, Chengdu, and Beijing at the end of 2019. In November 2020, six new pilot regions were added: Shanghai, Hainan, Changsha, Xi'an, Qingdao, and Dalian. After years of exploration and evolution, e-CNY's pilot app was launched in January 2022, and a number of platforms, such as WeChat, Alipay, Jingdong, Meituan, and Hungry Mou, accessed e-CNY's system in succession. Subsequently, e-CNY red envelope activities were carried out with the active participation and support of local governments, one after another, and are full of vitality. At present, the pilot work has been extended to most regions of the country. In addition, during the pilot period, a series of e-CNY's application innovation achievements have been achieved, such as smart payment contracts, mobile payments for dual offline transactions, a hard wallet





payment model separate from cell phones, innovative application scenarios such as unmanned vending in the Beijing Winter Olympics Organizing Committee Park, and payment-related wearable devices (The People's Bank of China, 2021).

4. Reasons for e-cny's birth

E-CNY was born under specific circumstances, and its emergence had a certain historical inevitability. The forces driving its birth include, but are not limited to, the following five:

1) Growing demand for online payments

With the booming development of network technology, the network economy, such as online shopping, online offices, and online education, has developed rapidly. Coupled with the impact of COVID-19, the network economy's development is faster and its coverage continues to expand, leading to a continuous increase in the public's demand for online financial services, especially their expectations for convenient, safe, and inclusive payment services. Currently, China's economy has shifted from a stage of high-speed growth to a stage of high-quality development (Xi, 2017), and the digital economy has become an important driver of its economic growth. Electronic payment tools, such as WeChat and Alipay, provide the public with convenient and efficient retail payment services, which not only support the development of the digital economy but also cultivate their online payment habits, which, coupled with innovations in fintech and services, leads to a further increase in the demand for online payments. However, at this time, China lacks a new retail payment tool that is safer, more versatile, and more inclusive as a public product to provide the digital economy's development with strong support in order to further satisfy the public's diversified online payment needs (The People's Bank of China, 2021), thus improving the level and efficiency of basic financial services.

2) Decreasing cash utilization rate

With the development of the digital economy, the cash utilization rate of CNY has presented a decreasing trend in recent years, an important reflection of which is



the decline in the number of automated teller machines (ATMs). According to the quarterly payment system operation data released by PBC (Payment and Settlement Department of the People's Bank of China, n.d.), after statistical analysis, it was found that the number of ATMs showed a decreasing trend from the fourth quarter of 2020 to the third quarter of 2023, as shown in the following figure.

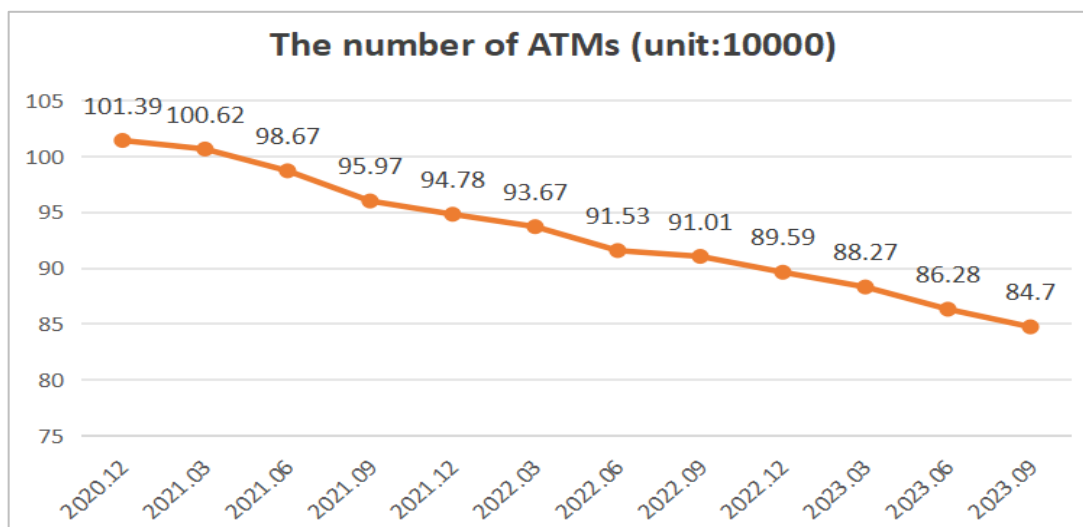


Figure 1. Number of ATM machines from the fourth quarter of 2020 to the third quarter of 2023
Source: own development on the basis of the quarterly payment operation statistics released by the PBC.

The use of cash has even been subject to some unreasonable restrictions in some places, as evidenced by the PBC's strict crackdown on refusing to accept CNY cash. The punished units mainly include public service institutions, parking lots, insurance companies, parks, and scenic spots (The Currency and Gold and Silver Bureau of the People's Bank of China, 2021), which have not failed to fully respect the public's right to choose cash payment methods and hindered the circulation of legal CNY. Although the use of cash shall not be restricted, especially in areas with insufficient coverage of online financial services, it has high management costs because its issuance, circulation, recycling, and other links require a significant amount of manpower, material resources, and financial investment (The People's Bank of China, 2021).

3) Potential threat of cryptocurrency to financial security

With the emergence of Bitcoin, more and more so-called cryptocurrencies are being continuously launched by the private sector. Although they use decentralized



blockchain and encryption technologies, they are difficult to play a monetary role in daily economic activities due to a lack of value support, high price fluctuations, low transaction efficiency, and huge energy consumption. They are often used for speculation and even become payment tools for illegal economic activities such as money laundering, which potentially threaten financial security and social stability. Even if some commercial institutions attempt to maintain the stability of currency value by anchoring sovereign currencies or related assets to launch so-called "stablecoins" or global stablecoins (The People's Bank of China, 2021), all of these may threaten financial security.

4) Increasingly mature and achievable theory of legal digital currency

In the past decade or so, remarkable achievements have been made in the development of fintech, and issuing authorities of legal tender in many countries and regions have been actively researching the digital form of legal tender. The theory of legal digital currency is becoming increasingly mature and has moved towards reality. In 2009, the emergence of Bitcoin attracted public attention to the concept of digital currency. The innovative technology it brings is called blockchain, which has been adopted by many other digital currencies, providing ideas for the central banks of various countries to develop legal digital currencies. Traditional legal currency can be digitized and stored on blockchain, achieving real-time transactions and greater transparency, gradually becoming the foundation of legal currency theory. The PBC continuously updates and improves the relevant theories and technologies of legal digital currency, forming the existing e-CNY's business framework and model (The People's Bank of China, 2021). The theory of e-CNY has become mature and realizable.

5) Competitive research and development of digital currencies worldwide

Digital currency can help modernize the financial system, raise the level of financial inclusiveness, and enhance the security and efficiency of financial services. The idea of countries around the world exploring and creating their own digital currencies has made the concept of legal digital currency increasingly popular. Subsequently, central banks or monetary authorities in various countries have been





actively promoting the research and development of digital currencies, and some have already begun or even completed preliminary tests. As countries around the world compete to speed up the development of digital currencies, China is also unwilling to fall behind. The birth of e-CNY has become an inevitable result of the development of the times.

5. BENEFITS BROUGHT BY E-CNY'S DEVELOPMENT

The benefits brought by the launch of e-CNY include, but are not limited to, the following aspects:

1) Meet the public's demand for cash in digital form

With the development of digital technology and electronic payments, the use of cash in the retail payment field is increasingly decreasing. However, as a public sector, the central bank has an obligation to create new channels for the public to directly obtain legal tender through cash digitization. China's research and development of e-CNY, a digital form of CNY, is aimed at supporting the development of the digital economy, meeting the public's demand for cash, and enriching the forms of cash provided by the central bank to the public.

2) Improve financial fairness and inclusion

The launch of e-CNY has further lowered the threshold for the public to access financial services. Based on the M0 positioning, e-CNY is mainly used for retail payments. Chinese residents without bank accounts and overseas residents who come to China in the short term can enjoy basic financial services by opening an e-CNY's wallet. This not only promotes financial equity but also enhances the level of financial inclusiveness.

3) Strengthen the efficiency and security of the retail payment system

E-CNY is a new type of payment method that can be generally accepted by the public, and its appearance enriches the diversity of payment tools and helps to improve





the efficiency and security of the payment system. China has always supported the coordinated development of multiple payment methods, and e-CNY has similar payment functions compared with general electronic payment tools. E-CNY draws on the technology and experience of electronic payment tools, forming a beneficial supplement to the latter. However, it has more advantages than the latter: firstly, it is the legal tender of the country and the highest security level asset; secondly, it has value characteristics and supports offline transactions, allowing for value transfer without relying on bank accounts. It has the characteristic of "payment settlement", which is beneficial for enterprises and the public to improve the efficiency of fund turnover and payment system operation while enjoying payment convenience; thirdly, e-CNY supports controllable anonymity, which is beneficial for protecting personal privacy and user information security (The People's Bank of China, 2021).

4) Facilitate the improvement of financial infrastructure

A relatively sound financial infrastructure is a necessary condition for the development of e-CNY, and the launch of the latter can help promote the improvement of the former. Firstly, it can promote the upgrading of financial infrastructure. The traditional banking system has the disadvantages of online-only payment and high handling fees, while e-CNY's system has the advantages of real-time settlement, support for offline transactions, with high payment efficiency and low cost, which can prompt financial institutions to speed up technical research and development and increase investment in financial infrastructure construction. Secondly, it can promote the development of financial technology. The development of e-CNY will give rise to more financial technology innovations and promote the development of financial technology. Thirdly, it can promote the perfection of the financial market infrastructure system. The basic system of the financial market is part of the financial infrastructure, and the development of e-CNY improves financial compliance and security, which helps to promote the improvement of the financial infrastructure.

5) Drive the development of the digital economy

The launch of e-CNY can drive the development of the digital economy. Firstly, the introduction of e-CNY accelerates the intelligence and convenience of the payment





and settlement system. E-CNY can not only realize 24-hour uninterrupted service through the offline transaction function but also combine with smart devices, which is convenient, fast, and intelligent and greatly reduces the cost of receiving and paying for users. Secondly, the launch of e-CNY can stimulate innovation and entrepreneurship in the field of the digital economy. It provides a new direction for the development of financial technology and creates new opportunities for economic growth. The emergence of e-CNY can prompt fintech companies to invest more resources in innovations about e-CNY. Through e-CNY's payment system, more innovative financial products and services will be created, which will help promote the inclusion and convenience of financial services and enable enterprises to obtain more credit support. Thirdly, the launch of e-CNY further promotes the digital transformation of the economy. The online and offline payment services provided by e-CNY's payment system can help enterprises realize digital transformation, better adapt to consumer demand, and improve marketing effectiveness. Fourthly, e-CNY provides more application scenarios for the digital economy. Through e-CNY, more application scenarios for the digital economy will be constructed, which helps promote the expansion of the digital economy industry chain.

6) Perfect cross-border payments and promote CNY's internationalization

Cross-border payments involve numerous complex issues such as currency sovereignty, foreign exchange management policies, exchange rate system arrangements, and regulatory compliance requirements, which are also problems that other countries work together to solve. Although e-CNY has the technical conditions for cross-border use, it is currently mainly used for domestic retail payments because currency internationalization is a natural process of market selection, and the status of international currency fundamentally depends on economic fundamentals as well as factors such as the depth, efficiency, and openness of currency and the financial market (Li, 2023). The exploration of cross-border payment of e-CNY combines the domestic pilot situation and the needs of the international community and establishes legal digital currency transaction arrangements and regulatory cooperation mechanisms with relevant monetary authorities and central banks, which facilitate the acceptance and widespread use of e-CNY by the international community, thereby perfecting cross-border payment and improving the internationalization level of CNY.





6. Challenges faced in the development of e-cny

There are, but are not limited to, six challenges faced by the development of e-CNY, as follows:

1) Impact on the original financial system

E-CNY may have an impact on the original financial system. Firstly, it has a certain impact on the existing payment system and financial institutions. The introduction of e-CNY changes people's consumption habits, and people may be more inclined to use electronic payments, which may reduce their reliance on traditional financial institutions and physical CNY cash. Secondly, it may affect monetary policy. It is thought that it is more attractive than deposits, and the supply of funds will bypass the commercial banking system, leading to a tightening of bank credit. Thirdly, it may affect financial stability. Someone believes that e-CNY, as the safest asset, could exacerbate the run on commercial banks during the crisis because the public could easily convert their bank deposits into e-CNY. However, others believe that existing electronic payment systems have already enabled rapid fund transfers between banks and that e-CNY will not have a significant impact on the pre-existing financial system (The People's Bank of China, 2021).

2) Relevant legal system to be improved

Although e-CNY is relatively mature in technology, there is still room for improvement in the legal system. Firstly, there are currently no specific laws and regulations to regulate the issuance, circulation, and use of e-CNY. Although there have been some positive developments in the research and pilot work of e-CNY, the relevant legal system is relatively lagging behind, and the issuance and use of e-CNY lack relevant norms and constraints, which may pose certain risks and loopholes, making it easy to be used for illegal transactions, money laundering, and other illegal criminal activities. Secondly, a perfect privacy protection mechanism and supervision measures have not yet been established. E-CNY may face the risk of data leakage during use, especially in terms of protecting trade secrets and personal privacy.





In addition, supervision laws are not yet sound. There are also certain deficiencies in China's regulation of payment settlement and financial technology. As a new payment method, the relevant laws and regulations of e-CNY are not yet sound, especially supervision laws.

3) Supervision system to be perfected

The supervision system needs to be perfected, which restricts the development and promotion of e-CNY. Firstly, CNY's anonymous transactions may lead to supervision loopholes. Unlike traditional bank payment systems, e-CNY does not require real-name authentication when building a wallet, and offline transactions can be carried out without a mobile phone, which may be exploited by criminals to engage in illegal transactions such as money laundering. Secondly, the regulation of e-CNY in terms of data privacy protection urgently needs to be strengthened. E-CNY involves a large amount of user data, and regulators have not yet established strict data security protection standards. The security of data and user privacy have not been sufficiently guaranteed, and people still have doubts about the security and credibility of CNY's system. In addition, there are supervision loopholes in cross-border e-CNY payments. At present, the cross-border payment function of e-CNY is not yet perfect, leading to inherent deficiencies in its supervision of international settlement payments and other aspects, which can easily breed cross-border illegal transactions.

4) Possible technical barriers may be encountered

E-CNY may encounter various technical obstacles in the process of research and development, updating, use, and promotion, which can affect its stable operation and widespread application. Firstly, there are technical barriers in terms of security. E-CNY is based on network technology such as blockchain, which poses certain network security risks and is inevitably attacked by hackers. Users may encounter phishing fraud and telecommunications fraud, and their information may also be at risk of theft (Ji, 2023). Therefore, technical obstacles may be encountered in the process of improving the security of e-CNY. Secondly, there are technical barriers in terms of promotion (Gao & Wang, 2022). Due to the technical characteristics of e-CNY and the complexity of financial regulation, the promotion of e-CNY requires a large amount of





manpower and technological input, and related technical standards and regulations also need to be continuously improved and updated. In this process, many technical obstacles will be encountered. Thirdly, there are technical barriers to cross-border payments and international cooperation. Cross-border payments and international cooperation of e-CNY will encounter various technical obstacles in establishing mechanisms for interconnection, interoperability, and interchangeability with digital currencies of other countries and regions and in the process of international settlements and payments. Fourthly, there are also technical obstacles in terms of supervision. In the process of supervision, e-CNY needs to utilize technology to innovate on supervision and will inevitably encounter some technical difficulties in financial supervision.

5) Some issues with CNY's use and promotion

There are some problems with the use and promotion of e-CNY. Firstly, people are concerned about its security and privacy protection. Although it has high technical security, some people are still worried that CNY's system may be attacked by hackers and their personal information may be leaked. Secondly, the public's acceptance of e-CNY needs to be improved. Some people may hold a skeptical attitude towards e-CNY due to a lack of relevant knowledge or understanding, or worry about the need to pay additional fees to adapt to CNY's system, or feel that it is not convenient enough because they have become accustomed to using original payment tools (Zeng, 2022). Thirdly, there is a competitive relationship between traditional payment methods and e-CNY. Despite the many technological advantages of e-CNY, its promotion still faces competition from various payment methods, such as cash payments, electronic payments, and other digital currency payment tools. Some payment tools may be more popular and in line with public consumption and payment habits. In addition, there are also issues with CNY's promotion of cross-border payments. At present, the cross-border payment function of e-CNY is not yet perfect, and there are still various technical obstacles to overcome in cross-border settlement and other aspects. It is also subject to foreign exchange and capital flow supervision by relevant countries, so it is not easy to promote it overseas.

6) Difficulties in international competition and cooperation





E-CNY faces challenges not only in international competition but also in international cooperation. With the development of digital currencies, more and more countries or regions are actively researching and promoting the development of their central bank digital currencies. It is not easy for e-CNY to improve its competitiveness in the international market and stand out in international competition. The development of e-CNY requires communication and cooperation with other legal tender-issuing authorities to address various issues related to cross-border payments, international settlements, regulatory cooperation, and so on (Wei, 2024).

7. Countermeasures to promote the development of e-cny

1) Continuously optimize CNY's design scheme

Since the development of e-CNY, the PBC has always attached great importance to its impact on the original financial system and has reduced the associated risks and eliminated the potential impact through top-level design of operations, technology, and policies to minimize its impact on the original financial system. For example, adopting a dual-tier operational model that is essentially the same as that of physical CNY; establishing appropriate institutional frictions to prevent the rapid spread of bank runs; setting transaction amount and wallet balance limits through a tiered classification design for e-CNY's wallets to minimize the crowding-out effect on deposits, so as to avoid the pro-cyclical effects under arbitrage and stressful environments. As the pilot work of e-CNY continues to advance, the PBC shall take into account the actual situation, make joint efforts with all sectors of society, including designated operating institutions, fully utilize the advantages of all parties, conduct in-depth research and evaluation of the comprehensive impact of e-CNY on the existing financial system, continue to explore new modes of application of e-CNY that are suitable for the economy and society, accumulate a good theoretical policy foundation and application experience for the development of e-CNY, and continuously iterate and optimize e-CNY's design scheme (The People's Bank of China, 2021).

2) Improve the relevant legal system





The focus of promoting the development of e-CNY is to improve its relevant legal system. Firstly, establish a specialized legal system for e-CNY, study and formulate its relevant management measures and clarify responsibilities, strengthen user privacy protection and risk prevention mechanisms, and ensure that e-CNY is safe, convenient, and easy to use. Secondly, improve business rules and technical standards. Organize comprehensive system security testing and evaluation from the aspects of security and business continuity to establish and improve the full process security management system of e-CNY's operation system, ensuring the safe and stable operation of the system (Jiang, 2022). Thirdly, establish and improve regulatory laws and regulations. Through legislation, clarify the regulatory requirements for designated operators and the rules for the issuance, circulation, and use of e-CNY, standardize the order of e-CNY's market, and provide a basis for regulators.

3) Strengthen the construction of the supervision system

The PBC should attach great importance to the supervision of e-CNY and take effective measures to ensure the smooth promotion and application of e-CNY. The first is to set up a professional supervisory organization, clarify the supervisory duties and authority, and strengthen the supervision and management of e-CNY. The second is to establish a sound regulatory system for e-CNY (Jiang, 2021). Formulate and improve regulatory measures and requirements based on the characteristics of e-CNY, standardize its use and trading behavior, establish a security risk assessment mechanism, timely detect and resolve security risks, and create a safe, convenient, and standardized environment for the use of e-CNY. Thirdly, crack down on illegal and irregular behavior. Regulators should strengthen cooperation with relevant departments, establish a multi-party collaborative regulatory mechanism, implement anti-terrorist financing, anti-money laundering, and other laws and regulations, and work together to combat the illegal use of e-CNY and money laundering. Fourthly, strengthen technical supervision. Regulators should utilize regulatory technology to strengthen monitoring and tracking of e-CNY to prevent its illegal use. Fifthly, regulators should strengthen cooperation with fintech companies to jointly develop e-CNY regulatory technology and improve the level of supervision. Finally, regulators should give full play to their subjective initiative, act proactively, strengthen relevant regulatory work, and improve the comprehensive regulatory capacity of e-CNY.





4) Make full use of resources from all parties

The PBC should pool its wisdom and utilize the resources and relevant talents of all parties in an integrated manner. In the face of various technical obstacles that may be encountered in the development of e-CNY, the PBC not only needs to solve these obstacles on its own but also needs to work together with other government-related units, fintech enterprises, and financial institutions to solve them. At the same time, the relevant technical confidentiality and non-competition systems should be improved. In the face of the problem of promoting the use of e-CNY, firstly, the government and relevant departments need to go on to strengthen publicity for the security of e-CNY and enhance the public's trust in it (Shi & Lu, 2024). Secondly, in order to promote the widespread use of e-CNY, the government needs to encourage enterprises and consumers to actively use e-CNY as a payment method through various means, such as providing supplementary training and red envelope rewards. In addition, the government needs to focus on publicizing the advantages and convenience of e-CNY while gradually reducing reliance on other payment methods through policy guidance in order to promote the widespread use of e-CNY.

5) Continuously deepen international exchanges and cooperation

The development of e-CNY should be based on the actual situation, continue to strengthen exchanges and cooperation with legal tender issuing authorities, take advantage of their strengths and complement their weaknesses, and continue to optimize and improve so as to enhance the international competitiveness of e-CNY and promote the development of e-CNY on a global scale. In order to continue to deepen international exchanges and cooperation, e-CNY needs to interconnect with the digital currencies of other countries (Xiang, 2021) and establish a cross-border payment and settlement network. At the same time, China should actively participate in and promote international exchanges and cooperation on legal digital currencies, strengthen technology sharing and regulatory cooperation with other countries, sign relevant agreements, explore and formulate relevant standards and rules in an open and inclusive manner and comply with them, and jointly address the challenges and risks posed by digital currencies. In addition, China can use e-CNY to facilitate cross-border trade and investment, promote the application and promotion of e-CNY in the





international market, and provide the prosperous development of the global economy with convenience to promote the internationalization of e-CNY (Zhou & Yang, 2022).

8. CONCLUSIONS

E-CNY is a legal tender issued by the PBC in digital form, with the characteristics of legal tender, centralized management, two-tier operation, M0 category, loose coupling of accounts, and retail digital currency issued to the public. Its design scheme has the advantages of advancement, compliance, rationality, applicability, functionality, reliability, inclusiveness, and so on. Its development process has gone through two stages, namely, theoretical research and pilot promotion, during which international exchanges and cooperation were carried out. Its design and practice are both effective.

The growing demand for online payments, the decreasing cash utilization rate, the potential threat of cryptocurrency to financial security, the increasingly mature and achievable theory of legal digital currencies, and competitive global research and development of digital currencies worldwide have prompted China to develop e-CNY, which has emerged as the times require. Its introduction could meet the public's demand for cash in digital form, improve financial fairness and inclusion, strengthen the efficiency and security of the retail payment system, facilitate the improvement of financial infrastructure, drive the development of the digital economy, perfect cross-border payments, and promote e-CNY's internationalization. However, its development also faces challenges in various aspects, such as its impact on the original financial system, the relevant legal system to be improved, the supervision system to be perfected, the possible technical barriers that may be encountered, some issues with e-CNY's use and promotion, and the difficulties in international competition and cooperation. Therefore, the development of e-CNY should be promoted by countermeasures such as continuously optimizing e-CNY's design scheme, improving the relevant legal system, strengthening the construction of the supervision system, making full use of the resources of all parties, and continuously deepening international exchanges and cooperation.





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