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THE TRANSFORMATION OF UKRAINE'S MONEY CIRCULATION IN THE CONTEXT OF INFORMATION-DIGITAL BANKING

ABSTRACT

The digitalization of the global economy has emerged as a defining trend of the 21st century, fundamentally reshaping monetary systems and financial interactions. In Ukraine, this process has catalyzed a shift from traditional cash-heavy models toward a transparent, integrated, and technologically advanced financial structure. The relevance of this study lies in the critical need to understand how information-digital banking tools influence the stability and efficiency of national money circulation amid rapid technological change and global economic integration.

The purpose of this research is to investigate the transformation of monetary circulation in Ukraine within the context of the digitalization of the banking sector and the broader economy. Specifically, the study aims to analyze the transition from cash-based transactions to modern cashless payment forms and evaluate the impact of information-digital banking on the mechanics of money circulation.

The results of the study reveal that the intensive implementation of electronic payment systems, internet banking, and mobile applications has significantly enhanced the transparency and efficiency of financial flows. The research identifies that these digital tools act as a primary catalyst for reducing cash usage and increasing financial inclusion among the population. Furthermore, the study highlights the vital role of institutional changes within the banking sector, which serve as a prerequisite for the effective functioning of digital payment instruments.

The conclusions indicate that the digitalization of the economy is the core factor driving the modernization of Ukraine's financial and credit systems. This transformation creates a robust foundation for a modern information-digital economy, enabling the country to adapt to international trends and technological shifts. Ultimately, the transition to information-digital banking ensures the resilience and competitiveness of the national monetary system in a globalized environment.

Keywords: monetary circulation, banking system, digital economy, information-digital banking, financial inclusion, electronic money

JEL Classification: E42, G21, O33

INTRODUCTION

Under modern conditions of the digital transformation of the financial sector, Ukraine's monetary circulation is undergoing significant structural changes. The active implementation of information-digital technologies in the banking sphere contributes to the emergence of new forms of money, the improvement of payment instruments, and the optimization of financial operations. These processes shape new patterns in the functioning of monetary market institutions and influence the speed, security, and transparency of monetary flows, as well as the transformation processes of money circulation. The growing role of information-digital banking necessitates a rethinking of traditional approaches to organizing monetary circulation and financial infrastructure. At the same time, digitalization generates both new opportunities for economic development and risks related to cybersecurity and regulatory adaptation. Under these conditions, a comprehensive analysis of the transformational processes taking place in the payment and banking systems becomes particularly relevant.

LITERATURE REVIEW

Within the scientific discourse, particular importance is attached to the concept of money as a social technology of account, according to which money is viewed not as a material carrier of value but as a standardized tool for recording mutual obligations within society. According to Peneder (2022), digitalization transforms the understanding of accounting, trust, and the legitimacy of money, since information-digital platforms and distributed ledgers change the mechanisms of conducting settlements. The development of the financial and credit market - defined as the set of economic relationships among participants regarding the movement of financial resources through mechanisms of lending, investment, and securities circulation - plays a key role in ensuring the stability of the state's monetary and credit system. In this context, modern monetary and credit obligations of the state are of particular significance. These include a system of financial instruments such as government securities, deposits, social payments, and state guarantees. They reflect the relationship between the state and citizens in the sphere of income distribution, the provision of socio-economic rights, and property protection, and they characterize the economic interests of individuals within the information-digital economy.

Changes in the nature of monetary circulation under the influence of digitalization stimulate a re-evaluation of classical theories of money. Foreign authors focus not only on the function of money as a medium of exchange or a store of value but also on its role as a digital unit of account, a technology of record-keeping, and an instrument of monetary policy under new conditions. Theoretical developments become crucial for understanding potential transformations such as CBDCs, cryptocurrencies, and the competition of private electronic currencies.

Among the leading theoretical approaches shaping the scientific discourse in foreign literature, several key directions should be noted. First and foremost, the concept of money as a social technology of account has become widely recognized. Within this approach, money is considered not so much a physical bearer of value as a standardized instrument for fixing mutual obligations in society. Digitalization is transforming the very notion of accounting, trust, and the legitimacy of money, because information-digital platforms and distributed ledgers change the ways in which settlements are conducted.

Special attention is also paid to the topic of competition between state and private forms of money. The research of Eichengreen (2021) demonstrates that private digital currencies, despite their limited stability, have the potential to transform the payment landscape.

At the same time, a significant portion of foreign research focuses on the role of the state in the process of information-digital transformation of the monetary and credit system. The model of issuing central bank digital currencies (CBDC) is analyzed as a compromise between the need for innovation and the preservation of monetary sovereignty. The works of Bordo (2021) and Levin (2017, 2021) reveal the potential effects of introducing CBDCs: changes in the transmission mechanisms of monetary policy, increased efficiency of the payment system, and expansion of financial inclusion. The theoretical understanding of the nature of cryptocurrencies is also presented in the works of researchers such as Catalini and Gans (2016), who interpret cryptocurrencies as a technologically driven innovation that transforms the principles of trust in the economy.

Attention should also be paid to the studies of Adrian and Mancini-Griffoli (2021), who, in their publications prepared within the analytical activities of the International Monetary Fund, developed the concept of a "synthetic CBDC" (sCBDC). This model envisions cooperation between the central bank and private financial institutions in creating digital currencies, where the state ensures trust and stability, while private companies provide innovation and user experience. Such an approach reduces technological and operational burdens on central banks while preserving monetary control. This is especially relevant for countries that aim to introduce digital currencies but possess limited resources or institutional capacity. A significant contribution to the discussion on digital money has also been made by economists from the European Central Bank, particularly Bindseil (2020), who studies the role of the digital euro within the EU payment system. In his works, he emphasizes that the introduction of a digital currency must be based on the principles of maintaining financial stability, ensuring market neutrality, and complementing existing means of payment. He also stresses the importance of a coordinated approach among EU member states and the need to prevent the dominance of private monetary initiatives that could undermine the sovereignty of national monetary policy. The experience of the European Union serves as a valuable example of how digital currencies can develop within the context of a complex supranational financial system.

In the domestic scientific discourse, the information and digital transformation of the monetary system is a subject of active research by such scholars as Mishchenko, Naumenkova and Mishchenko (2022). Their research focuses on analyzing the practical application of specific types of digital money and substantiating the theoretical foundations for the functioning of central bank digital currency (CBDC) mechanisms. It has been established that the digitalization of money represents a new stage in the evolution of banking and payment systems, central bank operations, and the functioning of both national monetary systems and the global monetary and financial architecture. In another study, Mishchenko and Ye. Tishchenko

(2024) develop the methodological framework for forming a mechanism through which digitalization impacts national resilience and the security of economic development.

In his 2022 work, O. Sharov continues his exploration of “monetary globalization,” analyzing the reciprocal impact of global processes on the fundamental essence of money, its functions, and its forms in the contemporary environment. In a 2025 study, the author outlines the concept of “monetary democracy” as a future framework for international settlements, examining how digitalization might reshape the hierarchy of global currencies.

Korneiev (2024) investigates the nature and scope of digital technologies' influence on the structure of the financial sector. The author analyzes how digitalization shifts traditional financial institutions toward mobile platforms and ecosystems, with a primary focus on balancing the adoption of innovative tools with the mitigation of systemic risks.

A significant role is played by the analytics provided by the National Bank of Ukraine, particularly its annual reports on the development of cashless payments, strategic documents regarding the implementation of the e-hryvnia, and research on financial technology regulation. Despite a substantial body of existing scientific and analytical work, there remains a pressing need for a comprehensive study of the digitalization of Ukraine's monetary and credit system. Such research must account for not only economic factors but also the legal, informational, and behavioral shifts that accompany this process.

AIMS AND OBJECTIVES

The purpose of this article is to analyze the features and patterns and to identify the trends in the formation of Ukraine's monetary circulation under the conditions of using information-digital technologies in the banking sector.

METHODS

A set of general scientific and specialized analytical methods was used in the research process. The application of systemic and comparative analysis made it possible to identify the specifics of monetary circulation transformation under the influence of banking sector digitalization. Economic and statistical methods were applied to assess the dynamics of key indicators of payment infrastructure development and digital banking in Ukraine. In addition, the methods of generalization and the structural-logical approach ensured the formulation of conclusions regarding trends and patterns of change in monetary circulation.

RESULTS

The main factor in the development of the modern economic environment of banking activity – the financial services market – is globalization, the strengthening openness of the world economy, international capital flows, and the creation of innovative financial instruments and services through the introduction of advanced technologies into the process of providing services and customer support by banks. The evolution of these factors is long-term in nature, and their impact continues to expand to new countries.

Information-digital banking is a system of organizing and providing banking services and products in which most or all key processes (customer service, account opening, transfers, lending, support) are performed using information and communication technologies and information-digital platforms (web interfaces, mobile applications, APIs, cloud solutions). Such a system assumes minimal or no dependence on physical bank branches, provides customers with round-the-clock access, and is based on automation, data analytics, the potential integration of fintech solutions, and interoperability with other information-digital services.

The formation of the information-digital economy - an organizational form of economic activity in which digital data, information technologies, and electronic communications serve as key production factors - has been accompanied by a profound institutional transformation of modern banking. This process has led to the growing role of cashless transactions, the creation of electronic payment platforms, and the implementation of digital identification based on new financial technologies. These changes have directly influenced the volume, speed, and structure of monetary circulation, as well as the level of accessibility, transparency, and trust in the banking system among a significant portion of the population.

The increase in financial inclusion and the change in behavioral models of economic agents have become decisive factors in modernizing the monetary policy of the state and individual banking institutions. Under current conditions, the development of information-digital technologies takes place within the framework of information-digital globalization – a process

of worldwide dissemination of information-digital technologies and information-communication networks that integrate national economies into a single global information space. For this reason, the study of the relationship between digitalization and the transformation of Ukraine's monetary and credit system is becoming particularly relevant both in theoretical and applied aspects.

Modern financial systems are increasingly based on new technological solutions such as blockchain, distributed ledgers, and mobile platforms. In this context, interest is growing in central bank digital currencies as a potential replacement for or complement to traditional money. The relevance of introducing information-digital forms of money increases under conditions of war, economic turbulence, and the active digitalization of society. Taking into account the achievements of foreign research allow for avoiding strategic mistakes in the process of reforming monetary circulation. Thus, combining Ukraine's historical experience with the analytical conclusions of the global scientific community creates the foundation for an effective transition to a new model of the monetary and financial system.

After Ukraine declared independence in 1991, there emerged a need to create its own financial system and national currency, a process accompanied by instability in monetary circulation and the absence of an adequate regulatory and legal framework. The introduction of the hryvnia contributed to a reduction in the consumer price index (from 501.7% in 1994 and 281.7% in 1995 to 139.7% in 1996 and 110.1% in 1997) and to the stabilization of the exchange rate at UAH 1.8–2.2 per U.S. dollar. This created the conditions for implementing the National Bank of Ukraine's Electronic Payment System, which became the foundation for the development of cashless transactions.

In the mid-1990s, the Ukrainian economy was characterized by a high dominance of cash: the share of the M0 aggregate in M3 accounted for almost half of total monetary circulation in 1995–1996. This was due to the population's distrust of the banking system, frequent inflationary shocks, and low financial literacy. High cash dependence hindered the effectiveness of monetary policy, as a significant portion of money remained outside the control of the banking sector.

Only after 1999, against the backdrop of macroeconomic stabilization, did the share of cash in the money supply begin to decline to 45%, reflecting the gradual growth of cashless transactions and increased trust in banks. At the same time, the M3 aggregate in 1996–2000 increased more than three and a half times – from approximately UAH 9 billion to over UAH 32 billion (Table 1) – indicating an expansion of the deposit base, increased lending, and the development of the financial market.

Changes in the structure of the money supply had important macroeconomic implications. First, the growth of deposits increased the potential of the banking system for investment and lending to the real sector. Second, the rising share of cashless forms of money contributed to a higher velocity of money circulation and reduced transaction costs in economic turnover. Third, it strengthened monetary transmission – the influence of NBU interest rates and reserve requirements on economic activity became more effective.

Thus, the quantitative indicators of the money market at the end of the 1990s reflect Ukraine's transition from a cash-oriented model to a more institutionalized, cashless circulation model. This laid the foundation for the further development of electronic payments, the implementation of modern banking technologies, and the strengthening of the National Bank's role in regulating monetary and credit processes.

It should be noted separately that, in economic theory and practice, a low share of cash in the structure of monetary circulation is considered an indicator of a developed financial and credit system. This is because:

- cash can be withdrawn from economic circulation - money does not work within the banking system, banks cannot issue loans, which leads to lower investment and affects economic growth;
- a high level of cash usage reduces financial inclusion and innovation, leading to slower fintech development, slower digital transformation, and reduced business competitiveness;
- cash contributes to the shadow economy, stimulating tax evasion, increasing hidden employment, and fostering corruption;
- cash is a key financial instrument in financing terrorism, with major risks including the voluntary transfer of personal cash by individuals to representatives of terrorist and/or separatist organizations (State Financial Monitoring Service of Ukraine, 2017).

On the other hand, cashless circulation: increases transparency, reduces transaction costs, accelerates money turnover, develops the financial and credit system, and makes the economy more manageable and predictable.

An important indicator of the institutionalization of monetary circulation was the growth in the number of bank accounts, which reflected the gradual transition of the population to the use of financial instruments issued by banks. While in 1992

only about 5% of citizens had a bank account, by the end of 2000 this figure exceeded 18%, indicating an increase in financial inclusion and an expansion of the banking sector's client base. The growth in the number of accounts and deposit operations was a consequence of the stabilization of the national currency, lower inflation, and the active development of commercial banking.

The expansion of operations with deposits and payment cards – for example, the first issuance of domestic bank cards by Aval and PrivatBank in 1997-1998 - initiated a new stage in the development of financial services. This process stimulated the formation of a cashless infrastructure and broadened the circle of users of banking products, gradually changing the structure of monetary circulation (Table 1).

Table 1. Structure of Ukraine's money supply from 1996 to 2000, as of the end of the period, UAH million. (Source: compiled by the author based on National Bank of Ukraine statistics)

Years	Monetary aggregate M0	Monetary aggregate M1	Monetary aggregate M2	Monetary aggregate M3	Share of cash	Share of transferable deposits in the national currency	Share of transferable deposits in foreign currency and other deposits	Share of debt securities
1996	4,041	6,315	9,023	9,364	43.15%	24.28%	28.92%	3.64%
1997	6,132	9,050	12,448	12,541	48.90%	23.27%	27.10%	0.74%
1998	7,158	10,331	15,432	15,705	45.58%	20.20%	32.48%	1.74%
1999	9,583	14,094	21,714	22,070	43.42%	20.44%	34.53%	1.61%
2000	12,799	20,735	31,390	32,087	39.89%	24.73%	33.21%	2.17%

In the first years of Ukraine's independence, monetary circulation remained predominantly paper-based; however, during this period, the foundations for cashless payments were laid. In 1999, a decision was made to create the National System of Mass Electronic Payments (NSMEP), which became a precursor to future digitalization. The development of the initial banking infrastructure was accompanied by the emergence of the first payment cards and electronic interbank settlements. Although information-digital technologies did not yet play a key role, this period laid the foundation for the formation of information-digital channels of monetary circulation in Ukraine.

Information-digital technologies gradually became the basis for the transformation of global markets, and individual economies and financial-credit institutions became dependent on the need to use information and communication technologies, automate exchange processes, create information-digital products and services, and digitalize interactions between the state, businesses, and citizens. For Ukraine, the development of the information-digital economy opened new opportunities for modernizing financial infrastructure and monetary circulation. During this period, significant changes in the structure of monetary assets were observed: the share of cashless funds in bank accounts increased, reflecting the gradual transition from a cash-based to a cashless economy.

According the IndexMundi in 2001, Ukraine had approximately 1.9 personal computers (PCs) per 100 people (around 920,000 computers), and by 2006, this figure had increased to approximately 4.5 PCs per 100 people (over 2.1 million PCs). At the same time, Internet user penetration rose from 1.24% in 2001 to 4.51% in 2006. With a low level of PC penetration, financial services via the Internet (online banking, electronic payments) remained inaccessible to a significant portion of the population. Bank cards were mostly used only for cash withdrawals and rarely for online transactions. The widespread adoption of PCs in both business environments and households became a prerequisite for the transformation of cash relations. In particular, it facilitated the transition from predominantly cash-based payments to increasing use of cashless payment instruments and the development of electronic financial services. The growth of information-digital literacy among the population and the technical capacity of enterprises created conditions for the development of online banking, e-commerce, and information-digital payment systems.

With the development of information-digital infrastructure, the active introduction of electronic payment instruments took place. In 2001, only 300,000 payment cards were in use in Ukraine, whereas by 2005, their number had reached 9.5 million, reflecting the shift from cash-based payments to card-based transactions. This process stimulated increased financial inclusion and strengthened the connection between the population and the banking system. An important outcome of digitalization was the gradual formation of an electronic payment culture in households. From 2002, banks began widely implementing online accounts, through which citizens could pay utilities, top up mobile phones, and make money transfers.

By 2005, approximately 15% of payment card users were accessing their accounts online, which was a significant figure at that time.

Additionally, it is worth noting the spread of POS terminals, which was a logical response by businesses to the growing adoption of bank cards among households. Between 2001 and 2013, the distribution of cashless payment systems was uneven: payment terminals were mostly located in large supermarkets, banks, and chain stores. The majority of the population still relied on cash, and bank cards were mainly used for ATM withdrawals.

The development of e-commerce also contributed to the modernization of monetary circulation. According to the State Statistics Service, in 2003, the volume of electronic transactions in the B2C sector exceeded UAH 150 million, and by 2006 it had grown to over UAH 800 million. This created a need for innovative payment solutions and the expansion of Internet acquiring networks among commercial and service enterprises.

In our research in 2012 we showed that the global financial crisis of 2008 and the subsequent economic slowdown had a negative impact on the volume of monetary circulation. However, the crisis also prompted banks to optimize costs and digitalize services. In 2010, the active development of Internet banking systems was launched, providing a new level of interaction between clients and financial institutions. By 2012, Ukraine had over 160,000 POS terminals in operation, and more than 70% of banks had their own online platforms. In 2013, over 68 million payment cards were issued in the country, of which around 30 million were active. At the same time, the number of POS terminals increased to 205,000, indicating the expansion of infrastructure for cashless payments. Transactions with payment cards exceeded 2.6 billion, with over 40% being cashless. During this period, trust in bank deposits also increased, contributing to a reduction in the share of cash in the total money supply.

In 2001, the share of cash in the money supply ($M0/M3$) was over 42.73%, and by 2007 it had decreased to 28.05%. After a slight increase in the share of cash in Ukraine's money supply during 2008–2009 due to the global financial crisis, the share of $M0$ continued to decline and reached 26.16% by 2013 (Table 2). This decline is explained by the growth in the share of transferable currency deposits and all term deposits in the money supply structure, rising from 33.42% in 2001 to 57.47% in 2013.

Between 2001 and 2013, the money supply in Ukraine demonstrated: a gradual replacement of cash with bank deposits and other bank liabilities; growth of the banking system until 2008; a temporary return to cash during the 2008–2009 crisis; and a subsequent recovery with a return to the trend of increasing the cashless component by 2013.

Table 2. Structure of Ukraine's money supply from 2001 to 2013, as of the end of each period, UAH million. (Source: compiled by the author based on National Bank of Ukraine statistics)

Year	Monetary aggregate M0	Monetary aggregate M1	Monetary aggregate M2	Monetary aggregate M3	Share of cash	Share of transferable deposits in the national currency	Share of transferable deposits in foreign currency and other deposits	Share of debt securities
2001	19,465	29,773	44,997	45,555	42.73%	22.63%	33.42%	1.22%
2002	26,434	40,354	64,395	65,129	40.59%	21.37%	36.91%	1.13%
2003	33,119	53,270	94,603	95,334	34.74%	21.14%	43.36%	0.77%
2004	42,345	67,090	125,483	125,705	33.69%	19.68%	46.45%	0.18%
2005	60,231	98,573	193,145	194,071	31.04%	19.76%	48.73%	0.48%
2006	74,984	123,276	259,413	261,063	28.72%	18.50%	52.15%	0.63%
2007	111,119	181,665	391,273	396,156	28.05%	17.81%	52.91%	1.23%
2008	154,759	225,127	512,527	515,727	30.01%	13.64%	55.73%	0.62%
2009	157,029	233,748	484,772	487,298	32.22%	15.74%	51.51%	0.52%
2010	182,990	289,894	596,841	597,872	30.61%	17.88%	51.34%	0.17%
2011	192,665	311,047	681,801	685,515	28.11%	17.27%	54.08%	0.54%
2012	203,245	323,225	771,126	773,199	26.29%	15.52%	57.93%	0.27%
2013	237,777	383,821	906,236	908,994	26.16%	16.07%	57.47%	0.30%

The events of 2014 - political instability, the annexation of Crimea, and the armed conflict in Donbas - led to a short-term decline in banking sector operations. However, even under these conditions, banks continued to develop mobile and Internet banking, allowing the population to maintain access to financial services.

From 2015 to 2021, the number of POS terminals in Ukraine more than tripled - from 148,000 to over 434,000 (Figure 1), reflecting the active development of the cashless infrastructure. The spread of contactless payments and the growing popularity of payment cards significantly stimulated this process. Despite a temporary decline in the number of POS terminals due to the occupation of part of Ukraine's territory, this trend continued. Approximately 87-92% of payment terminals supported contactless payments, which became especially important during the COVID-19 pandemic, when the need for safe financial transactions increased.

By the end of 2023, the number of POS terminals in Ukraine's retail network reached over 460,000 units, and by the end of 2024, this number had grown to 519,000, indicating a continued positive trend. The development of POS infrastructure in Ukraine is a clear indicator of the deep transformation in consumer payment behavior – from cash to convenient, fast, and secure digital transactions.

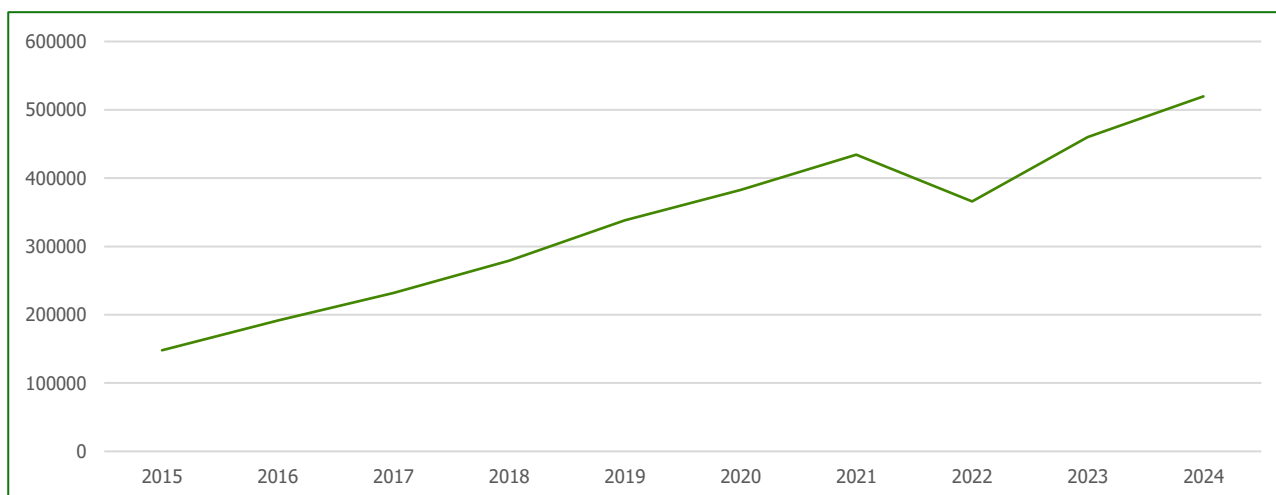


Figure 1. Dynamics of the number of payment terminals in Ukraine, 2015–2024, units. (Source: compiled by the author based on the Open Data Portal. Ukrainian Payment Card Market)

The last ten years have been decisive for the information-digital transformation of Ukraine's money circulation. During this period, against the backdrop of growing demand for transparency in financial operations, the fight against the shadow economy, and the overall development of financial technologies, banks and other payment operators began actively implementing information-digital services. Digitalization has affected both the infrastructure level (ATMs, POS terminals) and the client segment. It is worth noting that smartphone penetration in Ukraine from 2014 to 2024 has shown steady growth, from approximately 20% in 2014 to 85% in 2024, indicating a rapid adaptation of mobile technologies in society (Figure 2).

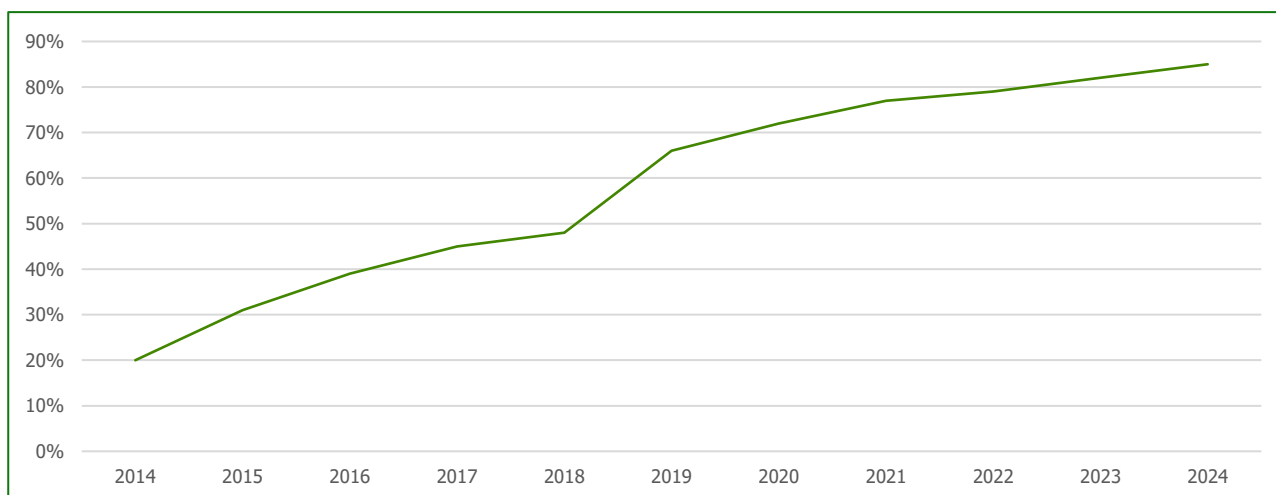


Figure 2. Smartphone penetration in Ukraine. (Source: Introducing: Reporting Ukraine Guide)

Almost every smartphone has access to one or more banking applications, which allow users to perform numerous banking operations that previously required the direct presence of the client at a bank branch (Table 3).

Table 3. Functions of mobile banking applications.

Function	Description
Account and balance overview	The user can view the balances of cards, current accounts, and deposit accounts in real time
Money transfers	There is also the possibility of instant transfers between their own accounts and to other cards (within Ukraine and abroad)
Payment for services	Utility payments, mobile services, internet, taxes, fines, tickets, etc.
Card management	Card blocking/unblocking, PIN code change, setting limits, issuing a virtual card.
Expense control	Expense analytics by category, budget creation, transaction history review.
Mobile payments (NFC, QR)	Payment by phone via Apple Pay, Google Pay, or QR codes.
Deposits and loans	Opening deposits, loan repayment, application for a loan/overdraft
Support and chatbots	Online communication with the bank (chat, call, inquiry)
Integration with other services	Insurance, currency purchase, investments, tickets, donations, cashback programs
Additional features	Biometric login (Face ID, Touch ID), push notifications for all transactions, transfers by phone number, issuance of virtual cards for online purchases, signing documents with an electronic signature (e-signature, BankID), receiving offers for new banking products.

According to the National Bank of Ukraine, in 2015 the total number of payment card transactions amounted to 2.1 billion, of which only 35% were cashless. By 2024, the number of transactions exceeded 8.6 billion, with a total value of UAH 6,577.4 billion. Of these, 91.8% by number and 90.1% by value were conducted within Ukraine. Most transactions in the country were already cashless: the share of cashless transactions by value in 2024 was 64.5%, and by number - 94.6% (NBU, 2025). This indicates a rapid increase in both virtual and tokenized bank cards (Figure 3). Mobile banking applications have become the main channel of interaction between the population and banks. For example, the Privat24 app had over 14 million active users in 2024 (PrivatBank. Annual report, 2024), while Monobank, which entered the market in 2017, had 10 million users as of August 2025 (Monobank's Dashboard, 2025). It is also worth noting the growth in expenses for cloud services. In the 2024 Consolidated Report of PrivatBank, these costs amounted to UAH 849 million (7.43% of all administrative and operational expenses), compared to UAH 739 million (6.73%) in 2023 (PrivatBank. Consolidated financial report, 2024).

The COVID-19 pandemic in 2020 became a powerful catalyst for digitalization. In 2020–2021, the number of online payments increased by 41% compared to the previous year, while NFC payments via smartphones tripled. The number of tokenized cards increased from 2.2 million at the beginning of 2020 to 16.5 million by the end of 2024, representing almost 28% of all active payment cards (Figure 3).

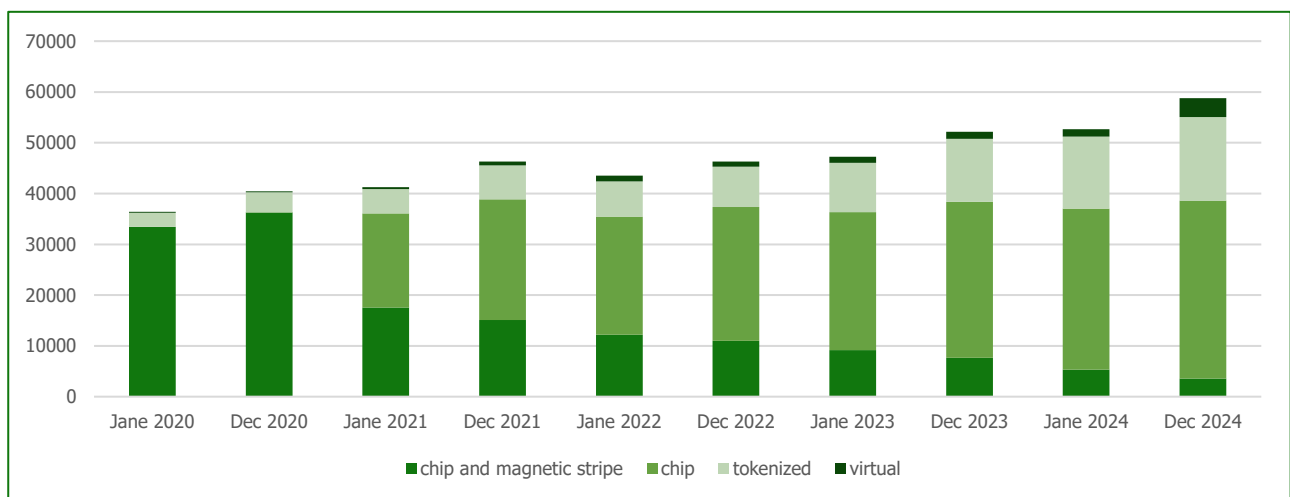


Figure 3. Changes in the structure of payment cards by half-year periods from June 2020 to December 2024. (Source: compiled by the author based on National Bank of Ukraine statistics)

It is important to emphasize that the information-digital economy includes not only online commerce and banking services, but also digital identification, cloud computing, virtual platforms, and automated accounting and settlement systems. In this context, digitalization has become a fundamental factor in the evolution of money circulation and the development of

modern banking, which has transformed from a primarily cash-based system into a multi-component cashless system with integrated information-digital interfaces.

Fintech development is accelerating rapidly: NFC technologies, contactless cards, mobile wallets, as well as experiments with blockchain solutions, are bringing information-digital circulation to a qualitatively new level. The National Bank of Ukraine is initiating the e-hryvnia project, considering it a strategic instrument of future monetary policy. Ukrainian banks are actively implementing open APIs, expanding the possibilities for integrating financial services with information-digital platforms. In 2022, the Law of Ukraine "On Payment Services" came into force, which expanded the range of financial service providers and aligned national legislation with European standards.

As of 2024, banks have developed a robust infrastructure: 132 million issued payment cards, of which 58.8 million are active (~44.5%). In 2024, 94.6% of all card transactions were cashless by number, and over 64% by value. While smartphones dominate daily internet traffic, PCs remain critically important for more complex financial operations - in offices, education, or government services. PCs have made secure internet banking possible, while the banking ecosystem has ensured convenient internet use through computers. In other words, the proliferation of computers provided the technical foundation for a high level of trust in information-digital banking tools, reflected in the mass adoption of cards and cashless payments.

In terms of financial inclusion, Ukraine has achieved significant results: by the end of 2024, over 85% of adults had access to bank accounts. The usage rate of digital wallets (Apple Pay, Google Pay, Garmin Pay) exceeded 60% in urban areas, and over 96% of POS terminals in Ukraine support contactless payments.

By 2025, the information-digital transformation of money circulation in Ukraine has become systemic. It encompasses both everyday citizen transactions and complex financial operations in the B2B and B2G segments. Further integration of artificial intelligence, open banking, big data, and blockchain into the payment infrastructure is expected, which will increase the flexibility and efficiency of Ukraine's financial system.

From 2014 to 2024, there has been a significant increase in the money supply, driven by high inflation (especially in 2014–2015 and 2022) and monetary expansion during COVID-19. However, all monetary aggregates increased unevenly - from 2.7 times (M0) to 4.6 times (M1). Consequently, the share of cash in Ukraine's money circulation decreased: in 2014, the M0 share in the M3 structure was 29.57%, while by the end of 2024, the cash share had fallen to 21.78% (Table 4).

Table 4. Structure of Ukraine's money supply from 2014 to 2024, as of the end of the period, UAH million. (Source: compiled by the author based on National Bank of Ukraine statistics)

Years	Monetary aggregate M0	Monetary aggregate M1	Monetary aggregate M2	Monetary aggregate M3	Share of cash	Share of transferable deposits in the national currency	Share of transferable deposits in foreign currency and other deposits	Share of debt securities
2014	282,947	435,475	955,349	956,728	29.57%	15.94%	54.34%	0.14%
2015	282,673	472,217	993,812	994,062	28.44%	19.07%	52.47%	0.03%
2016	314,392	529,928	1,102,391	1,102,700	28.51%	19.55%	51.91%	0.03%
2017	332,546	601,631	1,208,557	1,208,859	27.51%	22.26%	50.21%	0.02%
2018	363,629	671,285	1,273,772	1,277,635	28.46%	24.08%	47.16%	0.30%
2019	384,366	770,043	1,435,221	1,438,311	26.72%	26.81%	46.25%	0.21%
2020	516,085	1,050,051	1,847,363	1,850,007	27.90%	28.86%	43.10%	0.14%
2021	581,011	1,281,238	2,069,606	2,071,358	28.05%	33.81%	38.06%	0.08%
2022	666,073	1,571,360	2,500,502	2,501,621	26.63%	36.19%	37.14%	0.04%
2023	716,167	1,863,183	3,076,433	3,077,185	23.27%	37.27%	39.43%	0.02%
2024	759,753	2,129,279	3,487,858	3,488,377	21.78%	39.26%	38.95%	0.01%

We also observe a trend of a decreasing share of foreign currency demand deposits and other deposits (term deposits and balances in foreign currency accounts) from 54.34% to 38.06% in 2021 (before the full-scale invasion) – a decline of 17.86%, primarily due to the increase in the share of national currency demand deposits. Specifically, the share of the

latter in the money supply structure grew from 15.94% to 33.81%, an increase of 16.28%. Changes in the cash component (M0) over the same period were minor, with a decrease of 1.52% recorded. The share of debt securities increased only marginally, by 0.06%, within the statistical error range.

It is important to note that during 2008–2009, under the influence of the financial-economic crisis, the share of term deposits fell by 4.21% (from 55.73% in 2008 to 51.51% in 2009 – Table 2), which occurred proportionally due to increases in both the cash share and demand deposits by 2.22% and 2.10%, respectively.

On the other hand, during the period of full-scale military aggression, we observe stabilization and a slight increase in the share of term and foreign currency deposits, from 37.14% in 2022 to 38.95% in 2024, against the backdrop of a rise in the share of demand deposits from 36.19% to 39.26%, occurring exclusively due to a decrease in the share of cash from 26.63% to 21.78% (Table 4).

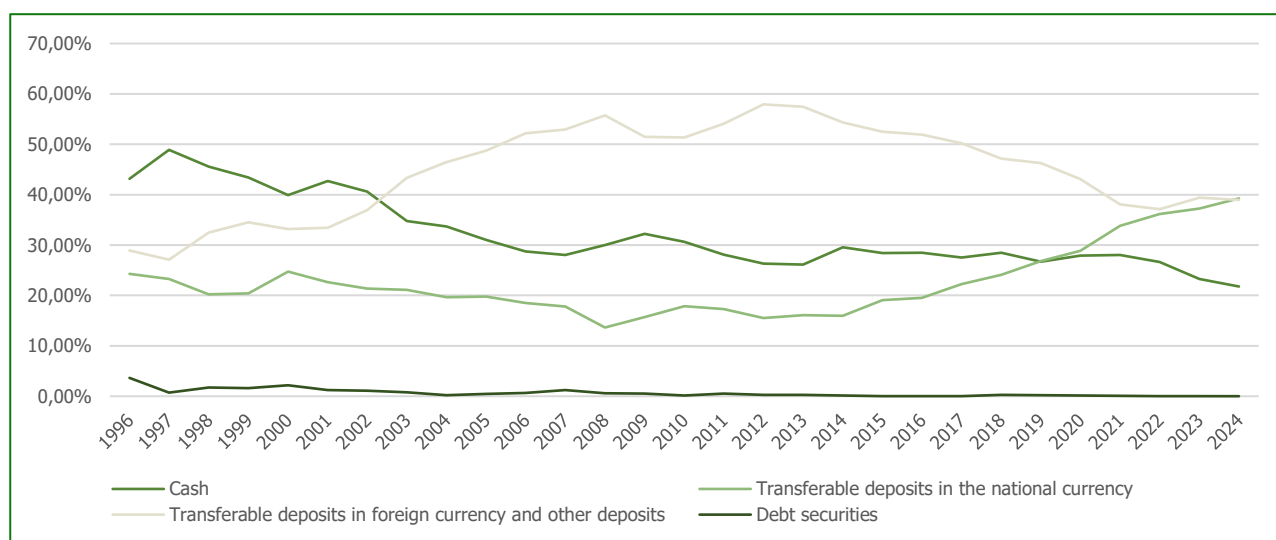


Figure 4. Changes in the Share of Components of Ukraine's Money Supply, 1996–2024. (Source: compiled by the author based on National Bank of Ukraine statistics)

The dynamics of the changes in the shares of the money supply components can be seen in Figure 4. Such a dynamic increase in the share of demand deposits can be explained by the growing technological capabilities of financial institutions, including through digital banking, which allows for maximizing the utility of monetary resources. This, in turn, encourages households and businesses to keep funds in accounts rather than accumulate cash, even during economic shocks. While the reduction in the cash share (M0) during 2022–2024 can be explained by institutional requirements of the NBU to limit cash withdrawals, the increase in account balances in 2014–2021 can be attributed not only to institutional measures but also to technological changes.

DISCUSSION

The relevance of this study is underscored by the pervasive impact of information-digital transformation on all sectors of Ukraine's economy, particularly the financial and banking spheres, necessitating a fundamental reassessment of the monetary system's operational framework. These transformational shifts, specifically through the integration of digital banking into money circulation, aim to sustain the requisite monetary dynamics focused on maximizing the capitalization of the national currency. In Ukraine, this process is of paramount importance within the context of post-conflict recovery and integration into the global information-digital space. The proactive implementation of digital banking and the widespread adoption of mobile financial services are fundamentally restructuring money circulation and payment infrastructure. Consequently, there is a pressing need for a systematic analysis of digitalization's impact on the stability and effectiveness of monetary policy. A comprehensive study of these trends is essential for developing an adaptive financial strategy amidst rapid technological shifts.

In contrast to other scientists (e.g., Geoffrey Ingham, 2024, Michael Peneder, 2022) who view money primarily as a “social technology of accounting” and focus on shifts in social trust mechanisms, we contend that under the conditions of information-digital globalization, technical accessibility (the infrastructural factor) is an equally decisive determinant. Our study demonstrates that the mass proliferation of personal computers and smartphones has formed the physical basis for the

population's transition to digital banking tools, thereby shifting the focus from sociological to infrastructural aspects of digital transformation. We attribute the growth of cashless payments not merely to regulatory policy but to specific structural shifts within the money supply, illustrating how the expansion of POS-terminal networks and neobanks directly correlates with the decreasing share of cash in circulation.

The scientific novelty of this research lies in the substantiation of a money circulation transformation model, wherein digital interfaces serve as the primary channel for financial inclusion. This allows for the integration of population segments previously excluded from the banking system, thereby capitalizing the monetary assets of both households and businesses.

The study is subject to several limitations:

1. Due to ongoing hostilities and the occupation of certain territories, data regarding the distribution of payment infrastructure (POS terminals, ATMs) in specific regions may be fragmentary.
2. While digitalization promotes transparency, this study cannot fully account for the volume of transactions within the "shadow" economy that may have migrated to unregulated foreign digital platforms.
3. This research primarily focuses on active banking service users, leaving the underlying causes of financial exclusion among the remaining population beyond the scope of this analysis.

CONCLUSIONS

The transformation of Ukraine's money circulation in the context of the spread of digital banking is systemic, multifaceted, and irreversible. The conducted study has identified several theoretical patterns and trends that define the current stage of evolution of the national monetary and financial system.

First, digitalization has become a key factor driving structural shifts in money circulation. From the early stages of the formation of Ukraine's banking system, its development was constrained by high cash dependency and weak infrastructure. However, since the 2000s, digital technologies have gradually created the prerequisites for the transition to cashless payments. Electronic payment systems, the development of card infrastructure, and digital banking have contributed to a steady and long-term decline in the share of cash in the money supply - from nearly 50% in the 1990s to 21.78% in 2024.

Second, digital banking has significantly improved the efficiency and transparency of money circulation. The growth of demand deposits in the national currency, the increase in cashless payments, and the rapid spread of mobile banking applications have become decisive institutional factors in changing the behavior of households and businesses. This transformation is mass-scale, engaging all economic actors. Digitalization enhances the efficiency of the financial system by reducing transaction costs, accelerating the turnover of funds, automating processes, and minimizing human-factor risks.

Third, digital payment instruments have substantially expanded access to financial services. Mobile applications, e-wallets, and remote banking services promote financial inclusion, which is a key component of sustainable economic development. These tools open new opportunities for businesses, simplify access to credit, investment, and real-time transactions, both by increasing the availability of financial services and by automating the decision-making process for loan issuance.

Overall trends in the use of digital banking contribute to strengthening the competitiveness of banks by enabling additional market segmentation and increasing the variety of financial services offered. The digitalization of money circulation creates strategic conditions for modernizing monetary policy and developing new instruments. Mobile applications have become the primary communication channel between banks and clients, while solutions such as NFC payments, virtual cards, and automated lending decisions have transformed digital banking into an independent financial ecosystem.

Digital technologies in money circulation form the foundation for implementing innovations such as cryptocurrencies, open banking, and the use of artificial intelligence in financial operations, allowing Ukraine to integrate into global financial trends and enhance competitiveness in international markets. In conditions of war and economic instability, digital banking ensures the resilience and continuity of the financial system. It is a flexible tool for state programs supporting the population, volunteer collections, humanitarian aid, and rapid social payments.

Thus, the digitalization of money circulation and digital banking represent not only technological modernization but also a strategic necessity for Ukraine on its path toward economic recovery, European integration, and strengthening financial sovereignty.

The findings of this study open several avenues for future academic inquiry. As the Ukrainian financial landscape continues to evolve, further research should focus on the following key areas:

First, AI and Cybersecurity in Banking: Future studies should explore the integration of Artificial Intelligence and Big Data in managing liquidity and mitigating the increased cybersecurity risks.

Second, addressing the Digital Divide: While this research highlights the growth of digital banking, more qualitative study is needed to understand the socio-psychological barriers facing the “unbanked” segments of the population.

Third, regulation of Virtual Assets: Given the transition toward a cashless economy, there is a significant need to develop a regulatory framework for the circulation of virtual assets, ensuring they support rather than undermine national monetary stability.

Fourth, post-War Financial Reconstruction: Finally, research should examine the role of digital banking infrastructure as a primary driver for attracting international investment and facilitating transparent financial flows during Ukraine’s post-war economic recovery.

ADDITIONAL INFORMATION

AUTHOR CONTRIBUTIONS

All authors have contributed equally.

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CONFLICT OF INTEREST

The Authors declare that there is no conflict of interest.

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ТРАНСФОРМАЦІЯ ОБІГУ ГРОШЕЙ УКРАЇНИ В КОНТЕКСТІ ІНФОРМАЦІЙНО-ЦИФРОВОГО БАНКІНГУ

Цифровізація глобальної економіки стала визначальною тенденцією XXI століття, що докорінно трансформує грошові системи та фінансову взаємодію. В Україні цей процес стимулював перехід від традиційних моделей із переважанням готівки до прозорості, інтегрованої й технологічно досконалої фінансової структури. Актуальність цього дослідження зумовлена нагальною потребою розуміння того, як інструменти інформаційно-цифрового банкінгу впливають на стабільність та ефективність національного грошового обігу в умовах стрімких технологічних змін і глобальної економічної інтеграції.

Метою цього дослідження є вивчення трансформації грошового обігу в Україні в контексті цифровізації банківського сектора та економіки в цілому. Зокрема робота спрямована на аналіз переходу від готівкових розрахунків до сучасних безготівкових форм оплати та оцінку впливу інформаційно-цифрового банкінгу на механізми грошового обігу.

Результати дослідження свідчать, що інтенсивне впровадження електронних платіжних систем, інтернет-банкінгу й мобільних додатків суттєво підвищило прозорість та ефективність фінансових потоків. Установлено, що ці цифрові інструменти виступають основним каталізатором зменшення використання готівки та підвищення рівня фінансової інклюзії населення. Крім того, у дослідженні підкреслено важливу роль інституційних змін у банківському секторі, які (зміни) є необхідною передумовою для ефективного функціонування цифрових платіжних інструментів.

Висновки вказують на те, що цифровізація економіки є ключовим чинником модернізації фінансово-кредитної системи України. Ця трансформація створює міцний фундамент для сучасної інформаційно-цифрової економіки, дозволяючи країні адаптуватися до міжнародних тенденцій і технологічних зрушень. Зрештою, перехід до інформаційно-цифрового банкінгу забезпечує стійкість і конкурентоспроможність національної грошової системи в умовах глобалізації.

Ключові слова: грошовий обіг, банківська система, цифрова економіка, інформаційно-цифровий банкінг, фінансова інклюзія, електронні гроші

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