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The Dialectics of Financial Innovations in the Digital Age

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ABSTRACT. The article provides a comprehensive study of financial innovations as a structurally significant component of the global innovation ecosystem in the process of large-scale transformations of the global financial sector. It is theoretically substantiated that in the context of the emerging information and digital era, financial innovations are becoming a key driver of structural modernisation of financial markets, shaped by the systemic digitalisation of financial services, the dynamic development of fintech solutions, the active spread of blockchain technologies, artificial intelligence and digital platforms, which are radically changing traditional models of creation, distribution and consumption of financial services. The key determinants of financial innovation development in the global business environment are specified and systematised. The research proves that digital and green transformations play a leading role among these innovations, which, through their synergistic action, ensure a deep convergence of financial, technological and environmental factors of economic growth of states and entire regions. It is highlighted that digital finance and fintech instruments are an important mechanism for supporting sustainable development in modern conditions, contributing to the mobilisation of investment resources in environmentally oriented projects and increasing the efficiency of financial intermediation. Particular emphasis is given to the cryptocurrency segment of the global monetary and financial system, which is transforming traditional payment, savings and transfer mechanisms and reflecting its transition to decentralised financial architectures. It is argued that the dynamic develop-

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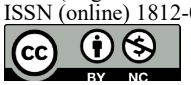

ment of crypto assets and decentralised finance significantly increases both the adaptability of financial systems to global challenges and the level of regulatory uncertainty and systemic risks. The paper systematises the technological and managerial resources of the network economy, which form new configurations of interaction between banking and non-banking financial institutions, fintech companies and regulatory authorities, creating a multi-level ecosystem of financial innovation. The evolution of financial innovations from the Fintech 1.0 model to Fintech 4.0 is revealed, and the key stages of the digital transformation of the financial sector are highlighted — from the automation of operational processes to the emergence of decentralised finance, central bank digital currencies and integrated financial data management platforms. A generalised description of modern technological tools for financial innovation (artificial intelligence, big data, blockchain, cloud computing, mobile financial applications, RegTech) is provided, and their impact on expanding financial inclusion and increasing the stability and competitiveness of financial institutions is determined. The key directions and consequences of the application of fintech solutions in the field of public financial management as a factor in strengthening the fiscal capacity of the state and increasing the international competitiveness of national economies are summarised. A reasoned conclusion is made that the dialectics of financial innovation in the information and digital age has a clearly contradictory nature, which gives rise to qualitatively new forms of competition for global financial capital. The scientific results obtained significantly deepen theoretical understanding of the modern institutional and regulatory architecture of the global ecosystem of financial innovations and can be used to develop strategies for the digital and green transformation of national financial markets.

KEYWORDS: global economic development, global political economy, institutionalism, digitalisation, global financial sector, global innovation ecosystem, fintech, sustainable finance, artificial intelligence, network economy, cryptocurrency.

Introduction

The current stage of global economic development is determined by the dominant influence of digital and green transformations, which, as international economic practice shows, have fundamentally different temporal and functional orientations. While digital transformation has a predominantly short- and medium-term impact on economic systems, causing their operational structural and functional changes, green transformation is characterised by a strategic medium- and long-term implementation horizon and covers virtually all categories of economic entities. In recent years, financial market analysts have increasingly confirmed the predictions previously formulated in the works of futurologists, according to which digital technologies (in particular, artificial intelligence, big data, blockchain, digital platforms and mobile devices) are key drivers of profound transformations in financial intermediation, the business models of financial institutions and the nature of interaction between banking institutions and their customers at the global level[5]; [6]. Given the scale and intensity of these changes, they

[5] Anifa, M., Ramakrishnan, S., Joghee, S., Kabiraj, S., & Bishnoi, M. (2022). Fintech Innovations in the Financial Service Industry. Journal of Risk and Financial Management. https://doi.org/10.3390/jrfm15070287.

are increasingly interpreted not as a gradual evolution, but as a qualitatively new stage in the development of the financial system, which is referred to in scientific literature as the "fintech revolution."

The global dynamics of innovation processes as the institutional and technological basis for digital and green transformations create the preconditions for achieving the Sustainable Development Goals and mitigating the key global challenges of our time. Financial and digital innovations are closely linked to economic growth rates, increased efficiency and inclusiveness of economic systems, and expanded access to financial resources, particularly for small and medium-sized enterprises and socially vulnerable groups, as confirmed by the results of empirical studies conducted by Filipino scientists[7]. Digital innovations also improve the financial performance and sustainability of firms[8].

The scale and significance of information and technologies for working with it (primarily in an automated mode using digital technologies) at the current level of socio-economic development give reason to say that humanity is already living in the information and digital age. The existence and development of the information society, as the next stage of development after the industrial and agrarian ones, the theoretical justification of which was initiated by D. Bell, E. Toffler, Y. Masuda, F. Machlup and other Western scholars, is not in doubt. Therefore, as demonstrated by D. Lukianenko, D. Pavlovskyi, and O. Sydorenko, research on the development of the global economy must take into account the digital imperative[9]. That is why many researchers are now delving into the study of the characteristics of individual technologies and their role in the development of institutions, macroeconomic or market processes, an example of which is currently artificial intelligence[10].

Despite the fact that, as evidenced by numerous scientific publications (in particular, the works of Al-Ansi A., Garada A. and Jaboub M., Gomber P., Kaufman R. J., Parker K. and Weber B. V. and other scholars), the issues of digital finance and fintech are characterised by a high level of elaboration and research activity, they still require in-depth conceptual and interdisciplinary understanding. First and foremost, this concerns revealing the internal logic of the evolution of digital finance, identifying the key

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[6] Gomber, P., Kauffman, R., Parker, C., & Weber, B. (2017). On the Fintech Revolution: Interpreting the Forces of Innovation, Disruption, and Transformation in Financial Services. Journal of Management Information Systems, 35, 220–265. https://doi.org/10.1080/07421222.2018.1440766

[7] Balboa, E., Ladesma, M., & Manguerra, A. N. (2024). Digital Financing Innovations and Their Impact on the Financial Performance of SMEs in the Digital Economy Era. JMM17 : Jurnal Ilmu Ekonomi Dan Manajemen, 11(1), 88–98. https://doi.org/10.30996/jmm17.v11i1.10879

[8] Hussain, M., & Papastathopoulos, A. (2022). Organizational readiness for digital financial innovation and financial resilience. International Journal of Production Economics. https://doi.org/10.1016/j.ijpe.2021.108326.

[9] Lukianenko, D., Pavlovskyi, D., & Sydorenko, O. (2023). The digital imperative of global economic development. International Economic Policy, (2), 39. pp.7-26. https://doi.org/10.33111/iep.2023.39.01

[10] Burmaka, M., & Pavlovskyi, D. (2025). The phenomenon of artificial intelligence in the global economy. International Economic Policy, No. 1(42). pp.7-26. https://doi.org/10.33111/iep.2025.42.01

determinants of its development, and conducting a comprehensive analysis of the economic, institutional, and social consequences of its spread[11]; [12]. In addition, the process of digital and green transformation gives rise to a number of internal contradictions that determine the scientific and practical relevance of further research. In particular, these are *dichotomies* that define the contradictory nature of modern transformation processes and require systematic scientific analysis, in particular:

- simultaneous growth of the digital divide *versus* increased opportunities for quality inclusion at all levels (micro, macro, meso, global);
- increased productivity and automation of labour *versus* increased systemic, cyber and regulatory risks;
- the undermining of the monopoly of banking activities *versus* the growth of their cooperation and integration with competitors and partners;
- demand for innovation leading to growth and qualitative improvement *versus* the desire for stability, consumer protection and confidentiality.

Global experience shows that national economies that implement strategies and policies based on scientific research are most effective in adapting to such challenges. That is why investing in scientific research is more effective than reacting daily to risks that could have been prevented or minimised.

The development of the digital economy and financial innovation are among the pressing tasks for the development of the domestic economy and the realisation of national economic interests in the global economic space. In particular, this is regulated by a number of documents: On Stimulating the Development of the Digital Economy in Ukraine (Law of Ukraine); Strategy for digital development, digital transformation and digitisation of the public finance management system for the period up to 2030 (Order of the Cabinet of Ministers of Ukraine); Concept for the development of digital competencies until 2025. In addition, legislation on virtual assets is currently being actively developed.

From a theoretical point of view, the development of the digital economy and financial innovations is of interest to scientists who are involved in improving a whole range of theories, concepts and models. These include *systems theory and innovation theory* and the role of technology in economic development, *theories of the information economy* and data management, networks and infrastructure, *institutional theories* and national and international models of regulating relations, the maturity and effectiveness of institutions and the digital rights of producers and consumers, as well as *theories of global and European integration*, which are designed to harmonise national interests in

[11] Al-Ansi, A., Garad, A., & Jaboob, M. (2024). Unravelling the complexities of financial innovation and digital transformation within banking systems. Multidisciplinary Reviews. https://doi.org/10.31893/multirev.2024265.

[12] Gomber, P., Kauffman, R., Parker, C., & Weber, B. (2017). On the Fintech Revolution: Interpreting the Forces of Innovation, Disruption, and Transformation in Financial Services. Journal of Management Information Systems, 35, 220 — 265. https://doi.org/10.1080/07421222.2018.1440766

the process of bringing countries closer together. A special place is given to *the theory of social transformations* and *the theory of change*, which in this study are presented at the macroeconomic and global levels, enabling the management of the evolution of economic systems.

The authors of this study proceed from the assumption that there is still a significant lack of comprehensive research on financial innovations in the information and digital era in domestic scientific discourse and, therefore, there is a constant need for a systematic assessment of the current state of development and the identification of likely prospects for development. This involves positioning financial innovations in the mechanism of economic development, identifying the determinants and resources for the development of financial innovations, studying the evolution of financial innovations in the context of global competition, and assessing the impact of transformations on the development of sectors of the global economy and the emergence of new sectors.

The aim of this study is to provide a systematic theoretical and analytical representation of the dynamic competitive development of financial innovations in the information and digital age. To achieve this goal, a number of interrelated tasks were set in this study, namely:

- to reveal the role of financial innovations in the global innovation ecosystem;
- to identify the key determinants of the development of financial innovations in the information and digital era;
- to assess the impact of green and digital transformation on the global financial sector;
- to characterise the digitalisation of the global financial system in terms of the determinants of financial innovation development;
- outline the cryptocurrency segment of the global monetary system in the dialectic of financial innovation;
- identify the technological and managerial resources of the network economy in the dialectic of financial innovation;
- demonstrate the consistency and continuity of financial innovation development;
- analyse the use of technological tools for financial innovation using specific examples.

Methodologically, this study relies on the use of descriptive analytics and the case method, a systematic approach and generalisation, as well as a high level of abstraction. An important postulate of the study is to take into account the general philosophical understanding that, over time, the effect of any factors is exhausted, in the process of which new forms of materialisation of economic activity appear, which in turn lead to the formation of new factors or the provision of new functional features to traditional ones. The dialectical development of factors and forms is constant,

which at the level of the global economy, thanks to innovations, manifests itself in changes in technological structures, stages of development of integration processes, and the emergence of qualitatively different generations of goods and technologies.

Financial innovations in the global innovation ecosystem

One of the key trends in global economic development in recent decades has been the rapid expansion and systematic structural diversification of financial innovations. In concrete terms, between 2019 and 2024 alone, the total number of devices connected to the internet worldwide grew from 7.7 to 18.1 billion, and by 2033 it will reach a record high of 39.6 billion (Fig. 1).

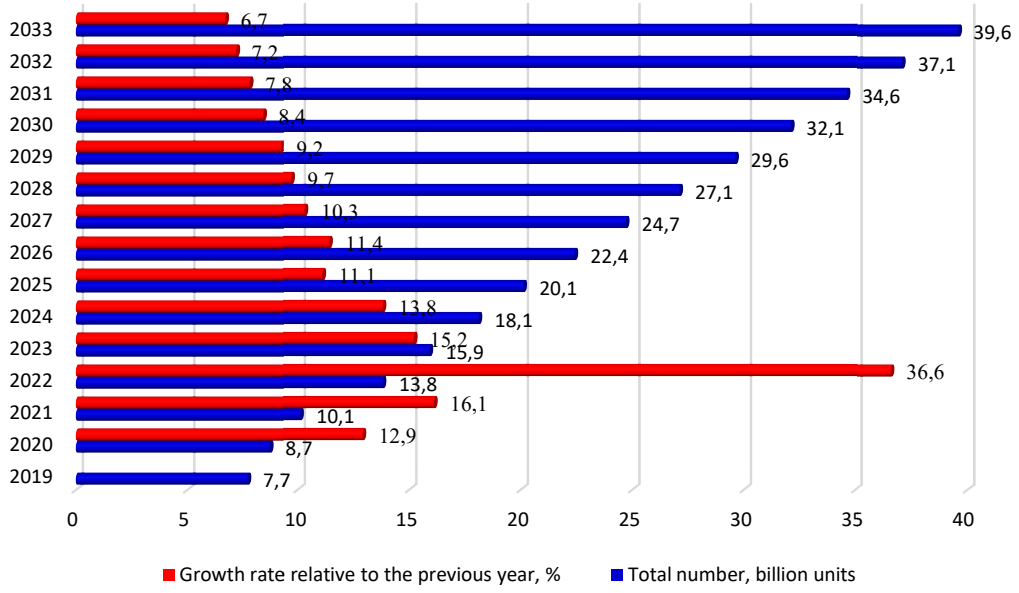

Fig. 1 — Dynamics of the global number of devices connected to the Internet of Things in 2019-2024 and forecast for the period up to 2033

Source: calculated and constructed by the authors based on data from[13] and[14].

[13] Number of Internet of Things (IoT) connections worldwide from 2019 to 2023, with forecasts to 2030 (in billions). Statista. The Statistic Portal. https://www.statista.com/statistics/1183457/iot-connected-devices-worldwide/

[14] Number of Internet of Things (IoT) connections worldwide from 2022 to 2023, with forecasts from 2024 to 2033 (in billions). Statista. The Statistic Portal. https://www.statista.com/statistics/1183457/iot-connected-devices-worldwide/

Such dynamics was largely driven by the rapid spread of the Covid-19 pandemic, which not only accelerated the systematic introduction of digital technologies into the global financial industry, but also motivated traditional financial intermediaries to systematically digitise their own operational processes and customer services in order to strengthen their competitive market positions in the fierce competition with highly specialised fintech companies.

At the same time, the effectiveness of financial innovation implementation in the global market must be analysed in the overall context of the functioning of the financial subsystem of the global innovation ecosystem. The financial innovation ecosystem should be viewed exclusively as an integral part of the global innovation ecosystem, which, on the one hand, is focused on increasing the competitive advantages of national financial systems and, on the other hand, reflects a number of defining trends in global economic development. This primarily overall architecture of business structures, the dynamic modernisation of their corporate strategies and business models, as well as the increase in market capitalisation of companies and firms involved in the formation of ecosystems. On this basis, we can argue that the global financial ecosystem is the central link in international financial relations, capable of radically transforming the structural dimensions of national and regional subsystems of the global financial market.

The global capital market makes intensive use of accumulated scientific and analytical knowledge and achievements, including technological changes, for the qualitative development of economic systems and processes at virtually all levels. We draw this conclusion based on an analysis of the works of leading scientists around the world. A bibliographic analysis has revealed several clusters of highly cited studies on the dialectics of financial innovation in the information and digital age (Fig. 2). The dominant clusters are investment and technology, environmental and financial, and banking and transformation, between which there are numerous interrelationships.

A summary of the key methodological provisions of scientific works devoted to the dialectics of financial innovations in the international economic system revealed a significant lack of in-depth research on this issue. Thus, based on the results of summarising the works of domestic and foreign scientists on the problems of the information society, it is possible to identify a number of key general features of economic development that can form a general idea of the evolutionary progress of financial innovations and its driving forces. First and foremost, these are key *dialectical features* that "permeate" virtually all areas of global socio-economic development at the horizontal level, namely:

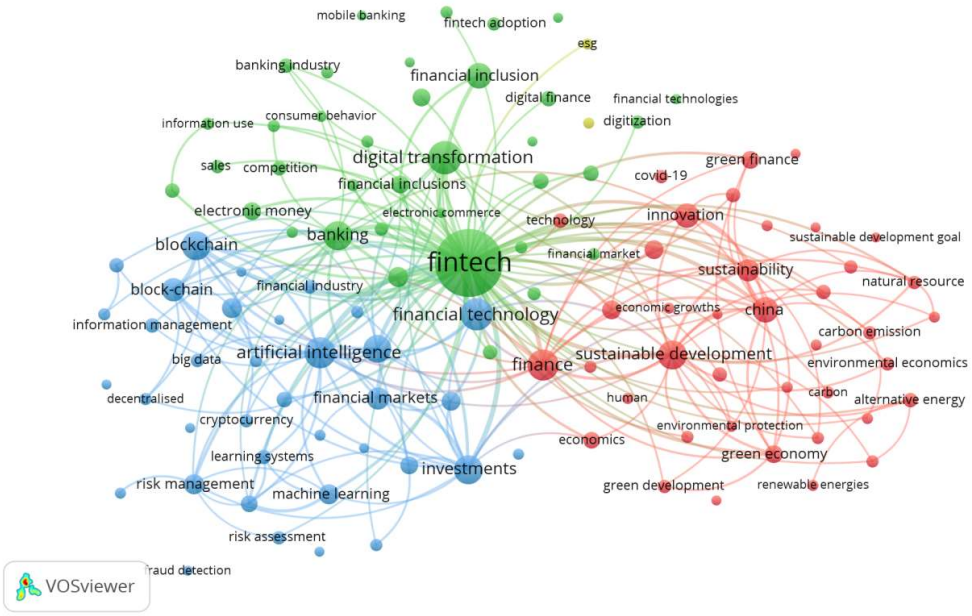

Fig. 2 — Semantic map of research on financial innovations in the information and digital era

Source: constructed by the authors based on the keywords of publications in the Scopus database using the following search query: "(TITLE-ABS-KEY ("financial innovations" OR "banking innovations" OR "finance innovation" OR "financial innovation" OR fintech OR "financial technology") AND TITLE-ABS-KEY (digit* OR fintech OR "financial technology" OR inform*) AND TITLE-ABS-KEY (transformation OR age OR era OR stage OR transition OR evolution OR revolution))"

- systemic intellectualisation of economic activity at the corporate, national and international levels as the basis for ensuring the competitive positions of economic entities;
- large-scale application of information and communication technologies in the processes of internationalisation of economic activity and financial instruments, as well as ensuring the integration of national financial markets;
- increasing scale and intensity of the use of information technologies in the process of social reproduction, which is reflected in the steady increase in the share of ICT in the GDP structure and labour markets of the vast majority of countries;
- dynamic networking and virtualisation of the global economy as leading trends in the development of the global financial ecosystem and sectors of national economies, which ensure high levels of cross-border information flow;

- significant acceleration in the cross-border movement of funds and financial capital, as well as a steady increase in the productivity of social labour;
- shortening of the life cycle of innovative solutions and the need for constant support of innovative activity in the context of dynamic development of the IT sector.

As global experience shows, even at the beginning of the 20th century, the scale, structural dimensions and dynamics of the global financial market were far from always being determined by scientific models or logical constructs developed by theoretical scientists. Today, as emphasised by E. Engelen, I. Ertьrk, J. Froud, S. Johal, A. Leaver, M. Moran and K. Williams, factors such as the scale of leverage available to economic entities, the resource capabilities for using derivatives, special purpose vehicles (SPVs) and structured investment vehicles (SIVs), as well as the realisation of the potential for securitising financial flows such as residential mortgages, long-term loans and other assets[15]. Moreover, in the current environment, financial markets are no longer characterised by the provisions of neoclassical theory with its abstract market forces and unknown entities, but are determined by the activities of specific economic actors, conceptually defined by game theory, behavioural finance and network economics.

Key determinants of financial innovation in the information and digital age

Today, the level of readiness of global financial market actors to intensify innovation is one of the important factors in the international competition for access to global capital sources. This readiness covers a fairly wide range of structural components, from technological and regulatory readiness to develop and implement financial innovations to the readiness of the skills and production culture of the economic actors themselves. This fact should guide the global financial community towards the systematic digitalisation of its corporate strategies and business models as a guarantee of increasing the level of technological readiness for financial innovation. In support of this thesis, we cite, in particular, the results of research by J. Purba, H. Hery and V. Lestari, who, using the example of developing countries, convincingly demonstrate the close link between the dynamics of financial innovation and the level of implementation of Industry 4.0 technologies in international economic practice. These include, in particular,

[15] Engelen E., Ertürk I., Froud J., Johal S., Leaver A., Moran, M., ... Williams, K. After the great complacence: Financial crisis and the politics of reform. Oxford University Press. 2011.

the Internet of Things, computer and cloud computing, big data analytics and mobile technologies, which in recent years have become an integral component of strategic corporate management in terms of the systematic implementation of innovative technologies for financial customer service[16].

When characterising the determinants of financial innovation in the information and digital age, we cannot ignore the readiness of its actors to apply artificial intelligence. As demonstrated by K. Mahmud, M. Joarder and K. Sakib, the demographic profile of a given country, its financial condition, the level of financial literacy of the population and its mental preparedness, as well as the current level of applied technologies decisively determine the pace of development and implementation of financial innovations[17]. On the other hand, the main limiting factors for the development of financial innovations are a significant lack of trust, infrastructure, knowledge and security, as well as the low quality of the financial services themselves[18].

No one doubts that the process of developing and implementing financial innovations requires close convergence of the technological readiness of financial market participants with their innovative culture and current practices of adapting technologies to the needs of national markets in their sectoral and institutional dimensions. This approach makes the development of effective models of technological adaptation, taking into account the level of technological innovation, one of the priority tasks for the competitive development of these entities. It should be emphasised that this is extremely relevant both for entities that implement their own innovative developments and for market participants that apply developments created by other financial market actors. Thus, A. Mahmood, M. Imran and K. Adil emphasise that identifying the levels of technological readiness of financial innovations and their perception, together with the application of financial innovations in corporate business models of performance management, significantly expand the resource capabilities of financial institutions to innovate their own economic activities[19]. Taken together, this also raises the issue of managing the transfer of financial technologies at the national and international levels.

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[16] Purba J. T., Hery H., Lestari V. N. S. Financial Technology Readiness: Strategic Innovation Management in the Service Industry 4.0. In ACHITS 2019: Proceedings of the 1st Asian Conference on Humanities, Industry, and Technology for Society, ACHITS 2019, 30-31 July 2019, Surabaya, Indonesia. European Alliance for Innovation. 2019. 108 p. URL: https://eudl.eu/pdf/10.4108/eai.30-7-2019.2287760

[17] Mahmud K., Joarder M. M. A., Sakib K. Customer Fintech Readiness (CFR): Assessing customer readiness for fintech in Bangladesh. Journal of Open Innovation: Technology, Market, and Complexity. 2023. Vol. 9 (2).

[18] Mahmood A., Imran M., Adil K. Modelling Individual Beliefs to Transfigure Technology Readiness into Technology Acceptance in Financial Institutions. SAGE Open. 2023. Vol. 13 (1). URL: https://journals.sagepub.com/doi/ pdf/10.1177/21582440221149718

[19] Ibid.

The impact of green and digital transformation on the global financial sector

The current stage of global economic development is characterised by large-scale and comprehensive processes of green and digital transformation, which raises the issue of comprehensive research into the nature and mechanisms of their impact on structural changes in the global financial sector. This includes, in particular the ethical dimension of the green transition in the context of compliance with the strategic priorities of global sustainable development; the introduction of models of social reproduction capable of optimising the balance between economic, social and environmental priorities of global social progress; the systematic introduction into international business activities of effective tools for preventing global financial imbalances and mitigating the consequences of disruptions to the structural parameters of global financial equilibrium.

Based on this, we can say that the inclusion of qualitatively new factors in the system of global determinants of the development of the global financial market makes it possible to form a clear idea of the transformational changes that are taking place in the current models of economic behaviour of owners and consumers of financial capital, as well as a wide range of financial intermediaries represented in various segments of the global market. In the short term, such financial innovations may lead to a significant deepening of regional and structural-functional asymmetries in the distribution of global financial capital, an increase in its overconcentration in a small group of post-industrial countries, and shift the main burden of financing innovative transformations to less economically developed entities of the global economic system. Therefore, the processes of its green transformation, if fully compliant with the principles of sustainable development, are a significant stimulating driver for the introduction of financial innovations. In particular, UNCTAD experts S. Chevik, J. Jalles and D. Ribaudo argue that green innovations, based on revolutionary more mature technologies, significantly expand the resource capabilities of global financial capital to maximise profits by increasing investment capital in financial innovations and thus forming new technological waves[20].

It is worth noting that recent years have been marked by a rapid increase in the number of publications whose keywords are "green finance." Thanks to this, the theoretical and methodological basis for researching the transformational changes in the global financial system is actively being formed. According to data from international scientometric databases, the greatest contribution to the development of this issue has been made by F.

[20] Ribaudo D. The Technology and Innovation Report 2023. UNCTAD United Nations Conference on Trade and Development. 2023. URL: https://unctad.org/system/files/official-document/tir2023_en.pdf

Taghizadeh-Hesary, C. Lee, D. Zhang, N. Yoshino and many other Western scientists representing the scientific achievements of countries such as China, the United States, the United Kingdom and Germany[21]; [22]; [23]. The most significant achievements of these scholars in the study of green finance include, in particular, issues related to the diversification of sources of long-term investment in green transformation processes, interest rate management, elimination of institutional capacity gaps among key players in the global financial market, etc.

In view of the above, we believe that the organisational, economic, institutional and regulatory landscape of green finance is currently a determining factor in the systematic dissemination of sustainable development principles in international economic practice. As F. Taghizadeh-Hesary and N. Yoshino rightly point out in this regard, the resource potential of long-term financing of technological modernisation projects and the "greening" of infrastructure support for economic activity (such as green energy infrastructure) can be significantly increased by involving such types of financial market entities as pension funds and insurance companies in this process[24].

In terms of specific figures, today, about 250 banks around the world are implementing the Principles for Responsible Banking in their operations[25], the implementation of which ensures the systematic greening of banks' operations and services in accordance with sustainable development criteria. In the United States alone, green banks invested USD2.6 billion in renewable energy development in 2017 alone[26]. At the same time, as of the end of 2019, development banks had issued green bonds totalling more than USD31 billion, excluding the USD55 billion issued by other banking institutions[27]. The leading global issuer of green bonds is currently *the Industrial and Commercial Bank of China* (Fig. 3), which had issued green bonds worth almost USD7.6 billion by the end of 2022[28]. Thus, green banking operations currently represent an important financial innovation that plays a key role in "greening" the global economic system and taking it to a higher level of development.

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[21] Zhang D., Mohsin M., Rasheed A. K., Chang Y., Taghizadeh-Hesary F. Public spending and green economic growth in BRI region: mediating role of green finance. Energy Policy. 2021. 153 p.

[22] Lee C. C., Lee C. C. How does green finance affect green total factor productivity? Evidence from China. Energy Economics. 2022. Vol. 107. URL: https://doi.org/10.1016/j.eneco.2022.105863

[23] Taghizadeh-Hesary F., Yoshino N. Sustainable solutions for green financing and investment in renewable energy projects. Energies. 2020. Vol. 13 (4), 788. URL: https://www.mdpi.com/1996-1073/13/4/788/pdf

[24] Taghizadeh-Hesary F., Yoshino N. Sustainable solutions for green financing and investment in renewable energy projects. Energies. 2020. Vol. 13 (4). URL: https://www.mdpi.com/1996-1073/13/4/788/pdf

[25] Principles for Responsible Banking. URL: https://www.unepfi.org/ banking/bankingprinciples/

[26] Clean Energy Finance: Green Banking Strategies for Local Governments. EPA-430-F-18-004. October 2018. — p. 3. https://www.epa.gov/sites/default/files/2018-10/documents/usepa_greenbankingstrategies_october_2018.pdf

[27] CBI. 2019 Green Bond Market Summary, 2020. https://www.climatebonds.net/files/ documents/publications/2019-Green-Bond-Market-Summary_2025-02-17-163104_ftzm.pdf

[28] Value of green bond issuance of the largest banks worldwide in 2022 (in million U.S. dollars). Statista. The Statistic Portal. URL: https://www.statista.com/statistics/1291144/green-bond-issuance-value-of-largest-banks/

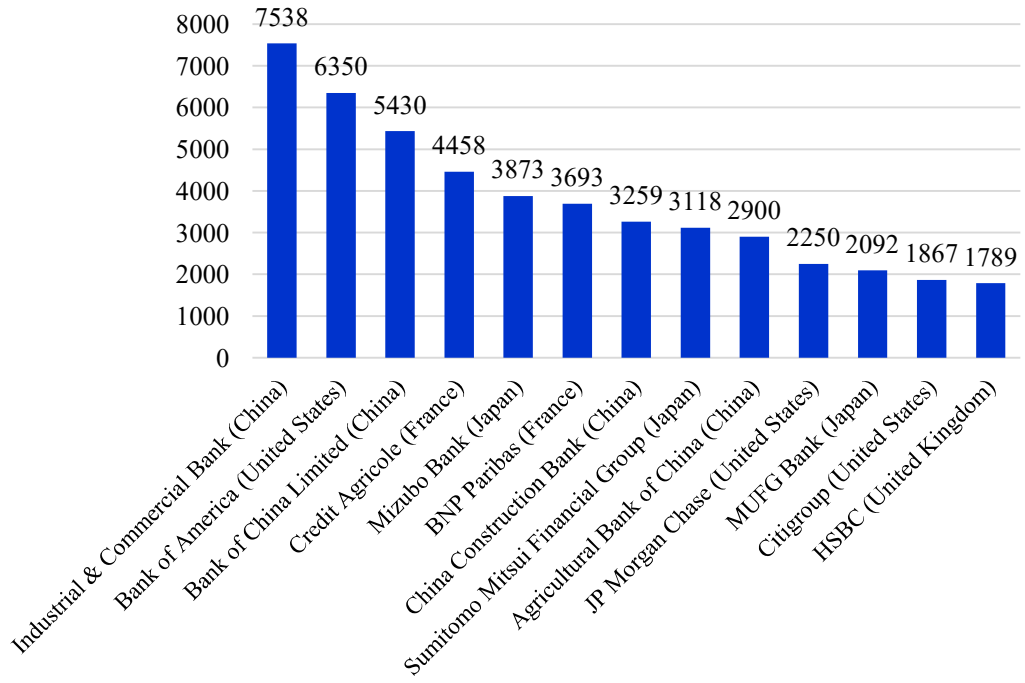

Fig. 3 — Cost of issuing green bond instruments by the largest global banks in 2022, million US dollars

Source: compiled by the authors based on data from[29].

Against the backdrop of the growing scale and diversification of green financial projects, we are all witnessing the formation of a qualitatively new stratification of countries based on the level of "greening" of their national financial systems. This primarily concerns the growing role in these processes of multinational corporations and a wide range of institutional investors — pension and mutual funds, insurance companies and sovereign wealth funds, unregistered infrastructure funds and asset managers, etc. In this regard, we believe that in the coming decades, it will become common practice for countries to accuse each other of engaging in unfair competitive practices of green protectionism, which will significantly restrict access to national markets for entire groups of goods and services.

At the same time, innovative financial instruments such as preferential taxation and lending to special green funds, tax refunds and greening of the tax administration process, state subsidies for leasing payments when

[29] Value of green bond issuance of the largest banks worldwide in 2022 (in million USD). Statista. The Statistic Portal. https://www.statista.com/statistics/1291144/green-bond-issuance-value-of-largest-banks/

purchasing new technological equipment, state investment guarantees, linking preferential taxation and lending to economic entities to the extent of their use of eco-innovations or renewable energy, etc. All of these are currently being used as a natural complement to traditional financial instruments, namely structured finance, public-private partnerships, technical assistance, etc.

Digitisation of the global financial system in the determinants of financial innovation

We know from international practice that the high dynamics of the digitalisation of the global financial system is also an important determinant of innovation in the global financial ecosystem. This refers to the widespread use of business process automation and financial transactions in financial services for economic entities, the introduction of computerized technological solutions and algorithmic trading on organized markets, as well as the widespread use of artificial intelligence and the improvement of existing algorithms for making financial management decisions. As a result, international economic practice is constantly seeing the emergence of qualitatively new financial products and services, models for the distribution of financial capital and methods for pricing financial services, as well as mechanisms for managing business risks, the combination of which causes high turbulence in the structural parameters of global financial markets. In a broad sense, this means, first of all, that the virtualisation of trade in financial services and the digitisation of financial data have become powerful driving forces for the deepening of the global financial market, increasing its scale and liquidity; and the dematerialisation of financial flows enables a steady increase in the value of derivatives trading[30].

In addition, the systematic computerisation of business processes in the financial sector opens up wide opportunities for the design and application of standardised models and methods of financial management, in particular, the capital asset pricing model (CAPM) and its intertemporal version, the three-factor Fama-French model and the four-factor Carhart model, the Black-Scholes model, the arbitrage pricing model, etc. In our opinion, all of them need to be promptly improved, adapted and used in the modern digital environment, which will make it possible to form a crucial toolkit for understanding the structure of an investment portfolio and the specifics of its operation, as well as assessing the impact of active portfolio management on the value of future profits.

[30] Engelen E., Ertürk I., Froud J., Johal S., Leaver A., Moran, M., ... Williams, K. After the great complacence: Financial crisis and the politics of reform. Oxford University Press. 2011.

The fierce and relentless competition between global market players for access to global financial capital, which has been greatly intensified by the large-scale digitalisation of economic activity, significantly raises the issue for operators in the global financial industry of significantly expanding their customer base by generating market demand for innovative financial services. This issue is most acute for those banking institutions that are under intense competitive pressure from other participants in financial systems who are not only able to offer the market effective alternatives to bank deposits or lending, but also rely on innovative financial solutions in their activities. As D. Broby argues, it is innovative financial technologies that give new market players significant competitive advantages over traditional banks in the form of both significant savings in transaction costs for maintaining physical infrastructure and a reduction in intermediaries in the global financial chain[31].

At the same time, the most pressing issue for various groups of financial intermediaries in the near future is the choice of one of the possible alternatives of market behaviour, namely:

- existing players — retaining existing customers by offering new quality financial products and services;
- new players — to enter the market with qualitatively new innovative digital products and services;
- niche players — comprehensive development of banking institutions as providers of specialised services;
- social networks — to develop and offer the market a wide range of payment platforms.

As we can see, each of these alternative market behaviours corresponds to the economic interests of a particular group of market participants and reflects different strategies for adapting to the dynamic conditions of the digital economy and current trends in the global financial environment.

The cryptocurrency segment of the global monetary system in the dialectic of financial innovation

Another financial innovation that is extremely important for the development of the modern global economy is represented by the cryptocurrency segment of the global monetary system, which is currently in the process of developing its instrumental and technological design. In our opinion, although cryptocurrencies are currently considered innovative financial instruments, as they become increasingly integrated into global settlement and payment systems, they will begin to perform all the functions inherent

[31] Broby D. Financial technology and the future of banking. Financial Innovation. 2021. Vol. 7 (1). P. 1-19.

to money. This pattern is already clearly evident in the example of Bitcoin, which demonstrates both a significant reduction in the cost of verifying platform users and the dynamic networking of computers located around the world. At the same time, we should not ignore the fact that it is the decentralisation of Bitcoin transactions that is giving rise to new challenges and types of market imperfections[32], primarily in terms of ensuring the functioning of payment systems, price and financial stability in the markets, and the implementation of monetary policy by national governments.

It should also be emphasised that in the current conditions of technological globalisation and world economic development, it is blockchain technologies that have significantly accelerated the next wave of innovation, becoming a natural result of the evolutionary progress of both the theoretical and methodological foundations of the network economy and the information and communication technologies that form its technological core. Thus, blockchain technologies have essentially developed a qualitatively new type of universal equivalent capable of performing the functions of money and, therefore, being actively used in financial relations. These include, in particular, various types of cryptocurrencies, whose market circulation system has been able to offer financial operators a whole range of technological solutions. It is no secret that the latter clearly have significant competitive advantages over traditional (fiat) currencies in terms of the decentralised nature of assets, the security and speed of financial transactions, as well as their significantly higher profitability and liquidity, the expansion of innovative opportunities for investors, the simplicity of investing, its convenience and versatility. Suffice it to say that between April 2013 and September 2023, the price of Bitcoin rose from USD135.3 to over USD27,200, and in October 2025, it reached its historic high of over USD108,600[33]. According to estimates by experts at the McKinsey Global Institute, the use of cryptocurrency assets will enable banking institutions to reduce their operating costs by USD13-15 billion per year, and participants in commercial transactions (served by such banks) by USD1-2 billion, respectively. And this is without taking into account the 40-60-fold increase in the speed of settlements under trade contracts and the 160-fold acceleration of letter of credit settlements, which together will significantly improve the efficiency of all available financing channels[34]. It is no coincidence that today in the United States, more than 2,000 companies accept payments in cryptocurrencies, and in Ukraine, a state cryptocurrency fund has even

[32] Catalini C., Gans J. S. Some simple economics of the blockchain. Communications of the ACM. 2020. Vol. 63 (7). P. 80-90. https://doi.org/10.1145/3359552 https://www.nber.org/system/files/working_papers/w22952/w22952.pdf

[33] Bitcoin (BTC) price per day from 14 June 2020 to 4 December 2025 (in U.S. dollars). Statista. The Statistic Portal. https://www.statista.com/statistics/326707/bitcoin-price-index/

[34] Ngai J. L. Blockchain-Disrupting the Rules of the Banking Industry. Report by McKinsey. 2016.

been established to collect donations to support the Armed Forces and Ukrainians affected by the war[35].

Technological and managerial resources of the network economy in the development of financial innovations

The large-scale technological and managerial resources of the network economy have significantly accelerated the process of completing the formation of a mature model of the global financial capital market. Thus, the global economic crisis of 2007-2010, which can rightly be described as the first crisis in the history of the global financial capital market, was preceded by the rapid spread of financial innovations related to highly complex structured finance instruments. As J. Coval, J. Jurek and E. Stafford point out in this regard[36], it was precisely secured financial instruments that became one of the most powerful levers of the financial multiplier, which demonstrated high volatility, further exacerbated by the effects of the global network economy. In turn, S. Cecchetti, an expert at the Bank for International Settlements, argues that in times of crisis in global economic development, financial innovations make economic growth more stable and national business cycles less frequent and less severe[37]. Such economic effects are primarily ensured by the broad opportunities offered by structured finance to offset the negative impact of various types of risks associated with investors' tendency to maximise the value of their investment portfolios.

As is well known, modern financial theory assumes that at different stages of their life cycle, companies have different needs for financial capital necessary for their competitive development in an international context. Therefore, a comprehensive understanding of the key postulates of the theory of cyclical economic development determines not only the specifics of the current economic behaviour of economic entities, but also their active search for alternative models with the aim of strengthening their competitive positions in the market. Under such conditions, financial innovations play a crucial role in optimising the quantitative parameters of consumption and capital savings. In particular, J. Been and K. Goudswaard argue that it is the existing asymmetries in national financial models at the household level that determine inter-state differences in the levels of development of national financial systems and the degree of their involvement in

[35] Cryptocurrency in business: pros and cons. NicUA, 28 June 2022. https://info.nic.ua/uk/blog-uk/cryptocurrency-in-business-2/

[36] Coval J., Jurek J., Stafford E. The economics of structured finance. Journal of Economic Perspectives. 2009. Vol. 23 (1). P. 3-25. URL: https://pubs.aeaweb.org/doi/pdfplus/10.1257/jep.23.1.3

[37] Bank for International Settlements. IFC Bulletin No 31 Measuring Financial Innovation and its Impact. Proceedings of the IFC Conference, 26-27 August 2008. Basel: Bank For International Settlements. 2009.

the global financial market[38].

It should also be added that the regional localisation of financial market participants and the range of financial instruments they use have a decisive impact on the effectiveness of their financial and economic activities in the post-industrial phase of global economic development. Although the implementation of the concept of financial risk diversification in practice makes it possible to significantly reduce the impact of individual financial instruments on the economic performance of operators in the international financial industry, different groups of investors always implement fundamentally different corporate strategies and business models for risk management. As V. Polkovnichenko rightly points out, the vast majority of private investors in their economic activities show a high propensity to acquire direct ownership of financial instruments offered by local enterprises[39]. At the same time, investment portfolios of specialised investment intermediaries are characterised by a significantly higher level of diversification, as confirmed by the financial crises of 2007-2010 and 2021.

Despite the fact that in the pre-globalisation phase of the international economic system's development, financial innovations demonstrated a fairly high level of inertia and a long-term nature of dissemination across various sectors and world regions, we are now witnessing the rapid internationalisation of financial innovations, with qualitatively new financial instruments becoming available to all market operators almost immediately through the system of financial intermediaries. Thus, R. Green, J. Campbell provide numerous examples of how financial instruments that are widespread in some countries or regions may be virtually unknown in other parts of the global economy. Moreover, this pattern is observed even in such "golden billion" countries as the United States and the United Kingdom[40]; [41]. The main reasons for this situation lie in the fact that private investors and households show a fairly high propensity to use standardised financial instruments, while technologically complex instruments always require an individual approach and specialised skills, which are significantly lacking among non-professional participants in financial markets. As a result, it becomes significantly more difficult for financial innovators to achieve their strategic market goals of introducing the latest financial products and services, especially in conditions of weak patent protection in financial markets.

Meanwhile, despite the relative methodological immaturity of the fintech

[38] Been J., Goudswaard K. Intertemporal and intratemporal consumption smoothing at retirement: Micro evidence from detailed spending and time use data. Journal of Pension Economics & Finance. 2023. Vol. 22 (1). P. 1-22.

[39] Polkovnichenko V. Household portfolio diversification: A case for rank dependent preferences, Review of Financial Studies. 2005. Vol. 18. P. 1467-1502.

[40] Green, Richard, K., and Susan M. Wachter. "The American Mortgage in Historical and International Context." Journal of Economic Perspectives 19 (4), 2005: 93–114. DOI: https://doi.org/10.1257/089533005775196660.

[41] Campbell J. Y. Household finance. The journal of finance. 2006. Vol. 61 (4). P. 1553-1604.

concept, scientific literature provides a systematic justification of the factors that determine the transformation of financial innovations into relatively mature products (Table 1). At the same time, although the combination of these factors of fintech's economic performance in different business models (such as alternative trading platforms, cryptocurrency assets, information aggregators, subprocess insurance, credit communities, payment services or robotic advisors) differs significantly, all business models currently being implemented have in common the prioritisation of issues related to ensuring security, privacy and transparency of financial innovation products, as well as their maximum adaptation to the needs of specific regional markets and minimisation of transaction costs of implementing services in real economic practice[42].

Table 1

TYPOLOGY OF FACTORS OF ECONOMIC EFFECTIVENESS OF IMPLEMENTING FINANCIAL INNOVATIONS INTO REAL ECONOMIC PRACTICE

Group of factors	Factors
Strategic	Corporate planning; operational design; competitive plan; marketing plan; change management effectiveness
Operational	Human resources selected based on competencies; strategic alliances and networks; operational alignment; cost and benefit dynamics related to innovation; effectiveness of efforts, costs or losses; project management effectiveness; protection and commercialisation of intellectual property rights
Technological	Technology integration; technology adaptation; security, privacy and transparency; environmental sustainability; ethical issues
Value proposition	Convenience/practicality/customisation; brand/status; distribution channels; monetary; intermediation and disintermediation; decision support
Consumer	Socio-economic characteristics of users; degree of consumer orientation; consumer trust; user perception of quality and value; value appeal; ease of use
Economic	Financial capital; cost structure; taxation; government support and incentives; other resources (physical, intellectual)
Environment	Competition in the industry; market conditions; regulation
Horizontal	Risk management (financial, productivity, time, social, psychological, privacy)

Source: summarised and compiled by the authors based on data from[43]; [44]; [45]; [46].

[42] Werth O., Cardona D. R., Torno A., Breitner M. H., Muntermann J. What determines FinTech success? — A taxonomy-based analysis of FinTech success factors. Electronic Markets. 2023. Vol. 33 (1). 21 p. URL: https://doi.org/10.1007/s12525-023-00626-7

[43] Groenewegen G., de Langen F. Critical success factors of the survival of start-ups with a radical innovation. Journal of Applied Economics and Business Research. 2012. Vol. 2 (3). P. 155-171.

[44] Nicoletti B. Critical success factors. In B. Nicoletti (Ed.), The Future of Fintech (pp. 161–175). Palgrave Macmillan. 2017.

[45] Santisteban J., Mauricio D. Systematic literature review of critical success factors of information technology start-ups. Academy of Entrepreneurship Journal. 2017. Vol. 23 (2). P, 1-23.

At the same time, it is important to note that even within the same sector of the global economy, financial innovations can have varying degrees of impact on the activities of different groups of economic entities. For example, in China, state-owned banking institutions specialising in serving urban agglomerations and rural areas are experiencing a significant decline in the profitability of their economic operations due to the market spread of fintech products. On the contrary, joint-stock banks, in most cases, demonstrate a significant increase in their competitive status in the banking services market[47]. On this basis, it can be concluded that it is the scale of economic activity, the structure of equity capital and the current corporate strategies for managing it, as well as the specifics of the target consumer segment, that determine the decisive influence of financial innovations on the success of business activities.

The evolution of financial innovation: from Fintech 1.0 to Fintech 4.0

When characterising the factors of financial innovation development in the information and digital era, we cannot ignore the formation and dynamic development of the Internet finance sector, which has both national and global dimensions of its evolutionary progress. Thus, the emergence of a qualitatively new sector of the global economy based on the organic convergence of the traditional financial sector and the latest digital infrastructure, which relies on the technological capabilities of the Internet and ICT, eloquently confirms the transition of economic globalism processes to a qualitatively higher — post-industrial — level of development. First and foremost, the Internet finance sector, relying on traditional infrastructure (payment systems, lending systems, platforms for combining basic assets) and innovative financial platforms (integration of payment, management and other services; navigation for users of financial services; social interaction; personalisation and customisation of financial services), provides multi-channel and multi-level integration of financial industry operators, capable of permanently generating alternative software and innovative financial products[48].

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[46] Werth O., Cardona D. R., Torno A., Breitner M. H., Muntermann J. What determines FinTech success? A taxonomy-based analysis of FinTech success factors. Electronic Markets. 2023. Vol. 33 (1). 21 p. URL: https://doi.org/10.1007/s12525-023-00626-7

[47] Lee C. C., Ni W., Zhang X. FinTech development and commercial bank efficiency in China. Global Finance Journal. 2023. Vol. 57.

[48] Guo Y., Liang C. Blockchain application and outlook in the banking industry, Financial Innovation. Springer, Heidelberg. 2016. Vol. 2. Iss. 24. P. 1-12.

Moreover, the dynamic development of network communication technologies makes it possible at the current stage of global economic development to begin experimenting with the introduction and dissemination of blockchain technologies in the global financial sector. This fact encourages the global scientific community to distinguish between Fintech 1.0, Fintech 2.0, Fintech 3.0 and Fintech 4.0 within the structure of financial innovations, with specific innovations in products and services, operational and organisational processes, as well as current corporate strategies and business models inherent in each technological group. So, if third-generation fintech represents profound revolutionary changes in the spread of alternative software, as well as the use of big data analytics to provide customers with more personalised and customised financial services, then fourth-generation fintech represents the spread of financial innovations into the process of managing underlying assets. This process is accompanied by the widespread use of blockchain technologies capable of ensuring the systematic digitisation of corporate assets and the transfer of values according to the P2P principle (from entity to entity, i.e. without intermediaries)[49]. It is no coincidence that it was financial institutions specialising in clearing settlements that were among the first to appreciate all the competitive advantages of Fintech 4.0 technological innovations.

It is worth noting that a comprehensive comparative analysis of current national practices in the application of traditional and innovative financial instruments provides a better understanding not only of the specifics of their development and implementation in business practice in each individual country, but also of the key directions of transformation of these instruments in the context of financial globalism. In particular, a fundamental megatrend in the evolution of financial business models is currently the systemic digital transformation of the global financial sector, closely linked to the acquisition of modern digital competencies by its users, the steady increase in the effectiveness of innovative financial services and the reduction in their cost, as well as a significant acceleration of the transaction process and increased security of data and financial resources (Table 2).

That is why, in the era of post-industrialisation of the global economy, all relevant issues concerning the management of information as an economic resource must be properly regulated within the framework of national economic models, and the competence dimension must be taken into account as much as possible in the models of development of education systems.

[49] Guo Y., Liang C. Blockchain application and outlook in the banking industry, Financial Innovation. Springer, Heidelberg. 2016. Vol. 2. Iss. 24. P. 1-12.

Table 2

COMPARISON OF FINANCIAL BUSINESS MODELS

Criterion	Traditional banking business	Internet finance (Fintech 3.0)	Blockchain banking (Fintech 4.0)
User experience	- Similar alternatives; - homogeneous services - poor user experience	- large number of alternatives; - personalised services; - user experience	- large number of alternatives; - personalised financial services; - user experience
Efficiency	- large number of intermediaries; - Complex clearing process - low efficiency	- large number of intermediaries; - complex clearing process; - low efficiency	- settlements from entity to entity; - no intermediaries; - high efficiency
Cost	- large amounts of manual supervision - large number of intermediate links; - high cost	- low levels of manual supervision; - small number of intermediate links; - high cost	- full automation of customer financial service processes; - no intermediate links - low cost of financial services
Security	- centralised data storage; - possibility of forgery; - possibility of leakage of users' personal data; - insufficient security	- centralised data storage; - possibility of forgery; - possibility of leakage of users' personal data; - low level of security	- distributed data storage; - impossibility of forgery; - low probability of leakage of users' personal data; - high level of security for financial services

Source: compiled by the authors based on data from[50].

We know from history that although each new generation of financial technologies emerges as a result of the development and widespread implementation of a certain type of financial innovation, the substantive content and social forms of each subsequent generation originate in the depths of the previous one[51]. Thus, based on the application of individual technologies of the Fintech 2.0 generation, a holistic ecosystem of automated software interfaces, standardisation and focus on service innovations of Fintech 3.0 was formed over time. Fintech 4.0, on the other hand, is characterised by the following regrouping of all key components and the spread of Inter-

[50] Guo Y., Liang C. Blockchain application and outlook in the banking industry, Financial Innovation. Springer, Heidelberg. 2016. Vol. 2. Iss. 24. P. 1-12.
[51] Anifa M., Ramakrishnan S., Joghee S., Kabirai S., Bishnoi M. M. Fintech Innovations in the Financial Service Industry. Journal of Risk and Financial Management. 2022. Vol. 15 (7).

net of Things technologies. At the same time, as international practice shows, under conditions of systemic digital transformations of all structural subsystems of the global financial market, we can expect the dynamic spread of financial technology waves in global coordinates, which over time may even form a kind of "reverse" cross-border transfer of financial innovation developments from developing countries to the "golden billion" countries[52].

It is no coincidence that experts at the Bank for International Settlements have been observing the active growth in the use of IT technologies to improve tools and operational processes in the global financial market for quite some time. In particular, of all the diversity of its structural links and subsystems, we consider it most appropriate to divide them into credit and deposit activities, capital raising services, payment, clearing and settlement services, investment management services, and insurance. It should be added that each of these subsystems is characterised by the dominance of specific financial innovations and prevailing megatrends in fintech development that are unique to it. Although some of these innovations are exclusively sectoral in scope, while others are horizontal, all of them can be effectively applied in virtually all sectors of the global economic system (Table 3).

However, as we can see, the performance of global market players is not always linked to the generation and implementation of innovative financial developments with high added value, economies of scale or diversified areas of market implementation. There are many cases where significant financial results of economic entities are achieved through the use of a wide range of financial engineering tools in the form of higher financial leverage, diversification of sources of financial resources or acceleration of financial transactions[53]. Therefore, if the classification of types of financing is based on the criterion of investment risks, then, according to G. Minsky, the most successful classification is as follows:

- hedge financing, which involves directing financial flows to cover both the principal amount of the debt and its servicing;
- speculative financing, where financial flows only cover the cost of servicing the debt, but not the principal amount;
- Ponzi financing, which involves the use of debt and financial innovations solely to cover the cost of servicing the debt and interest on it (i.e., essentially a financial pyramid)[54] .

[52] Financial Business: Innovation, Fintech, Regulation: International Collective Monograph / Edited by L. O. Prymostka, Doctor of Economics, Professor / L. O. Prymostka, I. V. Krasnova, V. V. Lavreniuk, L. M. Sembieva, et al. Kyiv: KNEU, 2022. 375 p.

[53] Haldane A. Small Lessons from a Big Crisis. Federal Reserve Bank of Chicago 45th Annual Conference. 8 May 2009.

[54] Minsky H. P. Stabilising an Unstable Economy. New Haven and London: Yale University Press. 1986.

Table 3

TYPOLOGY OF FINTECH SERVICES BY INNOVATION SECTOR

<table>
<tr><th rowspan="3">Type of services</th><th colspan="5">Sectors of innovation</th></tr>
<tr><th rowspan="2">Lending and deposit activities, capital raising services</th><th colspan="2">Payment, clearing and settlement services</th><th rowspan="2">Investment management services</th><th rowspan="2">Insurance</th></tr>
<tr><th>Retail</th><th>Wholesale</th></tr>
<tr><td rowspan="5">Sectoral services</td><td>Crowdfunding</td><td>Mobile wallets</td><td>B2B points of sale</td><td>High-frequency trading</td><td>Connection to mobile devices</td></tr>
<tr><td>Marketplaces Loans</td><td>Direct P2P transfers</td><td>Currency exchange</td><td>Copy trading</td><td>Big data</td></tr>
<tr><td>Mobile banks</td><td rowspan="2">Digital currencies</td><td rowspan="2">Digital exchange platforms</td><td>E-commerce</td><td>Advanced risk insurance</td></tr>
<tr><td>Credit scoring</td><td>Robotic advisors</td><td>New contracts</td></tr>
<tr><td rowspan="8">Horizontal market services</td><td colspan="5">Portals and data aggregators</td></tr>
<tr><td colspan="5">Ecosystems (infrastructure, open access, API)</td></tr>
<tr><td colspan="5">Data processing programmes (big data analysis, machine learning, modelling and forecasting)</td></tr>
<tr><td colspan="5">Distributed ledger technologies (blockchain, smart contracts)</td></tr>
<tr><td colspan="5">Security (user identification and authorisation)</td></tr>
<tr><td colspan="5">Cloud computing, quantum computing</td></tr>
<tr><td colspan="5">Internet of Things and mobile technologies</td></tr>
<tr><td colspan="5">Artificial intelligence (bots, chatbots, financial automation, algorithms)</td></tr>
</table>

Source: compiled by the authors based on data from[55] and[56].

It should be noted that even in conditions of economic globalism, the role and significance of the financial industry in the structural dynamics of macroeconomic growth of countries and regions vary significantly depending on their level of socio-economic development. While for developing

[55] Sound Practices: Implications of Fintech Developments for Banks and Bank Supervisors. Bank for International Settlements. Basel Committee on Banking Supervision, February 2018.
[56] Thakor, A. V. Fintech and banking: What do we know? Journal of Financial Intermediation. 2020. Vol. 41.

countries, the priority remains the issue of increasing the quantitative indicators of their financial markets, for leading countries it is their qualitative characteristics, including assessments of their breadth, depth (capacity) and liquidity, the movement of the general market situation, as well as the structural modernisation of existing financial instruments.

Modern technological tools for financial innovation

A comprehensive analysis of the processes of introducing financial innovations into the economic activities of business entities gives reason to assert that their dynamics directly depend on both the characteristics of the processes themselves and the effects generated by financial innovations. Thus, direct lending (or peer-to-peer transactions), cryptocurrencies and smart contracts are the most eloquent modern examples of a diversified instrumental system of personalised financial and innovative services for economic entities, based on digital technological capabilities. The scale of their spread is evidenced, in particular, by the fact that the capitalisation of the global smart contract market grew from USD840 million to USD1.8 billion in the period 2018-2022 alone, and by 2030 it will reach almost USD10 billion, with an annual growth rate of 24 per cent between 2023 and 2030[57]. Moreover, even in the field of public financial management, we now find clear evidence of the widespread use of fintech, especially those types related to expanding the resource capabilities of customer settlement and payment services (mobile money, internet fintech payments, central bank digital currencies, etc.) (Table 4).

Even in conditions of economic globalism, the role and significance of the financial industry in the structural dynamics of macroeconomic growth of countries and regions vary significantly depending on their level of socio-economic development. While developing countries continue to prioritise the growth of purely quantitative indicators of their financial markets, leading countries focus on qualitative characteristics. These include, in particular, assessments of their breadth, depth (capacity) and liquidity, the movement of the overall market situation, as well as the structural modernisation of existing financial instruments.

[57] Smart Contracts Market Size, Share, Growth Report 2030. URL: https://www.zionmarketresearch.com/report/smart-contracts-market

Table 4

FORMS AND CONSEQUENCES OF THE APPLICATION OF FINTECH IN THE FIELD OF PUBLIC FINANCIAL MANAGEMENT

Consequences of fintech application		Forms of fintech payments		
		Mobile money	**Internet fintech payments**	**Central bank digital money**
Improvements	Budget payments	Money transfer programmes (G2P)	Wages and pensions (G2P), payments to suppliers (G2B)	E-vouchers for healthcare services, money transfers (G2P)
	Non-tax payments	Parking fees, transit fees, fines (P2G)	Road usage charges, passport fees and payments, agricultural service fees (P2G, B2G)	All types of non-tax payments (P2G, B2G)
Benefits of implementation	Increased fiscal transparency	Generation of high-frequency and reliable data that can be publicly disclosed on fiscal transparency portals; increased accountability and tracking of payment data		
	Improvement of the budget planning and execution process	Increased awareness among economic actors regarding resource allocation at the project planning stage; improved budget execution, especially for social cash transfer programmes, through the use of fintech applications for payment delivery		
	Improvement of fund management systems	Improving single treasury account operations and daily cash management based on the use of more timely and accurate data		

Source: compiled by the authors based on data from[58].

Conclusions

To summarise the above, we note the following: modern financial innovations are a natural result not only of global scientific, technical and technological progress, but also of fundamental processes of systemic digitalisation of the global economic space, profound transformation of the global institutional environment and radical modernisation of economic needs and behavioural patterns of market participants. Based on this, the dialectic of financial innovations in the information and digital era has a pronounced contradictory nature, which manifests itself, on the one hand, in a significant increase in the efficiency of national financial markets and a substantial expansion of market participants' access to fi-

[58] Uña G., Griffin N., Verma A., Bazarbash M. Fintech Payments in Public Financial Management: Benefits and Risks. Working Paper No. 23/20, International Monetary Fund, Washington, DC. 2023. 36 p.

nancial services, and on the other hand, in a rapid increase in systemic risks, market information asymmetry , cyber threats, and socio-economic asymmetries in global economic development. Under such conditions, the central issue is the consolidation of the global community's efforts in the field of balanced implementation of financial innovations, taking into account their risks and social consequences, neutralising their negative effects on global economic stability, and preventing deep structural imbalances in world markets.

*This article was translated from its original in Ukrainian.

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