МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ

Економічний вісник університету

Збірник наукових праць
учених та аспірантів

Том 20, № 2

Заснований у 2006 році
Видається два рази на рік

Переяслав
2025

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE

University Economic Bulletin

Collection of scientific articles of Scientists
and Postgraduate Students

Vol. 20, No. 2

Established in 2006
Issued 2 times a year

Pereiaslav
2025

ISSN 2306-546X (print)
ISSN 2414-3774 (online)

УДК 33
DOI: 10.69587/ueb/2.2025

Засновник та видавець:
Університет Григорія Сковороди в Переяславі

Рекомендовано до друку та поширення
через мережу Інтернет Вченою радою
Університету Григорія Сковороди в Переяславі
(протокол № 5 від 24 грудня 2025 р.)

Державна реєстрація:
Ідентифікатор медіа R30-04676.
Рішення Національної ради України з питань телебачення і радіомовлення
№ 1442, протокол № 14 від 25.04.2024 р.

Науковий журнал включено до категорії «Б» Переліку наукових фахових видань України,
у яких можуть публікуватися результати дисертаційних робіт на здобуття наукових ступенів доктора та кандидата наук зі спеціальностей: 051 – Економіка; 071 – Облік і оподаткування; 072 – Фінанси, банківська справа та страхування; 073 – Менеджмент; 075 – Маркетинг; 076 – Підприємництво, торгівля та біржова діяльність; 281 – Публічне управління та адміністрування; 292 – Міжнародні економічні відносини
(наказ МОН України № 1301 від 15 жовтня 2019 року).

Журнал представлено у міжнародних наукометричних базах даних, репозитаріях та пошукових системах:
ERIH PLUS, IDEAS/RePEc, Central and Eastern European Online Library (CEEOL), Ulrich's Periodicals Directory, Google Scholar, Polska Bibliografia Naukowa (PBN), Національна бібліотека України імені В. І. Вернадського, Dimensions, UC Library Search, EconStor, WorldCat, CORE, OUCI (Open Ukrainian Citation Index), Litmaps, J-Gate

Контактна адреса:
Університет Григорія Сковороди в Переяславі
08400, вул. Сухомлинського, 30, м. Переяслав, Україна
E-mail: mail@ue-bulletin.com.ua
https://ue-bulletin.com.ua/uk

ISSN 2306-546X (print)
ISSN 2414-3774 (online)

UDC 33
DOI: 10.69587/ueb/2.2025

Founder and publisher:
Hryhorii Skovoroda University in Pereiaslav

Recommended for printing and distribution
via the Internet by the Academic Council
of Hryhorii Skovoroda University in Pereiaslav
(Minutes No. 5 of December 24, 2025)

State Registration:
Media identifier R30-04676.
Decision of the National Council of Television and Radio Broadcasting of Ukraine
No. 1442, Minutes No. 14, dated 25.04.2024.

The scientific journal is included in category "B" of the List of scientific specialized publications of Ukraine, in which can be published the results of dissertations for obtaining the scientific degrees of doctor and candidate of sciences in specialties: 0311 - Economics, 0411 - Accounting and taxation, 0412 - Finance, banking and insurance, 0413 - Management and administration, 0414 - Marketing and advertising, 0416 - Wholesale and retail sales
(Order of the Ministry of Education and Science of Ukraine No. 1301, October 15, 2019).

The journal is presented international scientometric databases, repositories and scientific systems:
ERIH PLUS, IDEAS/RePEc, Central and Eastern European Online Library (CEEOL), Ulrich's Periodicals Directory, Google Scholar, Polska Bibliografia Naukowa (PBN), National Library of Ukraine after V.I. Vernadskiy (VNLU), Dimensions, UC Library Search EconStor, WorldCat, CORE, OUCI (Open Ukrainian Citation Index), Litmaps, J-Gate

Address for contacts:
Hryhorii Skovoroda University in Pereiaslav
08400, 30 Sukhomlynsky Str., Pereiaslav, Ukraine
E-mail: mail@ue-bulletin.com.ua
https://ue-bulletin.com.ua/en

РЕДАКЦІЙНА КОЛЕГІЯ

EDITORIAL BOARD

ЗМІСТ/ CONTENTS

М. Ігнатенко, С. Кучеренко, Л. Леваєва, Б. Чорний
Імплементація цифрових фінансових інструментів
у діяльність підприємств туристичного бізнесу
для підвищення їх конкурентоспроможності....8
M. Ihnatenko, S.Kucherenko, L. Levaieva, B. Chornyi
Implementation of digital financial instruments
in the activities of tourism enterprises to increase their competitiveness....8

Н. Татарин, С. Ванцура
Аналіз впливу економічних криз на глобальну економіку....19
N. Tatarin, S. Vantzura
Analysis of the impact of economic crises on the global economy....19

О. Новосьолова
Вимоги до платоспроможності страховиків:
українські практики та міжнародний досвід....28
O. Novosolova
Solvency requirements for insurers:
Ukrainian practices and international experience....28

А. Непран
Статистична оцінка регіональної асиметрії банківського кредитування в Україні....37
A. Nepran
Statistical assessment of regional asymmetry in bank lending in Ukraine....37

О.О. Олота, О.Н. Акінкунмі, Е.О. Балогун
Штучний інтелект та задоволеність клієнтів у банківському секторі Нігерії....44
O.O. Olota, O.N. Akinkunmi, E.O. Balogun
Artificial intelligence and customer satisfaction in the Nigerian banking sector....44

А. Кириченко
Оцінка привабливості регіональних ринків роздрібної торгівлі України
за комбінованою методикою GRDI-IMI....57
A. Kyrychenko
Assessment of the attractiveness of regional retail markets
in Ukraine using the combined GRDI-IMI methodology....57

Б.А. Абдулмумін
Ставка на рівність: подолання гендерного розриву
у фінансових системах Латинської Америки....67
B.A. Abdulmumin
Banking on equality: Closing the gender divide
in Latin America's financial systems....67

Т. Тойчієв
Оцінка інвестиційних проектів у Киргизстані:
сучасні методи та помилки у практиці контролінгу....78
T.Toichiev
Evaluation of investment projects in Kyrgyzstan:
Modern methods and errors in controlling practice....78

University Economic Bulletin
Vol. 20, No. 2, 2025
Journal homepage: https://ue-bulletin.com.ua/en
Received: 10.07.2025. Revised: 27.11.2025. Accepted: 24.12.2025. Published: 26.12.2025

UDC 338.48:004:005.336.1 DOI: 10.69587/ueb/2.2025.08

Implementation of digital financial instruments in the activities of tourism enterprises to increase their competitiveness

Mykola Ihnatenko*
Doctor of Economic Sciences, Associate Professor
Hryhorii Skovoroda University in Pereiaslav
08401, 30 Sukhomlinsky Str., Pereiaslav, Ukraine
https://orcid.org/0009-0009-8626-4624

Svitlana Kucherenko
PhD in Economic Sciences, Associate Professor
Hryhorii Skovoroda University in Pereiaslav
08401, 30 Sukhomlinsky Str., Pereiaslav, Ukraine
https://orcid.org/0000-0001-7560-1212

Liudmyla Levaieva
PhD in Economic Sciences, Associate Professor
Hryhorii Skovoroda University in Pereiaslav
08401, 30 Sukhomlinsky Str., Pereiaslav, Ukraine
https://orcid.org/0009-0004-9569-585X

Bohdan Chornyi
PhD in Economic Sciences, Doctoral Student
Hryhorii Skovoroda University in Pereiaslav
08401, 30 Sukhomlinsky Str., Pereiaslav, Ukraine
https://orcid.org/0009-0002-7980-2016

Abstract. The relevance of research on digital financial instruments was determined by their online functioning and the ability to instantly carry out transactions and settlements, to be economical and accessible in use. Therefore, the identification of their features and substantiation of priority areas of implementation in the activities of tourism enterprises carried out in the article is of theoretical and practical importance for increasing efficiency and competitiveness. It is important to identify and use the advantages of digital financial instruments to restore Ukrainian tourism enterprises due to the losses of the war. An analysis of monographic and analytical sources, as well as practical experience, was carried out, which allowed to establish that over the past decade, digitalisation and informatisation have become the leading drivers of tourism business development in Ukraine and in the world. The authors analysed the digital priorities of the main and auxiliary activities of the tourism industry, including electronic bookings of tourism products, accommodation and transportation; e- and m-commerce and electronic payments in tourism; digital insurance and lending; development of smart or virtual tourism and customer focus; digitalisation of document management, accounting, analysis, finance and big data. It was concluded that digital financial instruments are not sufficiently represented in this list. Therefore, they were classified into three sets of components: digital technological infrastructure; digital payment instruments; and digital regulatory mechanisms. The factors of their involvement, advantages, and risks were also identified. This made it possible to systematise their use, which will help to increase the efficiency, and thus the effectiveness and competitiveness of the tourism business. The article also drew conclusions about the need for their continuous improvement through the introduction of further innovative developments; integration with traditional financial instruments to increase the effectiveness of the latter and the convincing nature of digital ones; increasing inclusiveness through the spread of

Suggested Citation:
Ihnatenko, M., Kucherenko, S., Levaieva, L., & Chornyi, B. (2025). Implementation of digital financial instruments in the activities of tourism enterprises to increase their competitiveness. *University Economic Bulletin*, 20(2), 8-18. doi: 10.69587/ueb/2.2025.08.

*Corresponding author

high-speed Internet, mobile gadgets, deepening digital literacy of the population, innovative education and professional training of employees of tourism business enterprises

Keywords: online tourism; digital financial infrastructure; blockchain; digital regulatory financial mechanisms; investment; competitiveness

INTRODUCTION

Comprehensive research and development of digital financial instruments are actively carried out at all levels of their implementation: academic, regulatory and practical. Their relevance in the current conditions of increased competition in national and global markets is due to their ability to instantly provide transactions, be economical in maintenance, convenient to use, and therefore have a dramatic impact on the efficiency and competitiveness of all areas of life and businesses in particular. However, due to the rapid development of this area, its important aspects remain insufficiently studied or under-researched. The focus is on the ethical and legal regulation of implementing digital financial instruments in business activities; the integration of cryptocurrencies into the financial systems of countries, industries, sectors, and enterprises; the implications of their influence on the economic stability of business entities and overall monetary policy; as well as the associated risks and security of their use. The need for further research is actualised and growing due to the development of new technologies and the need for their safe and effective implementation in the financial sector and practical activities of enterprises and organisations to maintain competitive positions, expand in markets, ensure financial and economic stability, and economic growth in general. This fully applies to agriculture, tourism, hotel and restaurant business, energy and industry, and all other sectors; financial relations of public relations, individuals, and social life in general. For example, the competitiveness of tourism enterprises is determined primarily by their ability to provide services to customers quickly and conveniently, to make various financial settlements, and to have optimised internal business processes. These requirements are best met by the use of online financial instruments, i.e. digital ones. They can ensure that the tourism business is carried out where and when traditional financial instruments cannot be used – where financial institutions and financial relations mechanisms do not operate due to economic inexpediency, war and other uncertainty factors. This once again demonstrates that the topic of this article is relevant and timely.

It should be noted that a number of publications are devoted to the introduction of digital and information technologies, digital financial instruments into business, including tourism activities. Among them are the works of I. Bezugliy & A. Struk (2024), who comprehensively described digital technologies in tourism: digital marketing, chatbots, cloud technologies, the Internet of Things, Big Data and financial support for their implementation. However, these publications do not pay enough attention to digital financial instruments. They require additional research. Taken together, the combination of digital innovations in tourism and digital financial instruments will enhance the effectiveness of the former due to the special properties of the latter (Lysiuk *et al.,* 2021; Stryzhak, 2022). However, the role and application of digital finance in this task requires additional coverage. O. Havryliuk (2021) examined in detail the tools for activating the tourism business in general, namely e-learning, booking information services, online events (anti-crisis webinars, workshops, online intensives, etc.). However, the use of these and other digital tools also requires innovative financial support, and therefore scientific understanding. This also requires identifying the special properties of digital financial instruments. T. Koliada & Y. Prozorov (2024) in their articles identified the role and prospects of using blockchain technology and cryptocurrencies in the tourism industry in Ukraine. The authors describe the global cryptocurrency market and Ukraine's place in this market, consider the advantages and opportunities for wider use of cryptocurrencies in the tourism industry in modern conditions.

The articles by V. Kyfyak & O. Kyfyak (2020) and V. Morokhovych *et al.* (2021) pay great attention to the analysis of the impact of online resources on consumer decision-making on the purchase of tours and travel. Therefore, it is of great importance to determine the role of online payments, the possibility of using digital money, digital wallets, online insurance and lending in this process in order to further develop and improve them in terms of efficiency and security. Other publications, on the contrary, relate to the study of purely digital financial instruments without identifying the specifics of their involvement in the activities of tourism enterprises. These are the publications of M. Ihnatenko *et al.* (2024). These authors identify the components and structure of digital financial instruments, their competitive advantages and areas of use. However, it is necessary to continue to determine the systemic impact and synergistic effect of the use of digital financial instruments in the activities of tourism enterprises. In the articles by O. Popelo & A. Tarasenko (2023) and N. Kholiavko *et al.* (2022) consider the structure and types of digital financial instruments, the digitalisation of credit services and financial services in general. However, they require more specificity, taking into account the conditions of the tourism business; types of tourism activities; tourism services and procedures; and risks of uncertainty.

Digitalisation as a key factor in the development of the hotel and restaurant industry and hospitality in the European Union and advanced countries of the world is also pointed out by other authors O. Dzhedzhula &

L. Volontyr (2021) and M. Dubyna & O. Kozlianchenko (2019). However, digital financial instruments are not sufficiently reflected in the schemes or models of its structure in relation to the tourism business. In particular, an informative and in-depth article on the strategic guidelines for financial support for the digital transformation of the tourism business focuses on the digital transformation of the core business itself – the organisation of smart tourism, virtual tours and excursions, virtual bookings, internet marketing, etc (Bezugliy & Struk, 2024).

The study by D. Morozov *et al.* (2023) emphasises the importance of innovation and digitalisation for the development of the tourism industry in the context of the global digital economy. Although Ukraine faces significant challenges in its tourism industry, the country has the potential to introduce digitalisation and become a leader in innovative tourism practices. R. Yankovoi & L. Sembiyeva (2023) investigated the role of financial instruments in supporting and stimulating business innovation. The authors consider venture capital financing, lending, crowdfunding and other mechanisms as key levers for the development of innovative projects and startups, so the reviewed materials require sectoral specificity. This once again makes it important to define the components and types (online financial settlements and payments, digital banking, digital financial platforms for investment) of opportunities (financial, professional, security); directions of using digital financial instruments in the activities of tourism enterprises (operating; investing; organising new types of tourism; restructuring enterprises; distribution in new markets).

Therefore, the issues of involving digital financial instruments in the activities of tourism enterprises are not sufficiently studied in terms of structure, components, areas of implementation, assessment of the impact on efficiency and competitiveness and require in-depth development. It should be noted that there is a significant number of scientific publications on the development of processes, directions and forms of digitalisation of tourism enterprises. However, the participation of digital financial instruments as a factor and, at the same time, a component of digitalisation in tourism at the level of investors, entrepreneurs and consumers required in-depth research. The purpose of the article was to identify systemic features, competitive advantages and risks, and to comprehensively substantiate the directions of implementation of digital financial instruments in the activities of tourism enterprises, taking into account their content, functions, capabilities, and factors of attraction to ensure competitiveness.

MATERIALS AND METHODS

The theoretical basis of the article is the scientific provisions of the economics of tourism business enterprises regarding their organisation, internal and external business environment; digital technologies and digital finance, primarily their content, structure, principles, feasibility, effects, risks of use; determination and economic assessment of the competitiveness of tourism enterprises, competitive advantages and risks of their management (Ihnatenko *et al.,* 2024; Razumkov Centre, 2025). In the course of the research, system-structural analysis and synthesis were used to determine the main directions of functioning of tourism enterprises in the context of digitalisation, analysis of information and digital technologies in ensuring their efficiency and competitiveness, and the place of digital financial instruments in their totality.

Also, with the help of system-structural analysis and synthesis, the structure and components of digital financial instruments as a systemic formation are substantiated; the factors, advantages and risks or disadvantages of their use are identified. With the help of factor analysis, the influence of internal and external environment factors on the possibilities and efficiency of attracting digital financial instruments in the activities of tourism enterprises is determined. The historical and monographic methods were used to review scientific publications on the problems of digitalisation of the tourism business in general and the use of digital financial instruments to ensure its competitiveness in particular. The authors also used the methods of economic comparisons and personal observations to identify trends and problems of using digital financial instruments in ensuring the competitiveness of tourism enterprises; assessing their bottlenecks and potential for the future; and strategic implementation priorities, taking into account the losses and damages of the war.

It is substantiated that the use of these research methods should have a logical cause-and-effect relationship and a clear sequence to ensure effectiveness, namely: determining the content, identifying trends and problems of development of tourism business enterprises and their digitalisation; establishing the components and structure of digital financial instruments, directions, volumes and efficiency of their use; assessing the impact of digital financial instruments on the competitiveness of tourism enterprises; strategic prospects and possible risks of their further use to increase the competitiveness of tourism businesses.

RESULTS AND DISCUSSION

The digitalisation of all areas of life has significantly affected the sphere of tourism, recreation and travel. Pandemics, hostilities, and other risks are contributing to the increasing use of digital and information technologies (IT) in tourism activities – the development of projects and models and areas of smart tourism, virtual tours and educational tourism, etc (Mosiiuk, 2021). It is also about the digitalisation of related services or support services, such as online booking, online marketing, financial payments and settlements. On the other hand, it is in the online sphere that the demands of customers and partners in tourism have largely moved. It has been found that the massive spread of laptops, mobile phones, smartphones and other mobile devices among consumers helps to ensure prompt access to up-to-date tourism information and its effective dissemination among a large number of tourists (Bezugliy & Struk, 2024). This ensures rapid growth of tourist flows,

products and services, and thus the profitability of the tourism business. This encourages tourism enterprises to introduce radical technological innovations in their activities, management and administration. Therefore, according to O. Havryliuk (2021), 61% of their marketing budgets are spent on supporting online marketing channels. For online tourism businesses, this figure has reached as much as 73%. The role of social media and individual travel bloggers in generating demand for tourism products and services and satisfying it is increasing. Currently, 55% of travellers like their information, and another 52% of consumers have booked tours based on photos from social media.

Digital financial instruments are tools that use modern digital, information and communication technologies to conduct financial transactions and manage finances. They include a wide range of solutions that allow for payments and settlements, investments, lending, insurance, asset management, currency exchange, and many other financial transactions in a digital format. Such instruments are significantly changing the traditional financial and investment ecosystem (securities, derivatives, traditional banking services, insurance, foreign exchange, etc.) These digital financial instruments increase the accessibility and convenience of financial services, reduce the cost of various transactions and speed them up, and increase the efficiency of the tourism business in general. Digital financial instruments include both technologies and models of organising tourism activities. They allow individuals – entrepreneurs and clients, as well as travel operators and agencies, hotel and restaurant complexes, and other accommodation and leisure facilities – to perform financial transactions using innovative new technologies such as blockchain, cryptocurrencies, financial applications, and electronic payment systems (Haponenko & Vasylenko, 2020).

From this list, it is clear that digital financial instruments are different in content, functions, and properties; they have their own organisation and functional structure. They can be represented as a system of different components with different functions, with homogeneous aggregates in their structure and construction. First and foremost, these are technological infrastructure; financial platforms and services; and regulatory mechanisms (Fig. 1).

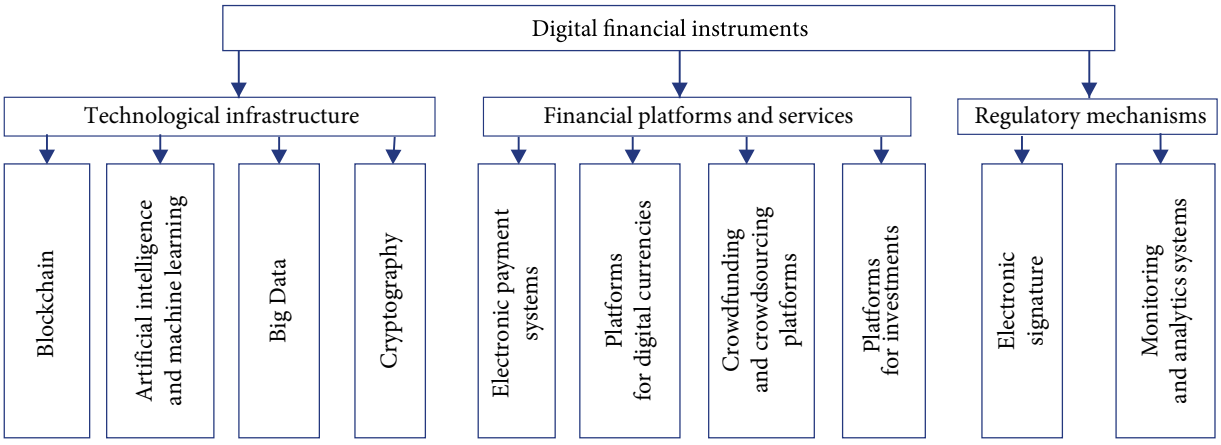

Figure 1. Functional structure of the system of digital financial instruments

Source: compiled by the authors

The digital technological infrastructure includes important structural components, namely blockchain, a technology for distributed ledgers that ensures transparency, security, and immutability of transactions. Artificial intelligence (AI) and machine learning are tools for predicting financial risks, assessing creditworthiness, and automating financial services. They are developed by IT companies and are actively used by companies in the travel and tourism industry and other businesses. These tools not only optimise operational activities but also help to solve strategic tasks of increasing competitiveness, such as reconstructing the internal structure of tourism enterprises, their mergers and acquisitions, and other forms and directions of restructuring.

Big Data is also a technology for analysing large amounts of data, which allows tourism companies and financial institutions to make informed management decisions based on the analysis of large amounts of information about financial relations and other activities. Finally, there is a component called cryptography. It is used to ensure the security of digital information and transactions in digital financial systems. These components are quite specific and are used mainly by IT companies, with the exception of blockchain and the digitalisation of large data sets.

The next set of digital financial instruments is formed by digital financial services and platforms. They are represented as electronic payment systems (e-wallets) – platforms for storing and transferring money in digital form, such as PayPal, Apple Pay, Google Pay, Privat24, Mono, MyRaif, etc. These payment instruments are the most commonly used in settlements by domestic tourism companies, including with individuals. Cryptocurrency platforms, i.e. platforms for exchanging, storing and conducting transactions with cryptocurrencies (e.g. Binance, Kraken), are

of great importance in this set. Crowdfunding and crowdsourcing platforms are also platforms for raising funds or providing loans via the Internet, such as Kickstarter or Peer-to-Peer platforms. Digital investment platforms (Robo-advisors) are automated platforms that help investors make investments based on algorithms and market analysis.

In Ukraine, the first two groups of components of this set are widely used. Online fundraising and investment platforms are much less developed. However, they are well tested and have proven their effectiveness abroad. Therefore, it is advisable to intensify their involvement in the tourism industry right now – to rebuild and restore tourism enterprises in the liberated territories; return relocated enterprises; and create new tourism products in line with changes in consumer behaviour, and thus changes in supply and demand in the tourism services markets. Their use can bring financial and investment funds in a short time, which, due to the losses of the war, are extremely necessary for domestic tourism enterprises.

The functional structure of the system of digital financial instruments includes a separate group of components in the form of digital regulatory mechanisms. First and foremost, this is an electronic signature, a digital authentication mechanism that guarantees the legal validity of electronic documents and transactions. They also include monitoring and analytics systems – tools for verifying financial transactions, fighting fraud and ensuring regulatory compliance. Digital financial instruments can be classified according to several other criteria, depending on their purpose, use and technology (Table 1).

Table 1. Characteristics of digital financial instruments

Digital financial instruments	Description	Example	Value	Advantages	Features
Payment cards	An electronic payment tool used for cashless payments	Pay with a Visa credit card in a supermarket	Simplifies the payment process and provides additional services, such as lending. Reduces the need for cash and increases the security of payments	◆ speed and convenience; ◆ access to online payments; ◆ protection against theft (chips, PINs, 3D-Secure)	Requires a bank account. Service fees may apply
Bank transfers	A financial transaction involving the transfer of funds between accounts	Payment for supplier services via SWIFT transfer	It ensures secure payments between counterparties. Allows you to make large payments and international transfers	◆ high level of security; ◆ transaction tracking; ◆ possibility of automation	Long processing time (especially for international transfers). Transfer fees
Electronic wallets	Online services for storing and using digital money	PayPal, Apple Pay, Google Pay	Facilitates online payments and makes them fast and secure. Increases the convenience of payments and reduces the need for physical cards	◆ instant payments; ◆ additional security levels (two-factor authentication); ◆ integration with mobile devices	Requires internet access. Limited acceptance in some countries
Cryptocurrencies	Decentralised digital assets for payments and investments	Payment for goods with bitcoins (BTC)	Serves as a digital analogue of cash, providing anonymity and security. Reduces dependence on traditional banking systems	◆ low fees for international transfers; ◆ high degree of confidentiality; ◆ no intermediaries	High exchange rate volatility. Limited use in traditional financial institutions
Mobile payments	Contactless payments via smartphone or special applications	Payment via QR code in mobile banking	Allows you to make payments quickly and securely. Simplifies financial transactions by replacing traditional payment methods	◆ high speed and convenience; ◆ minimal fraud risks	Requires a smartphone and internet connection. May be subject to regional restrictions
Digital credit instruments	Online platforms that provide loans without the involvement of traditional banks	P2P lending through the LendingClub and Prosper platforms	Facilitate access to loans, especially for people without a credit history. Allows you to quickly get financing without intermediaries	◆ minimum requirements for the borrower; ◆ low interest rates compared to banks; ◆ automated decision-making	High risks for investors. Possibility of fraud and lack of refund guarantees

Table 1. Continued

Digital investment instruments	Platforms and services for investing in financial assets via the Internet	Investments through Robinhood, eToro, Binance	They make investing accessible to a wide range of people. They allow spreading risks and generating passive income	◆ accessibility even for small investors; ◆ high liquidity of assets; ◆ automated portfolio management systems	High risks (especially in the cryptocurrency sector). Requires knowledge and experience in financial planning
Digital insurance	Online services that allow you to apply for and manage insurance policies directly via the Internet	Car insurance through Lemonade or Wefox	Allows you to quickly issue insurance policies without visiting offices. Makes insurance more affordable, convenient and transparent	◆ fast online processing; ◆ use of artificial intelligence to assess risks; ◆ automatic payments upon the occurrence of an insured event	The list of insurance risks may be limited. Requires digital proofs and documents
Robo-advisers (automated investment management)	Algorithmic platforms that automatically manage investment portfolios	Betterment, Wealthfront	Simplifies the investment process and helps manage assets based on market analysis. Allows beginners to invest effectively without deep knowledge	◆ minimal commissions; ◆ use of artificial intelligence to select assets; ◆ no emotional influence in decision-making	Does not take into account the unique financial goals of the user. Dependence on algorithms
Online stock exchanges	Platforms for buying and selling stocks, bonds, cryptocurrencies, and other financial assets	Robinhood, eToro, Binance	Allows investors to access global financial markets. Makes investing more accessible and liquid	◆ fast transactions; ◆ access to a large number of assets; ◆ the possibility of using leverage	High level of risk. Requires knowledge of finance and markets
Personal financial managers	Applications for personal finance control, budget planning, and cost analysis	YNAB, PocketGuard	Help users keep track of their income and expenses. They improve financial discipline and help to accumulate funds	◆ automated collection and analysis of financial data; ◆ integration with bank accounts and payment systems; ◆ flexibility in budget planning and forecasting	Requires access to personal financial data. May be paid for or have limited functionality in the free version
Corporate financial management systems (ERP systems)	Software systems for automating financial processes in companies	SAP, Oracle Financials	Optimise costs, manage risks and financial flows. Reduce financial losses and increase business efficiency		
Analytical platforms and financial forecasting	Use big data and artificial intelligence to analyse financial trends	Bloomberg Terminal, Tableau	Analyse markets, formulate strategies for investment and financial planning. Value: They help you avoid risks and make informed financial decisions		
Financial apps	Mobile apps or programs for managing personal finances, budgeting, and tracking expenses and income	Mint, YNAB (You Need a Budget), PocketGuard, Money Lover	They facilitate the control of financial flows, help in planning expenses and accumulating savings. They allow users to effectively distribute income, avoid unnecessary expenses, and achieve financial goals	◆ automated accounting of income and expenses; ◆ integration with bank accounts and cards; ◆ payment reminders and the ability to set financial goals	May require access to financial data Limited functionality in free versions

Source: developed by the authors

It should be noted that in order to predict and plan further involvement of digital financial instruments in the activities of tourism enterprises in order to increase their efficiency and competitiveness, it is necessary to constantly monitor the factors that accompany their use. The factors that influence the use of digital financial instruments by tourism business enterprises should be grouped in a certain way and supplemented by the competitive advantages and risks of digital financial technologies themselves (Fig. 2).

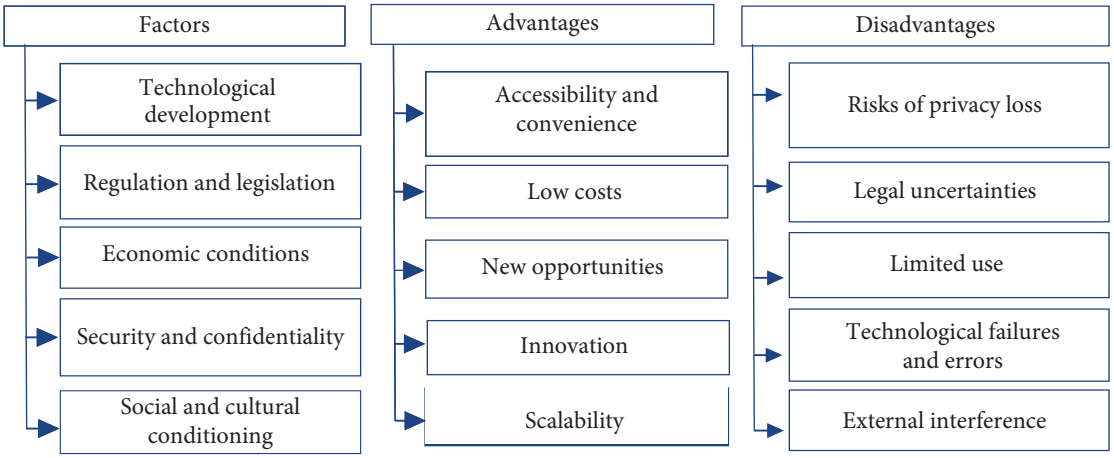

Figure 2. Factors, competitive advantages and disadvantages of using digital financial instruments in the tourism business

Source: developed by the authors

The factors of using digital financial documents by tourism business enterprises include:

◆ Technological development. One of the main factors affecting the use of digital financial instruments is the rapid development of technologies, such as information technology, programming, the Internet, mobile applications, blockchain, artificial intelligence and big data. A lack of technological infrastructure or insufficient digital literacy may limit the use of digital instruments. Ukraine has a strong tech sector. Even despite the war, the country is consistently ranked among the world's leading IT countries (Samoiliuk, 2025). Here, especially in Kyiv, Lviv, Odesa, and other relatively safe cities in the Western region, there are offices of leading companies in the industry, including those with billions of dollars in capitalisation; there is a recognised scientific school of developers and programmers; and a high level of training of innovative personnel.

◆ Regulation and legislation. Institutions and the legal environment are an important factor in the use of both digital and traditional financial instruments. Traditional instruments are regulated in a more stable manner and have a clearly defined legal framework, while digital instruments may face greater legal uncertainty, especially in countries where the regulation of cryptocurrencies and blockchain technologies has not yet been adapted. However, in Ukraine, digital tools for social life have comprehensive state support and development (Roik, 2023; Perebyinis, 2025).

For example, in the country, digital applications can be used to open bank accounts, reissue cards, and perform other financial transactions faster than in advanced countries. The Ukrainian digital application Diia is unparalleled in terms of the number of applications, services offered, and ease of use. Its use significantly eliminates corruption, bureaucracy, and the shadow economy in general; reduces administration time and unproductive related material and moral costs; improves the quality of governance; and promotes inclusion and social equality in society. This is especially important in times of war, as it saves Ukrainians, despite all the financial and economic advantages, from risks and dangers of life, abuse, etc.

◆ Economic conditions. In developed economies, digital financial instruments are usually more widely used due to the greater availability of internet banking, mobile applications and innovative financial platforms, and the existence of a system of innovative education, training and retraining. In an environment of economic instability, traditional financial instruments such as bonds and shares may be more attractive due to their stability. However, Ukraine has established successful online banking and travel agencies, fast and inexpensive internet and mobile communications, and accessible platforms for online bookings of all types of transport, hotels and tours around the world.

◆ Security and privacy. Digital tools require a high level of cybersecurity to ensure the safety of transactions and data storage. Distrust in the security of digital platforms can limit their use, especially in regions with a high incidence of cybercrime. Ukrainian experts are constantly working on programmes to improve and increase the level of digital security and information protection, countering not only economic hackers but also Russian military cyber criminals.

◆ Accessibility and convenience, and socio-cultural relevance. Digital financial instruments provide a high level of accessibility and convenience of financial relations

for users. They allow financial transactions to be carried out at any time and from anywhere in the world. This is an important factor for relocated businesses, other legal entities and individuals seeking speed and convenience, or for whom the use of traditional financial instruments is not possible. This factor also implies the availability of the Internet, a sufficient number of mobile communication devices, and people's willingness to use them. In countries with a high level of social trust in digital technologies, the population is more likely to use digital financial instruments. At the same time, in countries with a low level of trust in online platforms and/or a large number of older residents, traditional financial instruments may remain dominant in financial transactions. However, while the drivers for the development and adoption of digital financial instruments are favourable, their advantages and disadvantages require further study and consideration.

The advantages of digital financial instruments are: economic feasibility (they require less maintenance costs compared to traditional ones, which require special premises, service specialists and costs for their operation and maintenance); instantaneous execution; accessibility and convenience, as digital financial instruments allow financial transactions to be carried out anytime and anywhere, having access to the Internet or mobile applications. This greatly simplifies the process for users compared to traditional instruments that require a physical presence in financial institutions.

The next advantage is low costs, as digital financial instruments often do not require the costs of maintaining physical offices, a large number of employees, and therefore heating and lighting. Therefore, when used, digital financial instruments can offer more competitive prices and reduced fees compared to traditional financial institutions, services, and instruments in general. Digital platforms also provide instant or near-instant transactions, which is important for tourism businesses and individuals when the speed of financial transactions is of great importance.

It is important to continue to implement innovative developments in digital financial instruments and to develop other new opportunities on this basis. Digital financial instruments often use advanced technologies, such as blockchain, cryptocurrencies, and smart contracts, which allows for the creation of new and improvement of existing digital financial products and services that are not available through traditional financial mechanisms. A significant advantage is scalability, as digital instruments can serve a huge number of clients simultaneously without the need to increase the number of physical offices and employees.

The disadvantages of digital financial instruments are the risks of loss of personal data, trade secrets, theft of funds and other fraud. There is a certain legal uncertainty when digital financial instruments (cryptocurrencies, mining, apps, etc.) face legal and regulatory challenges due to the lack of clear rules, restrictions and standards. Currently, not all users have access to the Internet or sufficient digital skills to use digital tools. This may limit their use among older age groups. Technological failures, errors or attacks can lead to the loss of access to accounts or funds, which can be a major problem for users.

However, the favourable factors, significant competitive advantages and continuous improvement of digital financial instruments far outweigh their risks and disadvantages. Therefore, their implementation has more and more areas of manifestation in the activities of tourism enterprises. This includes making payments, transactions, and obtaining online loans through digital applications, payment systems, cryptocurrencies, and platforms in the online business or e-commerce of tourism enterprises. They significantly increase the competitiveness of tourism enterprises due to quick access to financial resources, instant payments, reduced service costs, and customer convenience. Thus, it contributes to an increase in sales, the number of transactions, and comfort for consumers and partners.

Blockchain technologies, digital payment platforms, and cryptocurrencies help to monitor international and domestic supplies and purchases in tourism, hotel and restaurant businesses, and thus income and expenses, as well as debts; reduce currency conversion costs, improve the reliability of partnerships, and enhance the image and business reputation of tourism and other businesses. Payments through mobile applications, online booking, and digital payment processing contribute to the growth of tourist flows, improve customer service, and service administration.

Digital financial instruments such as microfinance, crowdfunding, P2P lending, and smart contracts have significant potential to increase the competitiveness of tourism businesses. They are still underutilised in the tourism industry. However, if integrated with traditional financial instruments (stocks, bonds, financial grants and donor funds in 2022-2024), their use would be a significant investment basis for rebuilding tourism and hospitality businesses due to the losses and damage caused by the war.

According to forecasts, if the current trends continue, the share of digital technologies in all sectors of Ukraine's national economy will reach 65% in 2030 (Capital Times, 2022). Therefore, the other areas of implementation of digital financial instruments in the activities of tourism enterprises, namely: financial settlements with partners, government agencies, customers; formation of capital and other financial assets; support of internal business processes; use in strategies to increase competitiveness and development will be important strategic priorities in the future. This points to the need to continue their further research and substantiation.

CONCLUSIONS

Digital financial instruments play a key role in the modern development of business activities in tourism, providing businesses with significant advantages in various aspects. Their use allows not only to reduce costs and increase the efficiency of financial transactions, but also greatly simplifies the processes of access to finance and international transactions through crowdfunding, crowdsourcing

cryptocurrencies, etc. They provide speed and convenience in making payments, as well as facilitate the automation of many business processes, which allows for a focus on the development of strategic areas of tourism businesses.

Digital financial instruments significantly change business operations and create new opportunities for the development of the tourism business. They significantly accelerate all business processes, reduce unproductive time spent by both tourism business owners and employees, and customers. The use of digital financial instruments has significantly increased the level of comfort in the provision of travel services. Digital financial instruments also significantly reduce current cash costs, improve access to and generation of investment sources, and optimise financing processes and financial transactions. The prospects for their use are determined by the development of technologies such as blockchain, cryptocurrencies and artificial intelligence. However, in order to maximise their potential, it is necessary to address the issues of accessibility and trust in digital technologies, especially in regions with less developed digital infrastructure or among users with low levels of digital literacy. It is also about the need to continuously improve their components with functions of protection against risks and dangers. This means strengthening digital privacy protection in the field of digital finance; improving the digital development of financial instruments to increase reliability against possible intrusions by unauthorised persons, cyber thieves and other cyber criminals; and protecting against possible theft and withdrawal of funds. Preventing and avoiding cyberattacks by unfriendly countries is of great importance; ensuring military and national security in general.

Reducing the cost of developing and using digital financial instruments is also important for the future. Thus, when making digital payments, it is advisable to reduce bank interest rates, which can still be quite significant. These conclusions and proposals should be supplemented by a proposal on the need for innovative training, advanced training of employees of tourism enterprises for the effective use of digital financial instruments in their operational activities and in the future in solving strategic tasks. Given the rapid development of digital financial instruments in general, it is of national importance to promote the improvement of digital financial literacy of the population; the development of skills to access digital financial instruments; motivation and stimulation of the use of contactless payments and other digital financial opportunities. To this end, it is necessary to develop high-speed Internet, increase accessibility to digital financial transactions through national and global communications innovations. Thus, further research should focus on developing specific strategies for integrating advanced digital financial technologies, such as blockchain and artificial intelligence, into the tourism sector, as well as on creating comprehensive digital financial literacy programmes to overcome the existing challenges of accessibility, security and trust.

ACKNOWLEDGEMENTS

None.

FUNDING

None.

CONFLICT OF INTEREST

None.

REFERENCES

[1] Bezugliy, I., & Struk, A. (2024). Strategic guidelines for the financial security of the digital transformation of the tourism business. *Problems and Prospects of Economics and Management*, 1(37), 250-262. doi: 10.25140/2411-5215-2024-1(37)-250-262.

[2] Capital Times. (2022). *The share of IT in Ukraine's GDP will increase from the current 5% to 15% in 2030.* Retrieved from https://www.capital-times.com/dolya-it-u-vvp-ukraini-2030/.

[3] Dubyna, M.V., & Kozlianchenko, O.M. (2019). Conceptual aspects of the study of the essence of digitization and its role in the development of modern society. *Problems and Prospects of Economics and Management*, 3(19), 21-32. doi: 10.25140/2411-5215-2019-3(19)-21-32.

[4] Dzhedzhula, O.M., & Volontyr, L.O. (2021). Digitalization as the main factor in the development of the hospitality industry in the EU countries. *Economy. Finances. Management: Topical Issues of Science and Practice*, 3(57), 194-210. doi: 10.37128/2411-4413-2021-3-13.

[5] Haponenko, H., & Vasylenko, V. (2020). Prospects for the use of blockchain technology in the tourism industry. *The Journal of V.N. Karazin Kharkiv National University. Series: International Relations. Economics. Country Studies. Tourism*, 10, 193-199. doi: 10.26565/2310-9513-2019-10-20.

[6] Havryliuk, O.V. (2021). The pandemic crisis as a catalyst for the tourism industry. *A Collection of Scientific Works of ChDTU. Series: Economic Sciences*, 60, 22-29. doi: 10.24025/2306-4420.1.60.2021.228608.

[7] Ihnatenko, M., Kotsur, V., & Penkovsky, V. (2024). Efficiency and directions of using digital financial instruments in business activities in Ukraine. *Investments: Practice and Experience*, 24, 22-27. doi: 10.32702/2306-6814.2024.24.22.

[8] Kholiavko, N., Tarasenko, A., & Kolotok, M. (2022). Digitalization trends of the global market of financial services. *Scientific Bulletin of Polissia*, 1(24), 124-142. doi: 10.25140/2410-9576-2022-1(24)-124-142.

[9] Koliada, T.A., & Prozorov, Y.V. (2024). The latest digital financial instruments: Essence and prospects of use in the reconstruction of the affected territorial communities of Ukraine. *The Problems of Economy,* 2(60), 247-253. doi: 10.32983/2222-0712-2024-2-247-253.

[10] Kyfyak, V.F., & Kyfyak, O.V. (2020). Digitization of the development processes of tourist destinations in Western Ukrainian regions. *Bulletin of the Ternopil National Economic University*, 2(96), 162-173. doi: 10.35774/visnyk2020.02.162.
[11] Lysiuk, T., Matviichuk, L., & Lepkyi, M. (2021). Innovative information technologies tourist enterprises. *Economic Forum*, 11(3), 78-87. doi: 10.36910/6775-2308-8559-2021-3-11.
[12] Morokhovych, V.S., Kashka, M.Yu., & Talapa, S.Yu. (2021). Technological drivers of the development of tourist services. *Bulletin of the Lviv University of Trade and Economics. Economic Sciences*, 65, 53-58. doi: 10.36477/2522-1205-2021-65-07.
[13] Morozov, D., Domashenko, S., & Kaptiukh, T. (2023). Innovative activity of tourism enterprises in the context of global digitalization. *Economy and Society*, 50. doi: 10.32782/2524-0072/2023-50-15.
[14] Mosiiuk, S. (2021). Innovative marketing tools in the tourism industry. *Economics and Business Management*, 12(3), 54-60. doi: 10.31548/bioeconomy2021.03-04.054.
[15] Perebyinis, D. (2025). Legal aspects and future regulation of electronic financial instruments in the process of capital raising. *Economy and Society*, 71. doi: 10.32782/2524-0072/2025-71-149.
[16] Popelo, O.V., & Tarasenko, A.V. (2023). Development of digital innovations in the credit services market of Ukraine. *Business Inform*, 3(542), 108-114. doi: 10.32983/2222-4459-2023-3-108-114.
[17] Razumkov Centre. (2025). *Ukraine: From war to peace and recovery. Analytical assessments*. Retrieved from https://razumkov.org.ua/images/2025/03/07/2025-monthly-February-RC.pdf.
[18] Roik, O. (2023). Financial instruments to support the activities of enterprises in the conditions of war in Ukraine. *Scientific Bulletin of Uzhgorod National University*, 46, 67-71. doi: 10.32782/2413-9971/2023-46-12.
[19] Samoiliuk, M. (2025). *Ukraine war economy tracker.* Retrieved from https://ces.org.ua/en/tracker-economy-during-the-war/.
[20] Stryzhak, O. (2022). Tourism and digital technologies: Analysis of the relationship. *Economics of Development*, 21(2), 42-50. doi: 10.57111/econ.21(2).2022.42-50.
[21] Yankovoi, R., & Sembiyeva, L. (2023). Financial instruments in the development of business innovations. *Socio-Economic Relations in the Digital Society*, 4(50), 5-15. doi: 10.55643/ser.4.50.2023.534.

Імплементація цифрових фінансових інструментів у діяльність підприємств туристичного бізнесу для підвищення їх конкурентоспроможності

Микола Ігнатенко
Доктор економічних наук, професор
Університет Григорія Сковороди в Переяславі
08401, вул. Сухомлинського, 30, м. Переяслав, Україна
https://orcid.org/0009-0009-8626-4624

Світлана Кучеренко
Кандидат економічних наук, доцент
Університет Григорія Сковороди в Переяславі
08401, вул. Сухомлинського, 30, м. Переяслав, Україна
https://orcid.org/0000-0001-7560-1212

Людмила Леваєва
Кандидат економічних наук, доцент
Університет Григорія Сковороди в Переяславі
08401, вул. Сухомлинського, 30, м. Переяслав, Україна
https://orcid.org/0009-0004-9569-585X

Богдан Чорний
Кандидат економічних наук, докторант
Університет Григорія Сковороди в Переяславі
08401, вул. Сухомлинського, 30, м. Переяслав, Україна
https://orcid.org/0009-0002-7980-2016

Анотація. Актуальність досліджень цифрових фінансових інструментів визначається їх функціонуванням в режимі онлайн та здатністю миттєво здійснювати транзакції і розрахунки, бути економними та доступними у використанні. Тому здійснене у статті виявлення їх особливостей та обґрунтування пріоритетних напрямів імплементації у діяльність підприємств туристичного бізнесу мали теоретичне та практичне значення для підвищення ефективності та конкурентоспроможності. Важливе значення мало визначення та використання переваг цифрових фінансових інструментів для відновлення українських туристичних підприємств через втрати війни. Було проведено аналіз монографічних та аналітичних джерел, а також практичного досвіду, що дозволило встановити: протягом останнього десятиріччя цифровізація та інформатизація стали провідними драйверами розвитку туристичного бізнесу в Україні та у світі. Було проаналізовано цифрові пріоритети основної та допоміжної діяльності туристичної галузі, зокрема електронні бронювання туристичних продуктів, місць розміщення і транспортування; е- та м-комерцію та електронні розрахунки у туризмі; цифрове страхування та кредитування; розвиток смарт- або віртуального туризму й клієнтоорієнтованості; цифровізацію документообігу, обліку, аналізу, фінансів і великих даних. Було узагальнено, що цифрові фінансові інструменти у цьому переліку представлені недостатньо. Тому було здійснено їх класифікацію з виділенням трьох сукупностей складників: цифрової технологічної інфраструктури; цифрових платіжних інструментів; цифрових регуляторних механізмів. Також визначено чинники їх залучення, переваги та ризики. Це дозволило систематизувати їх використання, що сприятиме посиленню ефективності, отже, й ефективності та конкурентоспроможності туристичного бізнесу. Також отримано висновки про необхідність їх постійного удосконалення на основі впровадження подальших інноваційних розробок; інтеграції з традиційними фінансовими інструментами для підвищення дієвості останніх та переконливості цифрових; підвищення інклюзивності на основі поширення швидкісного інтернету, мобільних ґаджетів, поглиблення цифрової грамотності населення, інноваційної освіти й фахової підготовки працівників підприємств туристичного бізнесу. Стаття має практичну цінність для науковців, викладачів, студентів, практиків туристичного бізнесу

Ключові слова: онлайн туризм; цифрова фінансова інфраструктура; блокчейн; цифрові регуляторні фінансові механізми; інвестування; конкурентоспроможність

University Economic Bulletin
Vol. 20, No. 2, 2025
Journal homepage: https://ue-bulletin.com.ua/en
Received: 03.08.2025. Revised: 01.12.2025. Accepted: 24.12.2025. Published: 26.12.2025

UDC 336.71:338.24:332.1 DOI: 10.69587/ueb/2.2025.19

Analysis of the impact of economic crises on the global economy

Nataliya Tatarin
PhD in Economic Sciences, Associate Professor
Ivan Franko National University of Lviv
79000, 1 Universytetska Str., Lviv, Ukraine
https://orcid.org/0000-0002-7526-7282

Sofia Vantzura*
Student
Ivan Franko National University of Lviv
79000, 1 Universytetska Str., Lviv, Ukraine
https://orcid.org/0009-0009-8790-3184

Abstract. Financial crises have a deep and complex impact on the socio-economic development of countries, which emphasises the significance and relevance of investigating the main causes of their occurrence, the specifics of their course, and the consequences for macroeconomic stability. The purpose of this study was to identify and systematise the main factors leading to the development of global financial crises, and to assess their multifaceted impact on the economic stability and development of individual states and the global economy as a whole. The paper used a comprehensive approach using methods of comparative and statistical analysis, which allowed revealing the problems in more depth. The study analysed the key causes of financial shocks, among which a special place was occupied by deregulation of the financial sector, a significant drop in import volumes, a violation of the balance of payments, a reduction in investment volumes, and a significant decrease in the level of employment of the population. It was found that the occurrence of financial crises, in particular, in 2008 and 2020, was preceded by a noticeable decline in real GDP growth, which indicated the existence of certain warning signals for the economy. The dynamics of the main macroeconomic indicators, such as the level of inflation, unemployment, the poverty index, and the state budget deficit in the countries of the world in the period 2008-2024, were also considered in detail. Special attention was paid to the relationship between the slowdown in economic growth and the tendency to expand the budget deficit. The practical significance of the results obtained lies in the possibility of using them to develop more effective preventive measures and policies that will significantly reduce the negative impact of future crisis phenomena on the economy of countries, and ensure financial stability and sustainability of the public sector in the long term

Keywords: financial crisis; state budget; economic turmoil; public debt; international economy

INTRODUCTION

In the current conditions of global instability, the study of global financial crises becomes particularly relevant, since such shocks have a powerful impact on macroeconomic equilibrium, public administration, social systems, and the well-being of the population. Financial crises not only disrupt the functioning of financial markets, but also cause long-term consequences for the economic stability of states. In this regard, the study of their causes, mechanisms of spread, consequences, and means of overcoming is one of the priority areas of economic science.

N. Stukalo *et al.* (2015) the importance of a systematic approach to financial crisis analysis and highlighted the role of international financial institutions in maintaining global stability. V. Bugay & A. Onipko (2019) proposed tools for early detection of signs of destabilisation, focusing on the need for preventive monitoring. K. Kyseliova (2020) showed how the COVID-19 pandemic has intensified a new wave of economic crisis due to the disruption of global supply chains. Digital transformations have accelerated crisis cycles and made them more difficult to predict. The

Suggested Citation:
Tatarin, N., & Vantzura, S. (2025). Analysis of the impact of economic crises on the global economy. *University Economic Bulletin*, 20(2), 19-27. doi: 10.69587/ueb/2.2025.19.

*Corresponding author

paper by M. Savchenko & O. Shkurenko (2020) revealed the features of crisis management in developing countries, considering the weaknesses of their financial systems. M. Kichurchak (2021) offered advanced approaches to predicting crises in the global economy. M. Zahedian *et al.* (2022) used rapid indicators of economic security to analyse crisis phenomena in the national dimension. A significant contribution was also made by N. Rushchyshyn *et al.* (2021), exploring the legal aspects of financial security that redefine the concepts of bail-in and bail-out in the context of crisis management effectiveness. Using network models, as in the paper by S. Amor *et al.* (2022), allowed identifying hidden connections between financial agents and assessing the risk of systemic spread of the crisis. N. James & M. Menzies (2023) focused on behavioural factors and mathematical patterns of contemporary crises, which allows for a better interpretation of nonlinear dynamic processes in the economy. G. Chen (2024), and H. Mekki (2025) analysed the specifics of the impact of crises on emerging markets, emphasising the uneven consequences and the need for adaptive macro policies. Special attention was paid to the transnational spread of risks, which indicates the need for deeper international coordination.

Despite the volume of research, many of them analysed only individual factors of crises, without considering the complexity of contemporary challenges – the war in Europe, energy instability, digitalisation of finances, and behavioural changes. Thus, the purpose of the study was to identify the impact of global financial crises on socio-economic development and assess the main positive and negative consequences of crisis phenomena for public finances on macroeconomic stability.

MATERIALS AND METHODS

As part of the study, a comprehensive analysis of the macroeconomic consequences of the 2008-2024 financial crises in six countries with different levels of economic development was carried out. The choice of period was determined by the scale and nature of global shocks: the global financial crisis of 2008-2009, the COVID-19 pandemic in 2020-2021, and the geo-economic destabilisation of 2022-2024 caused by Russia's full-scale invasion of Ukraine. This chronological framework helped to cover long-term crisis dynamics with periods of both shock decline and gradual recovery.

Countries were selected according to the following criteria: macro-regional representativeness, role in the global economy, availability of statistical data, and the presence of crisis episodes. The sample included the United States, Germany, Japan, Ukraine, Brazil, and South Korea. The United States and Germany represented developed economies with strong fiscal bases; Japan was an example of an inflation-sensitive economy with high public debt (James & Menzies, 2023); Ukraine was a country with a transition economy that was extremely vulnerable to external shocks. When forming the sample, signs of financial vulnerability of countries were considered, in particular, the level of access to external financing. For example, Ukraine was included in the study based on identified factors of financial instability and limited access to capital markets in 2022-2023, as recorded in the paper by M. Savchenko & O. Shkurenko (2020). Brazil was an economy prone to politically determined crises (Chen, 2024); South Korea was a highly industrialised country with a stable financial system (Caccioli *et al.*, 2017).

At the first stage, the analysis of scientific sources was carried out, which considered both general patterns of crisis processes (Kyseliova, 2020) and analytics on specific indicators (Danis, 2020; Bessler *et al.*, 2021). The main objects of quantitative analysis were: real GDP (% of changes compared to the previous year), the unemployment rate, the consumer price index (inflation), the budget deficit and public debt (% of GDP). As part of the study, the list of macroeconomic indicators included indicators of the structure of public debt, in particular, the ratio between external and internal obligations. This approach was based on existing guidelines for assessing debt vulnerability for countries with unstable exchange rates. In addition, to model debt dynamics in crisis conditions, the conceptual provisions of the unstable equilibrium model adapted for the analysis of macro-financial processes (Zahedian *et al.*, 2022).

At the second stage, all collected data was normalised to a comparable format, after which dynamic series were constructed for each indicator for six countries. Statistical values were summarised in the form of average rates of change, coefficients of variation and deviation from the basic values, which helped to identify the stability or vulnerability of national economies in response to crises of various types. To identify economically vulnerable countries in the context of crisis shocks, aggregate economic stress indices were used, adapted based on the approach proposed by S. Amor *et al.* (2022). These indices helped to standardise the assessment of the level of financial stress in selected countries. In addition, a comparative analysis of the effectiveness of crisis tools, in particular bail-in mechanisms, was applied in accordance with the methodology described in the study by A. Kaddour *et al.* (2025), to assess the specifics of the US and German response to crisis phenomena.

The third stage of the study involved the use of comparative analysis methods with elements of a network approach to identify structural interdependencies between economies. The methodological framework for this stage was established based on the approach proposed by H. Wang & F. Liu (2024), who applied network analysis to study the dynamics of financial instability on a global scale. Countries were clustered according to crisis profiles, based on which a typology of anti-crisis scenarios was formed. The methodological basis of this stage was the approach to typologising crisis responses, adapted from the model proposed by H. Mekki (2025), which provided for grouping countries based on previous experience in responding to systemic economic shocks. The study applied scientifically based approaches to analysing the effectiveness of

economic policy in the context of financial challenges of the 21st century. The methodological basis included a detailed study of the dynamics of macroeconomic indicators, followed by their quantitative and qualitative analysis. To ensure the objectivity of the results, cross-country comparisons were used to assess the impact of individual policy decisions in different economic contexts. This approach was based on the provisions proposed by T. Kuchinka (2015), where the expediency of using empirical methods in the study of contemporary economic transformations was substantiated.

RESULTS AND DISCUSSION

Economic crises are an integral part of the development of the global economy. They play a key role in the transformation of economic systems, forcing us to review existing economic theories, models of state regulation and approaches to risk management (Stukalo *et al.*, 2015). At the initial stages of the development of market relations, economic crises are mostly local in nature from a historical standpoint. This is conditioned by the weak level of integration between countries, limited trade ties, and insufficient development of global financial instruments. Economic crises have a significant impact on the global economy and play an important role in its development. Approaches to economic growth in law tend to change, and this also affects how crises occur. Previously, when countries still had little cooperation with each other, crises occurred in individual regions and were not so large-scale or long-term.

During the period of globalisation and the development of international trade, the situation has changed – crises are becoming international. They are no longer limited to one country, but are rapidly spreading around the world. Therefore, it is necessary to take a fresh look at many economic theories, in particular, why crises arise, how they develop, what features and consequences they have. In the contemporary world, crises affect not only the economy, but also science, technology, society, and politics. They become larger in scale and occur more frequently. This is why scientists from all over the world are constantly investigating this phenomenon (Bugay & Onipko, 2019; Ishchuk & Biruk, 2021).

Global financial crises are a complex, multi-factorial phenomenon that is difficult to interpret monotonously. That is why numerous researchers have tried to explain their nature from different perspectives, forming a wide range of approaches to understanding the causes, scale, and mechanisms of crisis phenomena. The variety of opinions makes it necessary to organise them, which helps to better analyse crisis processes and predict their possible consequences. One of the most effective methods is to classify financial crises according to various criteria (Table 1).

Table 1. Classification features of global financial crises

Classification attribute	Type of financial crisis
Level of international economic relations	International
	Supranational
Disturbing factors	Monetary and financial services
	Political
	Economic
	Technological
	Globalisation
Coverage of the monetary and financial system	General
	Banking system
	Credit cards
	Budget
	Monetary circulation
	Debt obligations
	Currency accounts
	Stock companies

Source: developed by the authors based on N. Stukalo *et al.* (2015), V. Bugay & A. Onipko (2019)

Classification of global financial crises is not just a list of possible types, but an attempt to understand how and why certain events occur in the global economy. One of the main classification criteria is the scale of impact on the monetary and financial system, and the level of integration of the country into international economic relations (Kobets, 2015; Kyseliova, 2020). It is also important to consider the nature of factors that provoke or activate crisis phenomena, because they create contradictions between economic needs and the actual functioning of monetary and financial instruments.

The world has repeatedly experienced financial crises over the past hundred years, and this problem still remains relevant. It is not easy to solve it, even for experienced financiers. Often they cannot predict a crisis or stop its devastating consequences.

There are several main reasons why financial crises occur (Kuchinka, 2015):

- Problems in the financial markets. Investors often make decisions based on emotions rather than the actual state of affairs. This causes sharp fluctuations in asset prices, which leads to instability.

◆ Changes in the global economy. Some countries consistently spend more than they earn (have deficits), while others accumulate surpluses. This imbalance creates tension in the global financial system.

◆ Errors of rating agencies. These organisations, which were supposed to evaluate the reliability of securities, sometimes gave high ratings to risky assets. This was conditioned by poor control, poor organisation of work, and conflicts of interest.

◆ Absence of the main risk controller. There is no organisation in the global financial system that has the authority to control all important financial institutions, especially those that are not banks, but have great influence. For example, the US Federal Reserve cannot control hedge funds or investment banks.

◆ Poor risk management in companies. Many firms analyse different types of risk separately, but this does not work when it comes to complex financial instruments. In such cases, the risks are difficult to assess, and this can lead to serious problems.

It is worth noting that the list of causes of financial crises is not complete. Each specific crisis has its own unique characteristics, conditions and factors that most influenced its occurrence and development.

Main consequences of financial crises:

◆ Weakening of control over the financial sector. During a crisis, financial institutions (such as banks) start to perform worse. Some of them even go bankrupt and cannot return money to depositors or creditors.

◆ Rising unemployment. The crisis is severely affecting production and trade. Businesses close or shut down due to lack of money, and many people are out of work.

◆ Less imports. During a crisis, the country imports fewer goods. People have less money, so they reduce their expenses. Companies are also reducing their procurement volumes because they do not have sufficient funds.

◆ Deterioration of the balance of payments. The state begins to experience financial difficulties: revenues decrease, expenses exceed revenues, and the country cannot pay its debts on time.

◆ Reduced investment. During a crisis, investors lose confidence in the economy. They sell their assets to save money, which leads to the fall of stock markets and the destruction of many financial institutions.

Summing up the above, it can be noted that although most of the causes of financial crises are well known to specialists, they are usually identified after the crisis itself begins. It is very difficult to predict them in advance. The consequences of crises can vary in strength and affect different parts of the economy in different ways. The main difficulty lies in the fact that each crisis has its own specific, underlying cause. This makes forecasting difficult, but it shows how important it is to have an effective crisis management system. It should be based on strong state regulation and a high level of professionalism of financial managers.

Financial crises occur for various reasons, which can be both natural and related to people's actions. Their appearance is often caused by deeper processes in the economy and society. On the one hand, crises are caused by the natural development of the economy, when it becomes necessary to update or rebuild it. On the other hand, they can be the result of incorrect management decisions that depend on the level of professional training. In addition, natural events such as climate change or natural disasters can have a serious impact (Kichurchak, 2021). Changes that occur in the socio-economic development of society after the financial crisis can have a long-term and short-term character and be qualitative or quantitative, which include both reversible and irreversible consequences. The consequences that a financial crisis can have depend not only on its nature and nature of deployment, but also on the effectiveness of crisis management.

The global financial crisis of 2008-2009 significantly affected the socio-economic situation in many countries. It has led to a slowdown in economic growth and a decline in people's real incomes. As a result, the population began to live worse: the ability to spend money on daily needs, invest, or save money decreased. In addition, financial capital devalued and the exchange rate of national currencies fell. Inflation and unemployment are two key indicators that reflect the state of the country's economy. They are closely related and affect both the economy and people's lives (Rushchyshyn *et al.*, 2021). Based on these two indicators, the so-called poverty index was calculated – it showed the overall level of economic difficulties in the country, combining the level of inflation and unemployment (Fig. 1).

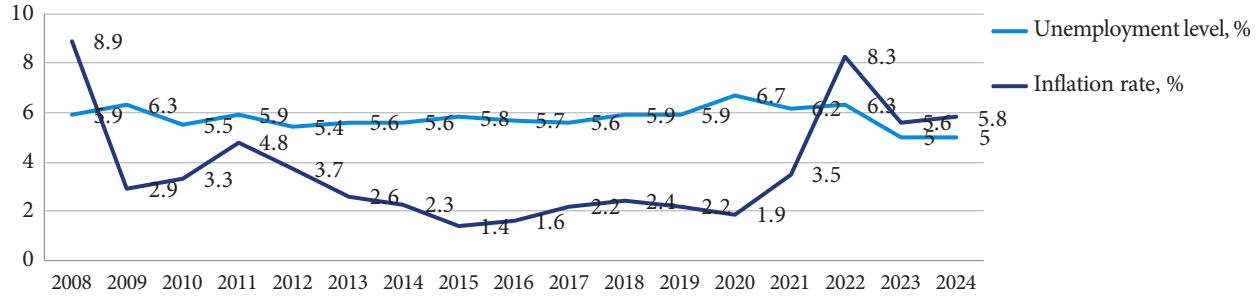

Figure 1. Dynamics of the unemployment level and inflation rates in the world during 2008-2024, %

Source: developed by the authors based on S. Kobets (2015), M. Kichurchak (2021), G. Chen (2024)

Global inflation and unemployment rates were clearly changing from 2008 to 2024. It is noteworthy that during the financial crisis of 2008-2009, inflation rose sharply to 8.9%, which is a high indicator on a global scale. In 2009, the unemployment rate also increased – from 5.9% to 6.3%, which indicates a deterioration in the economic situation in the world. During the COVID-19 pandemic in 2020, inflation, on the contrary, fell to 1.9%, but unemployment rose again. In 2021-2024, the global economy gradually recovered from the pandemic and new challenges, in particular, the war in Ukraine and the energy crisis. Inflation rose from 3.5% in 2021 to a peak of 8.3% in 2022, before falling to 5.6% in 2023 and 5.8% in 2024 due to tighter monetary policy. The unemployment rate initially increased (6.2% in 2021 and 6.3% in 2022), but from 2023 it began to decline – to 5% in 2023-2024, which indicates a gradual stabilisation of the labour market (Kaddour *et al.*, 2025). To better assess the socio-economic situation of the United States, Germany, Japan, Ukraine, Brazil, and South Korea, it is better to compare the poverty index (Fig. 2).

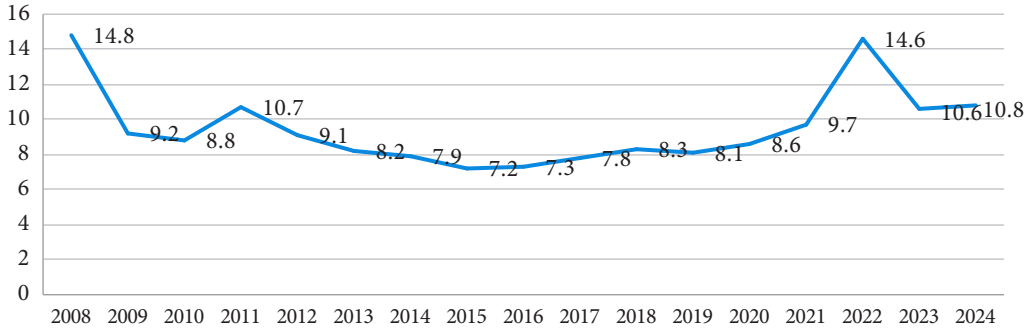

Figure 2. Dynamics of the global poverty index during 2008-2024, %

Source: developed by the authors based on M. Kichurchak (2021), H. Wang & F. Liu (2024)

In 2008, at the beginning of the financial crisis, the poverty index peaked at 14.8% due to a sharp increase in inflation. At the height of the crisis, in 2009, this figure fell to 9.2%, which was conditioned by a decrease in aggregate demand and a slowdown in price growth. In the future, the index continued to decline and in 2015 fell to 7.2%. However, after the start of the COVID-19 pandemic, starting in 2020, the poverty index began to grow again due to pent-up demand for goods and services, although in 2020 itself it temporarily fell due to expectations of a new financial crisis. In 2023, the poverty index was 10.6%, and in 2024 – 10.8%, which indicates certain instability of the economy caused by various external and internal factors. It is worth noting that, despite the negative consequences, financial crises can also have a positive impact on the socio-economic development of the country. They encourage economic reform, better governance, and the introduction of new technologies that can improve stability and growth in the long run.

In a market economy, public debt is an important part of public finances. When there is a budget deficit, a country attracts loans to cover it, which leads to an increase in public debt. On the one hand, if own funds are not enough, loans help to finance large projects and meet debt obligations, which can contribute to economic growth. On the other hand, too much debt increases the cost of servicing it, which can disrupt overall economic stability and even cause a financial crisis (Caccioli *et al.*, 2017).

Public debt usually arises from the need to finance the budget deficit to ensure timely spending, and invest in capital projects that will eventually contribute to economic growth. The issue of public debt is closely related to the issue of public credit, because it is through lending that this debt is formed. State credit is a system of relations that arises in the process of borrowing operations of the state with legal entities and individuals aimed at attracting financial resources to cover the budget deficit and finance state programmes (Amor *et al.*, 2022; Wang & Liu, 2024). The state in credit relations is most often a borrower, and lenders can be citizens, banks, insurance companies, non-state pension funds, enterprises, governments of other countries, and international financial and credit organisations (James & Menzies, 2023).

During the period from 2000 to 2022, several significant financial crises can be distinguished: the global financial crisis of 2008-2009 and the "coronavirus crisis" of 2020 caused by the COVID-19 pandemic. In addition, between 2022 and 2024, the world's economies faced the effects of geopolitical instability, rising inflation, and an energy crisis, which also caused noticeable fluctuations in financial markets and some economic instability (Fig. 3). The analysis shows that before global financial shocks, there was usually a gradual slowdown in economic activity. For example, in 2008, on the eve of the global financial crisis, GDP growth was only 2.1%, and in 2019 – 2.6% before the "coronavirus crisis". This suggests that financial crises do not occur suddenly, but are preceded by signs of an economic slowdown. In the post-crisis periods, the global economy managed to recover quite quickly: the real GDP growth rate in 2010 reached 4.5%, and in 2021 – 6%. Notably, the COVID-19 pandemic in 2020 dealt a stronger blow to the global economy than the financial crisis of 2008-2009. This was conditioned by large-scale restrictions in such sectors as tourism, air transportation and services, while in 2008-2009 the main blow fell on the financial and construction sector.

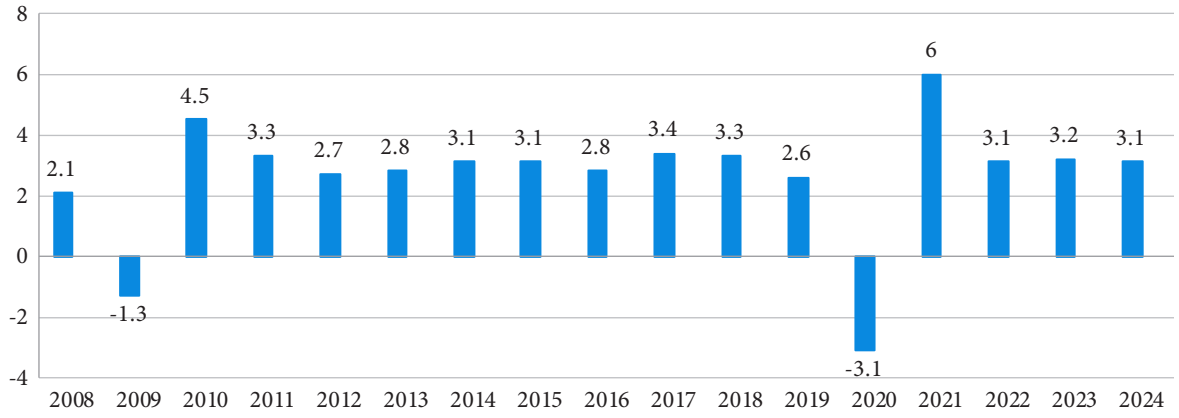

Figure 3. Dynamics of real GDP growth rates in the world during 2008-2024, % compared to the previous year
Source: developed by the authors based on S. Amor *et al.* (2022), H. Mekki (2025)

In 2023, the global real GDP growth rate was 3.2%, and in 2024 it was expected to slow slightly to 3.1%. This indicates a gradual stabilisation of the global economy after the pandemic and post-crisis period, but also the persistence of structural challenges that are holding back the return to higher growth rates typical of crisis decades. During financial crises, governments were forced to significantly increase borrowing to support public finances. This is conditioned by the fact that during periods of economic downturn, budget revenues are sharply reduced due to a drop in business activity and a decrease in tax payments. As a result, there is a need to attract additional resources to finance key budget expenditures (Bessler *et al.*, 2021; Zahedian *et al.*, 2022). A striking example of this is the significant increase in the state budget deficit in 2009-2010, which was a necessary step to stabilise the economy and ensure the fulfilment of state obligations (Fig. 4).

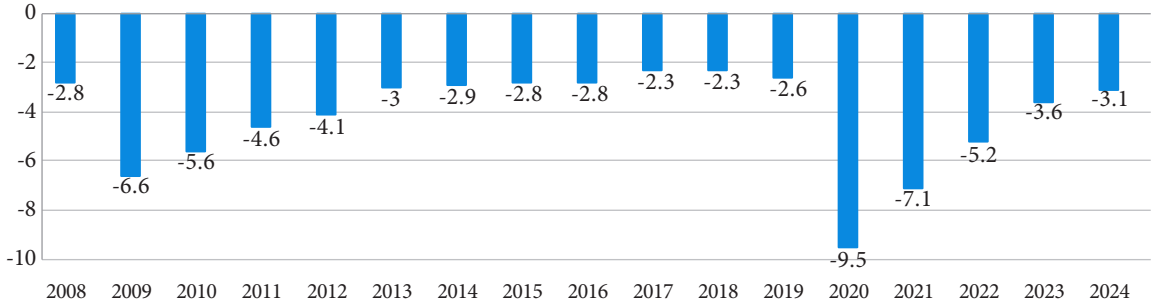

Figure 4. Dynamics of government budget deficits in countries around the world during 2008-2024, % of GDP
Source: developed by the authors based on A. Danis (2020), N. Rushchyshyn *et al.* (2021)

The global financial crisis of 2008-2009 will significantly worsen the state of public finances in most countries: there was a decline in budget revenues due to falling economic activity, while budget expenditures on economic stabilisation and support for financial sectors increased significantly. As a result, during 2009-2012, most countries had persistent budget deficits, which forced governments to actively resort to external and domestic borrowing (Danis, 2020; Mekki, 2025). A similar situation was repeated during the COVID-19 pandemic (2020-2022), when governments around the world were forced to sharply increase spending to finance medical measures, social support for the population, and mitigate economic losses. This also led to a significant increase in the state budget deficit.

In 2023, the global average budget deficit remained at -3.6% of GDP, while in 2024 it was expected to decrease to -3.1% of GDP. This indicates a gradual restoration of macro-financial stability, a decrease in anti-crisis spending and a partial increase in budget revenues due to the revival of economic activity. International financial organisations advise low- and middle-income countries to focus monitoring and control of contingent liabilities within the ministry of finance. In particular, the macro-financial department should be responsible for assessing fiscal risks and monitoring all types of such obligations. A unified approach to data collection and analysis allows managing risks more effectively. In some countries, such as New Zealand, Slovenia, or Sweden, these functions are performed by a debt agency. In Ireland, Poland, and Portugal, the respective departments of the ministry of finance or treasury (Andersson & Grundel, 2021; Chen, 2024).

The results obtained indicate a multi-factorial nature of the crises of 2019-2024, in particular, a combination of epidemiological, energy, military-political, and financial-behavioural factors. A similar interpretation can be traced in the study by S. Kobets (2015), which analysed the impact of external shocks on economic dynamics, but the researcher has not yet dealt with a combination of several crisis triggers simultaneously, in particular, those that operate at different levels (local, regional, global). The study focused on the synergistic effect of these crises, which was also confirmed by H. Mekki (2025), who emphasised the complex interaction of various crisis factors and their impact on financial stability.

In the course of the analysis of digitalisation of financial services and its role in mitigating crisis phenomena, it was revealed that the use of financial technologies (FinTech) was mainly of a stabilising nature. This conclusion coincides with the opinion of M. Kichurchak (2021), who noted that digital innovation contributes to the adaptation of financial systems to instability. Unlike previous studies, the analysis considered the specifics of the pandemic and military context, where digitalisation has become a critical tool for supporting the solvency of households and small businesses. N. Stukalo *et al.* (2015) focused on the problems of imperfection of the global financial architecture as a source of crisis, which is consistent with conclusions about the vulnerability of the international financial system. M. Savchenko & O. Shkurenko (2020) emphasised the importance of effective crisis management mechanisms in emerging markets, in particular, through the adaptation of quantitative easing policies, which was problematic to implement in Ukraine due to currency and debt risks.

In the context of the reactions of central banks, there is a significant difference in approaches in different countries. This issue was considered in detail by A. Kaddour *et al.* (2025), who analysed the impact of the "bail-out" and "bail-in" programmes on the stabilisation of financial systems. The study confirmed that such tools have had limited effectiveness in countries with limited financial resources. V. Bugay & A. Onipko (2019) paid attention to methods for diagnosing crisis phenomena, which is partly reflected in the study through the use of non-conventional markers of digital consumer behaviour and cyber risks. This was consistent with ideas of N. Rushchyshyn *et al.* (2021) regarding the importance of regulatory support for financial security in the face of new threats.

M. Zahedian *et al.* (2022), who examined crisis phenomena through the prism of the economic security of national systems, highlighted the role of structural disruptions in the global economy, especially in the context of global debt and imbalances. This perspective echoes the research by K. Kyseliova (2020), which analysed the 2020 crisis as a new phase of the global cycle, in particular, due to supply chain disruption, which was also considered in the study. Simultaneously, the results complemented this approach, adding a component of energy instability and geopolitical risks. An important difference of the study is an interdisciplinary approach that synthesises macroeconomic, behavioural, digital, and security aspects of crisis processes. This is consistent with the opinion of G. Chen (2024) and H. Wang & F. Liu (2024), who examined global economic uncertainty and systemic risks using network analysis.

Consequently, public debt in the advanced economy performs both a stabilising and a risk function. In times of crisis, it allows covering budget deficits, but with excessive accumulation, it threatens financial stability. The events of 2008-2024 demonstrated that financial crises are complex in nature and require an interdisciplinary approach to analysis and management, considering digital tools, fiscal risks, and global challenges.

CONCLUSIONS

The study found that financial crises have a complex and contradictory impact on the national economy. On the one hand, such crises lead to significant economic losses: a reduction in gross domestic product, a decrease in investment, an increase in the unemployment rate, an increase in poverty and an increase in public debt. On the other hand, they can serve as a powerful incentive for deep structural reforms, rethinking the role of the state in regulating the economy, improving the efficiency of the financial system and its resilience to future shocks. It is these positive effects that form the basis for a long-term recovery of the economy, even despite serious short-term challenges.

Special attention was paid to the analysis of public debt mechanisms during crisis periods, in particular, during the global financial crisis of 2008-2009 and the COVID-19 pandemic in 2020. As it turned out, attracting debt resources allowed governments to mobilise funds to stabilise the economy and support the population. However, in the long run, the growing debt burden creates serious fiscal risks and limits the ability to finance social programmes, infrastructure projects, and innovative development. Thus, the financial flexibility of the state becomes a critical condition for economic security.

The scientific originality of this study consisted in a comprehensive analysis of the relationship between the dynamics of GDP, the volume of public debt, and the overall level of financial stability of the state. The most up-to-date crisis episodes were considered, which allowed offering more accurate approaches to predicting the consequences of future crises and preparing for them. The practical significance of the results obtained is shown in clearly formulated recommendations for strengthening budget discipline, establishing control over debt obligations and improving the ability of public finances to respond flexibly to external challenges. In particular, the strategic area of economic policy to reduce the negative impact of future financial crises can be: the development of an effective system of crisis management, diversification of sources of financing for the economy, support for investment in industries with high growth potential, and ensuring an appropriate level of social protection for the most vulnerable categories of the population. Thus, the combination of financial caution,

strategic vision, and social policy orientation creates the basis for sustainable and balanced economic development, even in the face of instability in global markets and new challenges facing the contemporary world.

The prospects for further research in this area are to expand the analysis to new crisis situations, in particular, those related to energy, climate and geopolitical challenges that can significantly affect global economic processes. It is also advisable to investigate the adaptive capacity of various economic policy models in countries with different levels of development, and to assess the long-term effectiveness of anti-crisis measures implemented after the crises of 2008-2009 and 2020-2023. Further research may be aimed at developing integrated macroeconomic models that consider the relationships between fiscal, monetary policy, external debt dynamics, and structural transformations of the economy in the context of global instability. Thus, the results of the study confirmed the main theses of literature, but expanded them by including new factors and methods for analysing the crises of 2019-2024. This creates the basis for further research towards the development of effective stabilisation policies.

ACKNOWLEDGEMENTS

The authors express their sincere gratitude to Natalia Bohdanivna Tataryn, Doctor of Economics, Associate Professor of the Department of Financial Management, for her valuable scientific advice, assistance in research, and comprehensive comments on the development of the topic.

FUNDING

The research was conducted independently without any external funding; all expenses were covered by the authors themselves.

CONFLICT OF INTEREST

The authors declare that no conflicts of interest were identified during the preparation and conduct of the study. All aspects of the scientific work were carried out without the influence of external economic, political or other interests that could distort the results of the study. In addition, no funding was received from third parties, which could affect the objectivity of scientific conclusions. All scientific advice and comments provided in the course of research were aimed solely at improving the quality of research.

REFERENCES

[1] Amor, S.B., Althof, M., & Härdle, W.K. (2022). Financial risk meter for emerging markets. *Research in International Business and Finance*, 60, article number 101594. doi: 10.1016/j.ribaf.2021.101594.

[2] Andersson, I., & Grundel, I. (2021). Regional policy mobilities: Shaping and reshaping bioeconomy policies in Värmland and Västerbotten, Sweden. *Geoforum*, 121, 142-151. doi: 10.1016/j.geoforum.2021.02.005.

[3] Bessler, W., Taushanov, G., & Wolff, D. (2021). Optimal asset allocation strategies for international equity portfolios: A comparison of country versus industry optimisation. *Journal of International Financial Markets, Institutions and Money*, 72, article number 101343. doi: 10.1016/j.intfin.2021.101343.

[4] Bugay, V.Z., & Onipko, A.D. (2019). Characteristics and diagnostics of the financial crisis. *Economic Space*, 142, 101-111. doi: 10.30838/ P.ES.2224.260219.101.382.

[5] Caccioli, F., Barucca, P., & Kobayashi, T. (2017). Network models of financial systemic risk: A review. *Journal of Computational Social Science*, 1, 81-114. doi: 10.1007/s42001-017-0008-3.

[6] Chen, G. (2024). Impact of the global financial crisis on emerging markets. *Frontiers in Business, Economics and Management*, 17(1), 128-132. doi: 10.54097/amdewv22.

[7] Danis, A. (2020). Shareholder activism with strategic investors. *Finance Research Letters*, 33, article number 101209. doi: 10.1016/j.frl.2019.06.007.

[8] Ishchuk, L., & Biruk, T. (2021). Prospects of development of potential of local budgets of the region. *Economic Forum*, 11(1), 52-61.

[9] James, N., & Menzies, M. (2023). An exploration of the mathematical structure and behavioural biases of 21st century financial crises. *arXiv:2303.00000*, 1-14.

[10] Kaddour, A., Boubaker, R., Moualdi, S., & Alsayed, H. (2025). Reassessing financial crisis management: The impact of bailouts and bail-ins on moral hazard and sustainable recovery strategies. *Journal of Risk and Financial Management*, 18(2), article number 101. doi: 10.3390/jrfm18020101.

[11] Kichurchak, M. (2021). Development of the higher education market in the EU countries as a factor of human capital accumulation: Experience for Ukraine. *Economic Annals-XXI*, 192(7-8(2)), 52-62. doi: 10.21003/ea.V192-05.

[12] Kobets, S.P. (2015). Methodical approach to the evaluation of economic viability of enterprises. *Global and National Problems of the Economy*, 3, 307-311.

[13] Kuchinka, T.V. (2015). Theoretical aspects of studying the phenomenon of economic crisis. *Scientific Bulletin of Mukachevo State University. Series "Economics"*, 1, 29-34.

[14] Kyseliova, K.S. (2020). *Global financial crises, their manifestations, consequences and prevention measures*. (Doctoral dissertation, Sumy State University, Sumy, Ukraine).

[15] Mekki, H., Mtiraoui, A., Aroussi, Z., & Smida, M. (2025). Understanding the dynamics of financial and economic crises: A comprehensive analysis. *Cogent Social Sciences*, 11(1), article number 245740. doi: 10.1080/23311886.2025.2454740.

[16] Rushchyshyn, N., Medynska, T., Nikonenko, U., Kostak, Z., & Ivanova, R. (2021). Regulatory and legal component in ensuring state's financial security. *Business: Theory and Practice*, 22(2), 232-240. doi: 10.3846/btp.2021.13580.
[17] Savchenko, M., & Shkurenko, O. (2020). Formation of the mechanism of anti-crisis management by international entities. *Economic Analysis*, 30(4), 74-83. doi: 10.35774/econa2020.04.074.
[18] Stukalo, N.V., Lytvyn, M.V., & Polishko, G.G. (2015). Theoretical and methodological foundations of the global financial crisis. *Economic Space*, 101, 51-61.
[19] Wang, H., & Liu, F. (2024). Digital finance and enterprise innovation efficiency: Evidence from China. *Finance Research Letters*, 59, article number 104709. doi: 10.1016/j.frl.2023.104709.
[20] Zahedian, M.R., Bagherikalhor, M., Trufanov, A., & Jafari, G.R. (2022). Financial crisis in the framework of non-zero temperature balance theory. *Plos One*, 17(12), article number e0279089. doi: 10.1371/journal.pone.0279089.

Аналіз впливу економічних криз на глобальну економіку

Наталія Татарин
Кандидат економічних наук, доцент
Львівський національний університет імені Івана Франка
79000, вул. Університетська, 1, м. Львів, Україна
https://orcid.org/0000-0002-7526-7282
Софія Ванцура
Студент
Львівський національний університет імені Івана Франка
79000, вул. Університетська, 1, м. Львів, Україна
https://orcid.org/0009-0009-8790-3184

Анотація. Фінансові кризи мають глибокий і комплексний вплив на соціально-економічний розвиток країн, що підкреслює важливість та актуальність дослідження основних причин їх виникнення, особливостей перебігу, а також наслідків для макроекономічної стабільності. Метою даного дослідження стало виявлення та систематизація основних чинників, що призводять до формування глобальних фінансових криз, а також оцінка їхнього багатогранного впливу на економічну стабільність і розвиток окремих держав і світової економіки загалом. У роботі застосовано комплексний підхід із використанням методів порівняльного та статистичного аналізу, що дозволяє більш глибоко розкрити проблематику. У ході дослідження проаналізовано ключові причини фінансових потрясінь, серед яких особливе місце займають дерегулювання фінансового сектору, суттєве падіння обсягів імпорту, порушення платіжного балансу, скорочення обсягів інвестицій та значне зниження рівня зайнятості населення. Було з'ясовано, що виникненню фінансових криз, зокрема у 2008 та 2020 роках, передували помітні зниження темпів зростання реального ВВП, що свідчило про існування певних попереджувальних сигналів для економіки. Також детально розглянуто динаміку основних макроекономічних показників, таких як рівень інфляції, безробіття, індекс злиденності, а також дефіцит державних бюджетів у країнах світу у період 2008-2024 років. Особливу увагу приділено взаємозв'язку між уповільненням темпів економічного зростання та тенденцією до розширення бюджетного дефіциту. Практична цінність отриманих результатів полягає у можливості їх використання для розробки більш ефективних превентивних заходів і політик, що дозволять суттєво зменшити негативний вплив майбутніх кризових явищ на економіку країн, а також забезпечити фінансову стабільність і стійкість державного сектору в довгостроковій перспективі

Ключові слова: фінансова криза; державний бюджет; економічні потрясіння; державний борг; світова економіка

University Economic Bulletin
Vol. 20, No. 2, 2025
Journal homepage: https://ue-bulletin.com.ua/en
Received: 29.06.2025. Revised: 23.11.2025. Accepted: 24.12.2025. Published: 26.12.2025

UDC 368.025.6
DOI: 10.69587/ueb/2.2025.28

Solvency requirements for insurers: Ukrainian practices and international experience

Olena Novosolova*
PhD in Economic Sciences, Associate Professor
Kherson National Technical University
29016, 11 Instytutska Str., Khmelnytskyi, Ukraine
https://orcid.org/0000-0002-5225-6353

Abstract. The relevance of the study was due to the transformation of approaches to regulating the solvency of insurers in the world's leading economies and the need to adapt the Ukrainian insurance supervision system to international standards. Countries with developed insurance markets use capital assessment models based on economic value, risk-oriented management and transparency of reporting. The aim of the study was to conduct a comparative analysis of solvency regulation systems for insurers in the European Union, Great Britain, the United States, Japan and Ukraine, as well as to identify the key elements and tools that ensure the financial stability of insurance companies. The study used methods of comparative analysis, logical generalisation, deduction, a systematic approach and regulatory interpretation. It examined the three-component structure of the Solvency II system, in particular the qualitative and quantitative capital requirements, risk management requirements and transparency of reporting. Innovations in the assessment of insurers' solvency in Ukraine were characterised: the phased implementation of Solvency II standards, new criteria for determining regulatory capital, Solvency Capital Requirement calculations and minimum capital. The updated system of solvency requirements in the United Kingdom, Solvency UK, which is a modification of Solvency II and aimed to simplify regulatory pressure and stimulate investment, was analysed. The essence of the risk-based approach in the United States and the role of capital calculation models taking into account the specific risks of each type of insurance were revealed. It was noted that the American regulatory model is more decentralised, as regulation is carried out at the state and federal government levels. Special attention was paid to the reform of the solvency system in Japan, where an economic valuation model based on economic value will be introduced in 2025. It is similar to the European model, but takes into account the national characteristics of the market. The practical value of the work lies in the formation of methodological principles for improving the Ukrainian insurance supervision system, taking into account international experience, which will contribute to increasing the transparency, stability and investment attractiveness of the domestic insurance market

Keywords: assessment models; Solvency II; Solvency UK; solvency capital; minimum capital requirements; risk-oriented capital; insurance supervision

INTRODUCTION

The insurance market is an important element in the mechanism of compensation for material losses, ensuring social protection of citizens and accumulation of investment resources. A necessary prerequisite for the effective functioning of the insurance market is the reliability and solvency of insurers, who are capable of fulfilling their financial obligations in a timely and complete manner at any given moment. V. Dranus *et al.* (2023) studied theoretical approaches to determining the solvency of an insurer by comparing the characteristics of "solvency", "financial stability" and "financial reliability" of an insurer. The researchers noted that "solvency" is a criterion for assessing the financial condition of a company in the short term, and the financial security of solvency is the insurer's capital in liquid form. I. Abernikhina & I. Sokyrynska (2020) systematised approaches to indicators for assessing the solvency of

Suggested Citation:
Novosolova, O. (2025). Solvency requirements for insurers: Ukrainian practices and international experience. *University Economic Bulletin*, 20(2), 28-36. doi: 10.69587/ueb/2.2025.28.

*Corresponding author

an insurance organisation and showed the interconnection between the concepts of "liquidity" and "solvency" of an insurer. O. Klepíkova *et al.* (2019) studied the possibilities of using simulation modelling to assess the financial stability and solvency of an insurance company.

Ukraine's European integration aspirations have determined the direction of development of Ukrainian legislation in the field of insurance. Requirements for insurers to maintain solvency margins in European Union countries were introduced as early as the 1970s. With the further development of the European insurance market, the solvency requirements for insurers were modernised – Directive 2002/12/EC (2002). The fundamental document of the European Union (hereinafter – EU) containing common rules to facilitate the activities of insurance companies is Directive 2009/138/EC (2009). S. Mukhtarov *et al.* (2022) concluded that Solvency II requirements shift investors' attention to solvency information rather than the profits of European insurance companies, unlike Solvency D.K. Nguyen & D.-T. Vo (2020) investigated the relationship between the implementation of enterprise risk management (ERM) and the solvency of insurers in the European Union (hereinafter – EU) and empirically evaluated the impact of various factors on the level of solvency. A. Garayeta *et al.* (2022) and L. González *et al.* (2022) conducted a qualitative analysis of solvency regulation systems for insurers in six jurisdictions, including the EU and the US, to assess their compatibility and the possibility of introducing a unified global model. E. Siopi *et al.* (2023) identified the most important variables that influence the solvency capital requirement of an insurance company and allow it to be predicted. Y. Tyuleneva & T. Antoshko (2019) compared the principles of Solvency I and Solvency II, examined the specifics of implementing Solvency I in the Ukrainian legal field, and described the mechanisms for implementing Solvency II and the likely difficulties in implementing this approach in the activities of domestic insurance companies.

Law of Ukraine No. 1909-IX (2025) takes into account the provisions of Solvency II. The legislative act also sets out requirements for ensuring the solvency of insurers, which is achieved "by complying with solvency capital and minimum capital requirements." Given the social importance of the development of insurance relations, the insurance market regulator, the National Bank of Ukraine (hereinafter referred to as the NBU), pays particular attention to the issue of ensuring the solvency of insurance companies. Resolution of the Board of the National Bank of Ukraine No. 201 (2023) specifies the procedure for assessing solvency and regulates the methodology for assessing assets and liabilities for the purposes of calculating the regulatory capital of insurance companies. A. Abaieva (2022) conducted a critical analysis of the institutional and legal framework for the financial stability of Ukrainian insurers for compliance with Solvency II, and also determined the impact of innovations on the effectiveness of state regulation of insurance activities. H. Kulina (2024) analysed the main criteria put forward in the field of ensuring the solvency of insurers and identified problematic aspects related to the implementation of innovations. The aim of the article was to systematise the key features of approaches to regulating the solvency of insurers in leading countries in order to identify potential directions for adapting the Ukrainian insurance supervision system.

MATERIALS AND METHODS

The study was based on an examination of the approaches taken by the EU, the United Kingdom, the United States, Japan and Ukraine to regulating the solvency of insurers. A comparative approach to requirements was used in the course of the work. The main object of comparative analysis was legislative acts, directives, regulatory documents and statistical reports of relevant supervisory authorities that establish the legal framework and methodological basis for the system of regulating the solvency of insurers in different countries, in particular, the European Union (Directive 2009/138/EC, 2009), the United Kingdom (Solvency UK regime), the United States of America (Risk-Based Capital – RBC model) and Japan (Solvency Margin Ratio and Economic Value-based Solvency Ratio – ESR). To ensure the accuracy and reliability of the data, the following criteria for selecting sources were established in the study: relevance (given the rapid changes in regulatory policy, regulatory documents valid as of 2025 were used); authority (the information base consists of official sources – state regulatory bodies and leading insurance associations); representativeness and completeness of information (the analysis covers the world's leading insurance markets with different regulatory models; for each jurisdiction, key documents reflecting approaches and practices of solvency regulation, as well as threshold values of quantitative indicators and qualitative requirements, were considered).

The methodological basis of the study consists of the following approaches: systematic analysis, which made it possible to identify the structure, functions and features of each of the solvency assessment models; comparative legal method, used to identify differences and similarities between the European model (Solvency II), its adaptation in the United Kingdom (Solvency UK), the American RBC system and Japanese approaches; quantitative analysis, which was used to study the formulas for calculating key indicators (Solvency Capital Requirement (SCR), Minimum Capital Requirement (MCR), Solvency Margin Ratio (SMR), RBC Ratio, ESR).

The information content of the study is based on official publications of supervisory authorities (European Insurance and Occupational Pensions Authority (EIOPA), Prudential Regulation Authority (PRA), National Association of Insurance Commissioners (NAIC), Financial Services Agency (FSA) of Japan), national legislation (Law of Ukraine No. 1909-IX, 2025), documents of insurance associations, industry reports and methodological recommendations, as well as own summarisation and processing of regulatory parameters. To analyse current regulatory practice in Ukraine, a regulatory mapping method was used, which shows the stages of introducing Solvency II approaches into Ukrainian practice: from a simplified

model (2024) to a basic one (2027), and also identifies the criteria for insurers to move to full regulatory supervision.

RESULTS AND DISCUSSION

The Solvency II concept consists of three "pillars" (components): Pillar I – quantitative requirements (assessment of assets and liabilities and capital requirements); Pillar II – qualitative requirements (requirements for management, risk management, assessment of own risks and solvency (ORSA)); Pillar III – requirements for supervisory reporting and public disclosure. Solvency II establishes qualitative and quantitative requirements for the calculation of technical provisions and solvency capital requirements (SCR) using either a standard formula provided by the regulator or an internal model developed by the insurance company. SCR is the capital required to ensure that an insurance company can meet its obligations over the next 12 months with a probability of at least 99.5%. In addition to SCR, it is necessary to calculate the minimum capital requirement (MCR), which is the threshold below which capital must not fall. The MCR must correspond to an 85% probability of adequacy over one year and is between 25% and 45% of the SCR.

The solvency requirements for insurers in Ukraine have been significantly updated with the entry into force of the new version of Law of Ukraine No. 1909-IX (2025), the provisions of which are based on Directive 2009/138/EC (2009). Ukraine plans to introduce Solvency II in stages, with a simplified approach to assessing the solvency of insurers coming into effect on 1 January 2024 and a basic approach on 1 January 2027. Table 1 provides a comparative analysis of the requirements of Solvency II and Ukrainian legislation.

Table 1. Solvency requirements under Solvency II and in Ukraine

Criterion	Solvency II (EU)	Ukraine (2024-2027)
Model type	Risk-based approach based on three pillars	Phased implementation: simplified (from 2024) → basic (from 2027)
SCR	Determined either by the standard EIOPA formula or an internal model; covers 99.5% of risks over a one-year horizon	Calculated using an adapted standard formula similar to Solvency II
MCR	Determined as 25-45% of SCR; has an 85% probability of adequacy; there are minimum absolute limits	MCR = 1/3 SCR, but not less than UAH 32 million (non-life) or UAH 48 million (life and complex non-life)
Minimum absolute SCR/MCR thresholds	MCR: €2.5-3.7 million depending on class; SCR – no absolute limit set	MCR: determined in hryvnia; no absolute SCR limit
Risk assessment models	Internal models may be used with the regulator's approval	Internal models are not provided for in the simplified approach; in the basic approach, they are possible with the prospect of implementation
Use of standard formula	The main model for most insurers	The basic model for all companies at the simplified approach stage
Exceptions for small insurers	Not applicable if: direct insurance: premiums < €5.4 million, reserves < €26.6 million, reinsurance: premiums < €0.6 million/10%, technical reserves < €2.7 million/10%	Small companies may remain on the simplified approach
ORSA requirements	Mandatory	Provided for in the basic approach from 2027
Capital quality (structure)	Division into three tiers of capital (Tier 1-3), with restrictions on the use of lower-quality capital	Similar to Solvency II structure
Thresholds for transition to basic approach	In the EU – automatically, unless the insurer falls under the exceptions	Activities in at least one of the following insurance classes: 10, 11, 12, 13, 14, 15 and fulfilment of at least one of the following conditions: direct insurance: premiums > UAH 200 million reserves > UAH 700 million reinsurance: premiums > 10%/UAH 20 million technical reserves 10% / UAH 70 million
Regulator	EIOPA + national regulators	National Bank of Ukraine
Date of full implementation	2016 (EU), with continuous updates	Expected completion of the basic stage – 1 January 2027

Source: created by the author

In the United Kingdom, the system for regulating the solvency of insurers is based on Solvency UK rules, which are largely similar to the European Solvency II model, which was implemented in British law even before the country left the EU. The Solvency UK regulations came into full effect on 31 December 2024. The Prudential Regulation Authority (PRA) is the body responsible for supervising the financial stability and solvency of insurers in the United Kingdom. The new system modifies Solvency II and is designed to simplify requirements and reduce regulatory pressure, stimulate investment and ensure market competitiveness (Table 2).

Table 2. Key differences between Solvency UK and Solvency II

Element	Solvency II (EU)	Solvency UK (United Kingdom)
Regulatory structure	European (European Insurance and Occupational Pensions Authority (EIOPA) + national regulators)	British (PRA, Bank of England)
Risk margin	Higher (often criticised for overestimating reserves)	Reduced by ~ 65% (for life insurers), incentive for growth
Investment restrictions	Strict requirements for asset types	Greater flexibility – easier investment in infrastructure
Reporting requirements	Very detailed reporting	Reduced reporting, especially for smaller companies
Approach to internal models	High level of audits and require detailed approval	Simplification and faster model approval
ORSA, SFCR, RSR, QRTs principles	Mandatory for all full participants	Retained, but simplified reporting possible for small companies
System objective	Harmonisation of EU markets, protection of policyholders	Investment incentives, flexibility, proportionality, stability
Group supervision	The EU regulates at the insurance group level through EIOPA	PRA applies group supervision, but without supranational intervention
Gross premium threshold	€5,400,000 per year (gross, before reinsurance)	£25,000,000 per year
Technical provisions threshold	€26,600,000 (gross, before reinsurance)	£50,000,000
Threshold for reinsurers	€600,000 gross insurance premiums or €2,700,000 technical reserves	£2,500,000 gross insurance premiums or £5,000,000 technical reserves

Source: created by the author

Similar to Solvency II in the United Kingdom, insurers determine the MCR and SCR. In accordance with Solvency UK requirements, minimum absolute limits for the MCR have been established, which came into effect on 31 December 2024 (Table 3). In addition, the MCR must be no less than 25% and no more than 45% of the SCR.

Table 3. Absolute minimum MCR limits (as of 2025)

Type of insurer	Absolute minimum limit MCR (£)
General insurers (excluding classes 10-15)	£2,400,000
General insurers (classes 10-15)	£3,500,000
Life insurers	£3,500,000
Pure reinsurers	£3,500,000
Pure captive reinsurers	£1,200,000

Source: created by the author

No minimum absolute limits were set for SCR. Instead, the PRA defines SCR as the amount of capital needed to cover unexpected losses over the next 12 months with a 99.5% probability. In the United Kingdom, a wide range of measures are applied to insurers who violate Solvency UK requirements, from financial penalties to licence revocation, in order to ensure the stability of the financial system and protect consumer interests.

One of the most powerful insurance markets has formed in the United States of America, with American companies receiving more than USD 1.54 trillion in insurance premiums in 2023 (Rudden, 2025). It should be noted that in the United States, the regulation of insurance companies is divided between the states and the federal government. Each of the 50 states has its own laws governing the activities of insurers. For example, states are responsible for regulating insurance rates, licensing insurance companies and brokers, hiring financial experts to audit insurers, and providing support to consumers of services within the state. State insurance regulators are members of the National Association of Insurance Commissioners (NAIC) (n.d.), an organisation that standardises the regulation of insurance activities.

The federal government has fairly limited powers to regulate insurance activities, although after the 2008 financial crisis, the regulation of the financial stability of insurance companies was added to its jurisdiction. Law of the United States No. 111-203 (2010) created two supervisory boards under the Department of the Treasury - the Financial Stability Oversight Council (FSOC) and the Federal Insurance Office – to monitor the stability of the insurance industry. The FSOC has the power to designate certain insurance companies as Systemically Important Financial Institutions (SIFIs) so that they can be regulated by the Federal Reserve System (Morozova, 2021). SIFIs are subject to enhanced financial supervision – they must meet higher capital requirements, undergo stress tests, and submit bankruptcy plans for review. Although six insurers were initially classified as systemically important, they were all subsequently removed from the list.

The regulation of insurers' solvency in the United States differs significantly from the European model and is based on the determination of risk-based capital (RBC) – a method of measuring the minimum amount of capital required to maintain the insurer's operations, taking into account the size and risks of its insurance portfolio. This model was introduced in the United States in 1994. Separate RBC models were developed for each of the main types of insurance (e.g., life and health insurance, property and casualty insurance, health insurance). The RBC standard for insurance companies engaged in life and property/casualty (P/C) insurance is based on the National Association of Insurance Commissioners (2012). Similarly, the RBC standard for health insurers is the National Association of Insurance Commissioners (2011). The laws set out methods for calculating the minimum amount of capital.

The risk factors for RBC formulas focus on three main areas: asset risk, underwriting risk, and other risks. The emphasis on risks varies depending on the type of insurance. For example, for life insurers, the calculation formula includes five risk groups: risks related to affiliated persons, asset risks, insurance risks (underwriting), interest rate risks, and business risks (Scherer & Stahl, 2021). In the United States, an RBC ratio of over 200% is considered an acceptable level of Risk-Based Capital (RBC) for insurers. It is calculated using formula (1):

$$\text{RBC Ratio} = \text{Total Adjusted Capital} / \text{Authorised Control Level RBC} \times 100, \quad (1)$$

where Total Adjusted Capital (TAC) – the insurer's actual capital; Authorised Control Level (ACL RBC) – the minimum capital that the regulator considers sufficient, taking into account the risks (Risk-Based Capital Requirement Analysis, n.d.). Depending on the RBC value obtained, there are four levels of action that can be taken against the company (Table 4).

Table 4. Key RBC thresholds and corresponding regulator actions

RBC Ratio (%)	Category	Regulator actions
> 200%	Satisfactory Level	No action. The insurer is considered stable.
150%-200%	Company Action Level	The company submits a plan to strengthen its capital.
100%-150%	Regulatory Action Level	The regulator may intervene and demand action.
70%-100%	Authorised Control Level	The regulator has the right to take control of the company.
< 70%	Mandatory Control Level	The regulator is obliged to take measures (liquidation, reorganisation, etc.).

Source: created by the author based on Federal Reserve System (n.d.)

Japan accounts for 5% of the global market with insurance premiums of $363 billion in 2024, second only to the United States, China and the United Kingdom in terms of share of the global insurance market (Chaplin & Smethurst, 2025). In Japan, solvency requirements for insurers are regulated by the Financial Services Agency (FSA), which has the authority to monitor and analyse the economic solvency of insurers, including reviewing their risk assessment and capital management models. Since 1996, the main tool for monitoring solvency has been the Solvency Margin Ratio (SMR). It is calculated using formula (2):

$$\text{Solvency Margin Ratio} = \text{Qualifying Capital Resources} / (\text{Required Capital} \times ½) \times 100, \quad (2)$$

where Qualifying Capital Resources – capital resources that meet the requirements; Required Capital – the regulatory capital required to cover potential insurance, investment and operational risks (Resolution of the Board of the National Bank of Ukraine, 2023).

Insurance companies in Japan are required to maintain a solvency margin ratio (SMR) of at least 200%. If the solvency margin ratio falls below 200%, the FSA must take early response measures based on the provisions of Article 132 of the Insurance Business Act (Law of Japan No. 105, 1995). The purpose of early response is to ensure the reliable and proper operation of the insurance company and to protect policyholders. Measures range from the submission and implementation of corrective plans to the partial or complete suspension of the insurer's activities for a certain period. In addition, Japanese insurers must have at least 1 billion Japanese yen (USD 6.7 million) in share capital (for joint-stock companies); or the total amount of kikin (funds belonging to mutual insurance companies, equivalent to the capital of joint-stock companies), including the kikin redemption reserve in the case of a mutual company.

From 1 April 2025, Japan has introduced a new system for regulating the solvency of insurers based on an economically sound solvency ratio – the Economic Value-based Solvency Ratio (ESR). It is calculated using formula (3):

$$\text{ESR} = \text{Available Capital} / \text{Required Capital (SCR) (EC)} \times 100, \quad (3)$$

where Available Capital – the insurer's available capital calculated at economic (market) value; Required Capital (SCR or EC) – the capital required to cover the aggregate risk; SCR (Solvency Capital Requirement) – the capital requirement that takes into account standard risks (insurance, market, credit, operational, etc.); EC (Economic Capital) – economic capital determined by the company based on an internal risk assessment model (Requirements for Ensuring Solvency..., 2024).

The new solvency requirements system is similar to Solvency II. Japan's new rules are designed to be broadly consistent with ICS, but with minor adjustments. For example, the coefficient for calculating life insurance and

other types of insurance risks will be calibrated to take into account the characteristics of Japanese insurance companies – many Japanese insurers are small or medium-sized, while the coefficient in the Insurance Capital Standard (ICS) calculation is based on data collected mainly from large international insurance groups (The regulation of insurance in Japan, 2024). The introduction of ESR aims to improve the accuracy of assessing the solvency of insurers, improve risk management and ensure greater transparency for consumers and investors (Li *et al*., 2021).

The study shows that international systems for regulating the solvency of insurers are based on different conceptual approaches, but they share a common goal - to ensure the stability of the insurance sector and protect consumer interests. The European Solvency II model, which is the standard for regulation in the EU and has been adapted in the United Kingdom (Solvency UK), is based on a risk-oriented approach with a high level of detail, internal control and transparency. In particular, the three-component structure (quantitative requirements, qualitative management and transparent reporting) provides a comprehensive assessment of the financial stability of insurers.

In turn, the Risk-Based Capital (RBC) model, which is used in the United States, demonstrates a different approach to regulation, which focuses on the minimum acceptable capital, taking into account the specific risks characteristic of each type of insurance (Rudden, 2025). Despite its simpler structure, the American model also has effective supervisory mechanisms through the gradation of regulatory intervention levels depending on the size of the RBC ratio.

The introduction in Japan in 2025 of a new economically sound solvency ratio (ESR) system reflects a global trend towards harmonising insurance supervision in line with international standards, in particular the Insurance Capital Standard (ICS). The transition from Solvency Margin Ratio to ESR means abandoning simplified regulatory approaches in favour of a more accurate, economic assessment of risks and capital (Asadi & Al Janabi, 2020).

The analysis shows that the implementation of the three "pillars" (quantitative and qualitative requirements, reporting) is a common international practice that provides a comprehensive assessment of the financial stability of insurance companies. A comparison of the provisions of Ukrainian legislation with the Solvency II standards reveals both positive developments and potential challenges in the implementation of European practices. In this context, the conclusions of Y. Tyuleneva & T. Antoshko (2019) warning about the potential difficulties of implementing Solvency II in Ukraine were relevant. In particular, this concerns the shortage of qualified actuaries, the complexity of adapting international financial reporting standards (IFRS) to national provisions, and the limited resources of insurers for developing internal assessment models.

As H. Kulina (2024) rightly points out, the implementation of new legislation must be accompanied by the development of human capital, digital technologies and changes in insurers' investment policy approaches. Only under such conditions will the reforms have a systemic rather than a declarative impact on the financial stability of the industry. L. Morozova (2021) comes to similar conclusions, emphasising that although Ukrainian legislation is formally oriented towards the European model, actual solvency standards remain lower due to the weak development of the insurance market and the economy as a whole. Thus, there is a need for flexible adaptation of European approaches to national realities.

In the context of Ukrainian practice, where Solvency II is only just being introduced, the conclusions of E. Siopi *et al.* (2023) are of considerable importance. The researchers' study shows that the main determinants of solvency are: the level of reinvestment, long-term investments, cash and claims expenses, with long-term investments proving to be the most influential. Thus, insurance companies should focus not only on formal compliance with regulations, but also on internal investment strategies, liquidity management and control of claims settlement costs. The conclusion regarding the negative impact of excessive cash holdings on solvency deserves particular attention: cash that does not generate profit undermines the insurer's ability to cover future risks (Klapkiv, 2017; Alieksieiev *et al*., 2019; Nikolaieva, 2023).

A comparison with the results of A. Garayeta *et al.* (2022) allows for broadening the discussion in the context of global trends. In their research, the authors conducted a qualitative analysis of solvency assessment systems and found significant progress in harmonising models in different countries based on risk-oriented management principles. Thus, the Solvency II model is most consistent with the criteria of sustainable development in the areas of risk management, corporate control and transparency. Notably, the study also emphasises the importance of the environmental and social components in new solvency assessment systems. Although these aspects are not yet taken into account in the Ukrainian model, the prospects for their inclusion, for example through ESG investment criteria, are a logical solution in the further implementation of the full Solvency II model.

In the context of the global transformation of the insurance regulation and supervision system, it is important to take into account not only financial risks, but also the implementation of the principles of responsible management and sustainable development. The results of the study by M. Brogi *et al.* (2022) confirm the relevance of this approach: the implementation of ESG management (environmental, social and governance responsibility) by insurance companies correlates significantly with the size, profitability and solvency of the insurer. Therefore, large, profitable and financially stable companies are more likely to implement ESG policies. This is consistent with the logic of Solvency II, where more complex requirements apply to large market participants who have sufficient resources to implement internal models, ORSA and other elements of the system.

The Ukrainian model of phased implementation of Solvency II creates conditions for the gradual adaptation

of insurers to these standards, taking into account the scale of their activities. However, as in the study by M. Brogi *et al.* (2022), the question remains open as to whether small companies will be able to effectively implement ESG risk management requirements, given their limited resources. This points to the need to introduce simplified requirements for smaller companies.

CONCLUSIONS

The study found that modern models of solvency regulation for insurers in leading countries around the world, despite certain national characteristics, tend to implement risk-oriented approaches that involve not only a quantitative assessment of capital adequacy, but also increased requirements for risk management and transparency. The European Solvency II model, as well as the British Solvency UK system adapted to it, provide for a comprehensive evaluation of solvency, including internal models, ORSA requirements and extended reporting. The American RBC model is more adaptable to regional supervision and features an effective system of regulatory intervention through capital thresholds. Japan, which has long used the Solvency Margin Ratio, will also switch to an economic value-based solvency ratio (ESR) from 2025, reflecting the global convergence of approaches to insurance sector supervision.

Ukraine, in turn, is in the process of gradually implementing the provisions of Solvency II, which is not simply a copy of European legislation, but a profound structural reform that requires adaptation of the regulatory framework, institutional restructuring of the supervisory system, and improvement of the professional capacity of market participants. As of 2024, a simplified approach to solvency assessment has come into force in Ukraine, which provides for the establishment of requirements for regulatory capital and solvency capital of insurers. The further transition to a full basic approach is planned for 2027. This phased approach is entirely justified, as it avoids excessive pressure on the market and provides an adaptation period for companies. Ukraine has already completed the first stage of Solvency II implementation, but in practice, there are still numerous challenges related to the implementation of the second and third pillars (Pillar II and Pillar III), as well as the actualisation of ESG management practices.

The main problems that exist on the path to Solvency II implementation in Ukraine are: insufficient human resources (shortage of qualified actuaries, risk managers, financial monitoring and audit specialists); technical and digital unpreparedness of market participants: low process automation in many companies, which complicates the implementation of ORSA and QRTs tools; financial insolvency of insurers (a significant number of companies do not have sufficient capital to meet the new MCR/SCR requirements, especially in the small and medium-sized insurer segment); the need to strengthen the institutional infrastructure for supervision (ensuring the capacity of the National Bank of Ukraine as the insurance regulator to carry out risk-based supervision).

The results obtained confirm the need to harmonise the Ukrainian solvency assessment system with international approaches, in particular in terms of refining the methods for calculating SCR and MCR, introducing internal models, and improving the quality of corporate governance. Prospects for further research include analysing the effectiveness of the changes implemented in Ukrainian insurance during the transition period until 2027, developing methodologies for a standard SCR formula for the Ukrainian insurance market, and studying the impact of the new regulatory environment on the investment behaviour of insurers.

ACKNOWLEDGEMENTS

None.

FUNDING

The study did not receive funding.

CONFLICT OF INTEREST

None.

REFERENCES

[1] Abaieva, A.Yu. (2022). Development of institutional and legal support for the financial stability of an insurance company. *Actual Problems of Regional Economy Development*, 2(18), 194-205. doi: 10.15330/apred.2.18.194-205.

[2] Abernikhina, I.H., & Sokyrynska, I.H. (2020). Liquidity and solvency assessment of an insurance company. *Economic Bulletin of Dnipro University of Technology*, 1(69), 152-163. doi: 10.33271/ev/69.152.

[3] Alieksieiev, I., Mazur, A., & Moroz, A. (2019). Financial flows in the field of insurance. *Economics, Entrepreneurship, Management,* 6(1), 114-123. doi: 10.23939/eem2019.01.114.

[4] Asadi, S., & Al Janabi, M.A.M. (2020). Measuring market and credit risk under Solvency II: Evaluation of the standard technique versus internal models for stock and bond markets. *European Actuarial Journal,* 10, 425-456. doi: 10.1007/s13385-020-00235-0.

[5] Brogi, M., Cappiello, A., Lagasio, V., & Santoboni, F. (2022). Determinants of insurance companies' environmental, social, and governance awareness. *Corporate Social Responsibility and Environmental Management,* 29(5), 1357-1369. doi: 10.1002/csr.2274.

[6] Chaplin, R.A., & Smethurst, A.E. (2025). *Assessing prudential insurance regulation in Japan*. Retrieved from https://www.skadden.com/insights/podcasts/2025/03/assessing-prudential-insurance-regulation-in-japan.

[7] Directive 2002/12/EC of the European Parliament and of the Council "Amending Council Directive 79/267/EEC as Regards the Solvency Margin Requirements for Life Assurance Undertakings". (2002, March). Retrieved from https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A32002L0012.

[8] Directive 2009/138/EC of the European Parliament and of the Council "On the Taking-Up and Pursuit of the Business of Insurance and Reinsurance (Solvency II)". (2009, November). Retrieved from https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32009L0138.
[9] Dranus, V., Dranus, L., & Trushkina, N. (2023). Innovative approaches to managing the solvency of an insurance company in Ukraine. *Bulletin of Lviv National Environmental University. Series "AIC Economics"*, 30, 151-156. doi: 10.31734/economics2023.30.151.
[10] Federal Reserve System. (n.d.). *Summary of state regulation for identifying and supervising financially weakened insurers*. Retrieved from https://www.federalreserve.gov/boarddocs/staffreports/naicfrs/naicfrs.htm.
[11] Garayeta, A., De la Peña, J.I., & Trigo, E. (2022). Towards a global solvency model in the insurance market: A qualitative analysis. *Sustainability*, 14(11), article number 6465. doi: 10.3390/su14116465.
[12] González, L.O., Santomil, P.D., & Hoyt, R.E. (2022). The impact of ERM on insurer performance under the Solvency II regulatory framework. *The European Journal of Finance*, 29(4), 419-443. doi: 10.1080/1351847X.2022.2053180.
[13] Klapkiv, Y. (2017). Conflict of interests in the activities of insurance intermediaries. *Scientific Bulletin of Mukachevo State University. Series "Economics"*, 4(2), 171-176.
[14] Klepíkova, O.A., Polishchuk, S.O., Saramkov, O.A., & Nechay, D.V. (2019). Analysis of key indicators of financial stability of an insurance company using simulation modeling. *Bulletin of V.N. Karazin Kharkiv National University Economic Series*, 96, 80-94. doi: 10.26565/2311-2379-2019-96-09.
[15] Kulina, H.M. (2024). Innovations in state regulation of ensuring the solvency of insurance companies in Ukraine. *Efektyvna Ekonomika,* 4, 1-15. doi: 10.32702/2307-2105.2024.4.39.
[16] Law of Japan No. 105 "Insurance Business Act". (1995, June). Retrieved from https://www.japaneselawtranslation.go.jp/en/laws/view/4090.
[17] Law of the United States No. 111-203 "Dodd-Frank Wall Street Reform and Consumer Protection Act". (2010, July). Retrieved from https://www.congress.gov/bill/111th-congress/house-bill/4173/text.
[18] Law of Ukraine No. 1909-IX "On Insurance". (2025, January). Retrieved from https://zakon.rada.gov.ua/laws/show/1909-20#Text.
[19] Li, H., Porth, L., Tan, K.S., & Zhu, W. (2021). Improved index insurance design and yield estimation using a dynamic factor forecasting approach. *Insurance: Mathematics and Economics*, 96, 208-221. doi: 10.1016/j.insmatheco.2020.11.003.
[20] Morozova, L.S. (2021). Approaches to determining the solvency of insurance companies. *Market Infrastructure*, 51, 268-271. doi: 10.32843/infrastruct51-43.
[21] Mukhtarov, S., Schoute, M., & Wielhouwer, J.L. (2022). The information content of the Solvency II ratio relative to earnings. *Journal of Risk and Insurance*, 89(1), 237-266. doi: 10.1111/jori.12354.
[22] National Association of Insurance Commissioners. (2011). *Risk-Based Capital for Health Organizations Model Act #315*. Retrieved from https://content.naic.org/sites/default/files/model-law-315.pdf.
[23] National Association of Insurance Commissioners. (2012). *Risk-Based Capital (RBC) for Insurers Model Act #312*. Retrieved from https://content.naic.org/sites/default/files/model-law-312.pdf.
[24] National Association of Insurance Commissioners. (n.d.). *Risk-based capital*. Retrieved from https://surl.li/umunrx.
[25] Nguyen, D.K., & Vo, D.-T. (2020). Enterprise risk management and solvency: The case of the listed EU insurers. *Journal of Business Research*, 113, 360-369. doi: 10.1016/j.jbusres.2019.09.034.
[26] Nikolaieva, A. (2023). The insurance services market in Ukraine: Problems and determinants of development in the conditions of digitization of the economy. *Economic Forum*, 13(2), 109-116. doi: 10.36910/6775-2308-8559-2023-2-15.
[27] Requirements for ensuring Solvency and investment activities of an insurer. (2024). Retrieved from https://bank.gov.ua/admin_uploads/article/Vymogy_do_platospromozhnosti_23-05-2024.pdf?v=8.
[28] Resolution of the Board of the National Bank of Ukraine No. 201 "On Approval of the Regulation on Establishing Requirements for Ensuring Solvency and Investment Activities of an Insurer". (2023, April). Retrieved from https://zakon.rada.gov.ua/laws/show/v0201500-23#n384.
[29] Rudden, J. (2025). *Insurance market size in the U.S. 2009-2023*. Retrieved from https://www.statista.com/statistics/1102802/insurance-market-size-usa/#statisticContainer.
[30] Scherer, M., & Stahl, G. (2021). The standard formula of Solvency II: A critical discussion. *European Actuarial Journal,* 11, 3-20. doi: 10.1007/s13385-020-00252-z.
[31] Siopi, E., Poufinas, T., Chen, J.M., & Agiropoulos, Ch. (2023). Can regulation affect the solvency of insurers? New evidence from European insurers. *International Advances in Economic Research*, 29, 15-30. doi: 10.1007/s11294-023-09867-w.
[32] The regulation of insurance in Japan. (2024). *Asia Business Law Journal*. Retrieved from https://law.asia/insurance-regulation-japan/.
[33] Tyuleneva, Y.V., & Antoshko, T.R. (2019). Assessing the solvency of insurance companies in Ukraine: Solvency I or Solvency II? *Modern Problems of Economics and Entrepreneurship*, 23, 41-48.

Вимоги до платоспроможності страховиків: українські практики та міжнародний досвід

Олена Новосьолова
Кандидат економічних наук, доцент
Херсонський національний технічний університет
29016, вул. Інститутська, 11, м. Хмельницький, Україна
https://orcid.org/0000-0002-5225-6353

Анотація. Актуальність дослідження обумовлена трансформацією підходів до регулювання платоспроможності страховиків у провідних економіках світу та необхідністю адаптації української системи страхового нагляду до міжнародних стандартів. У країнах із розвиненими страховими ринками використовуються моделі оцінки капіталу, що базуються на економічній вартості, ризик-орієнтованому управлінні та прозорості звітності. Метою роботи був порівняльний аналіз систем регулювання платоспроможності страховиків у країнах Європейського Союзу, Великій Британії, США, Японії та України, а також виявлення ключових елементів та інструментів, що забезпечують фінансову стійкість страхових компаній. У дослідженні застосовано методи компаративного аналізу, логічного узагальнення, дедукції, системного підходу та нормативно-правової інтерпретації. Досліджено трикомпонентну структуру системи Solvency II, зокрема якісні та кількісні вимоги до капіталу, вимоги до управління ризиками, а також прозорість звітності. Охарактеризовано новації до оцінки платоспроможності страховиків в Україні: поетапне впровадження стандартів Solvency II, нові критерії до визначення регулятивного капіталу, розрахунків Solvency Capital Requirement та мінімального капіталу. Проаналізовано оновлену систему вимог до платоспроможності у Великій Британії – Solvency UK, яка є модифікацією Solvency II, та спрямована на спрощення регуляторного тиску та стимулювання інвестицій. Розкрито сутність ризик-орієнтованого підходу у США та роль моделей розрахунку капіталу з урахуванням специфіки ризиків кожного виду страхування. Зазначено, що американська модель регулювання є більш децентралізованою, оскільки регулювання здійснюється на рівні штатів та федерального уряду. Окрема увага приділена реформі системи платоспроможності в Японії, де з 2025 року запроваджується економічна модель оцінки на основі економічної вартості, вона є схожою на європейську модель, але з урахуванням національних особливостей ринку. Практична цінність роботи полягає у формуванні методичних засад для вдосконалення української системи страхового нагляду із урахуванням міжнародного досвіду, що сприятиме підвищенню прозорості, стійкості та інвестиційної привабливості вітчизняного страхового ринку

Ключові слова: моделі оцінки; Solvency II; Solvency UK; капітал платоспроможності; мінімальні вимоги до капіталу; ризик-орієнтований капітал; страховий нагляд

University Economic Bulletin
Vol. 20, No. 2, 2025
Journal homepage: https://ue-bulletin.com.ua/en
Received: 26.07.2025. Revised: 19.11.2025. Accepted: 24.12.2025. Published: 26.12.2025

UDC 336.71(477) DOI: 10.69587/ueb/2.2025.37

Statistical assessment of regional asymmetry in bank lending in Ukraine

Andriy Nepran*
PhD in Economic Sciences, Associate Professor
Kharkiv National Automobile and Highway University
61002, 25 Yaroslav Mudryi Str., Kharkiv, Ukraine
https://orcid.org/0000-0002-8329-7123

Abstract. The recovery of economic growth in Ukraine is hampered by the increasing differentiation of bank lending, which creates a number of problems for the state: the emergence of depressed regions, increased social tension, etc. The increase in regional differences in the banking lending system gives rise to centripetal tendencies, which "overlap" with the tendencies of increasing territorial stratification and lead to the emergence of peculiar geographical points with a high concentration of banking resources. The aim of this article was to statistically assess the regional asymmetry of bank lending in Ukraine, as well as to develop the main directions for improving monetary policy in terms of redistributing credit resources in order to reduce the differentiation of bank lending. The study used statistical methods to assess the regional differentiation of bank lending. A statistical analysis of the differentiation of bank lending in Ukraine was conducted. It was found that the process of regional lending is characterised as asymmetric, although in recent years there has been a slowdown in the processes of differentiation of bank lending. Overall, across all regions, the variation in the volume of loans issued to non-financial corporations has steadily decreased from 38.6% in 2021 to 14.1% in 2024. At the same time, a slowdown in regional asymmetry in bank lending was observed for certain types of economic activity. Thus, the coefficient of variation in lending to manufacturing enterprises decreased from 66.1% in 2021 to 31.5% in 2024. A reduction in regional asymmetry in bank lending can be achieved by withdrawing and redistributing credit resources from other regions. According to calculations, the introduction of a 50% standard for lending to trade and real estate transactions in Kyiv could free up an additional UAH 78.0 billion, which is 10.1% of the total volume of loans provided to non-financial corporations in Ukraine. If the standard is reduced from 50% to 30%, the additional amount of credit resources that can be redirected to other regions will increase to UAH 127.8 billion, or 16.5% of the total volume of loans. The results of the study can be used in the development of monetary policy measures to reduce regional differentiation in bank lending to non-financial corporations

Keywords: credit; regional development asymmetry; non-financial corporations; banking system; credit potential of regions; economic equalisation

INTRODUCTION

A characteristic feature of Ukraine's economic development over the past decade has been the intensification of regional asymmetry, which was largely due to the nature of bank lending. The economic consequences of increasing regional asymmetry are becoming increasingly significant and are hindering economic recovery. Regional disparities in bank lending are characteristic of many developed countries around the world. Solving this problem is particularly relevant for Ukraine, where the resumption of bank lending is accompanied by increased regional disparities, which creates a number of complex problems for the state. The consequences of increased regional asymmetry in economic development include the emergence of depressed regions, the need to allocate financial resources for subsidies, and increased social tension in society.

Research into the dynamics of regional differentiation in bank lending reveals the factors that slow down economic recovery. An in-depth analysis of the asymmetry of bank lending across regions makes it possible to identify and develop key measures for the redistribution of

Suggested Citation:
Nepran, A. (2025). Statistical assessment of regional asymmetry in bank lending in Ukraine. *University Economic Bulletin*, 20(2), 37-43. doi: 10.69587/ueb/2.2025.37.

*Corresponding author

credit resources in order to increase the symmetry of regional development. Many Ukrainian researchers have published works devoted to the analysis of bank lending. Research by V. Korneev *et al.* (2024) has established that crises caused by force majeure circumstances require active state intervention to ensure economic stability. O. Dzyubluk (2023) examined the main trends in the functioning of banks in the credit market. The author concluded that credit activity was sluggish and that bank investments were primarily focused on placing funds in accounts with the National Bank of Ukraine (NBU) and in government securities.

The work of M. Barna & N. Ruschyshyn (2020) analyses the dynamics of the banking system's development in the context of structural reform of Ukraine's national economy. N. Rushchyshyn *et al.* (2024) noted that when the banking system's loan portfolio declines, it increases primarily in state-owned banks. Based on an analysis of bank lending to agricultural enterprises by region, S. Andros (2024) identified the regions that received the largest amount of lending. The work of M. Krupka *et al.* (2024) examines the problems of activating lending to large enterprises and measures to activate it. I. Yaroshenko & I. Semigulina (2024) noted the role of bank lending in the recovery of Ukraine's economic development. Many foreign researchers have devoted their work to the problems of regional development and the impact of bank lending on it. In particular, the research of D. Gaur & D. Mohapatra (2021) is devoted to the relationship between economic growth and priority sectors of the national economy. The research of C. Altavilla *et al.* (2023) is devoted to improving the credit policy of banks in response to modern challenges. The financial instability of banks is highlighted in the work of M. Bellia & G. Cousin (2023), P. Bochmann *et al.* (2023), N. Charnay *et al.* (2024) and others.

However, despite the research conducted, the problem of assessing regional asymmetry in bank lending has not been widely addressed. Indicators of the share of regions in the structure of bank loans were mainly used to assess trends. Thus, such indicators do not give an idea of the direction and strength of regional differentiation in bank lending, the intensity and direction of this process. The aim of the study was to identify and quantitatively analyse spatial disparities in bank lending in Ukraine, as well as to determine strategic guidelines for optimising the regional distribution of credit resources.

MATERIALS AND METHODS

To assess regional differentiation in bank lending, statistical indicators were used, in particular, the coefficient of variation, the mean linear deviation, and structural indicators. It should be noted that the mathematical statistics indicators used to determine the differentiation of bank lending, which characterise the change (variation) in individual characteristics, provide different quantitative characteristics of its intensity. This, in turn, requires consideration in the economic interpretation of the results obtained with their help. The work used the coefficient of variation as the main indicator, the value of which characterises the increase or decrease in the variation of regional indicators of bank lending to economic entities from the average for Ukraine. It was calculated using the formula:

$$V_{VAR}^{t} = \frac{1}{\bar{x}^{t}} \sqrt{\frac{\sum (x^{t} - \bar{x}^{t})^{2}}{n}} \cdot 100\ \%, \quad (1)$$

where V^{τ}_{VAR} – coefficient of variation in year t; $\bar{x}^{t}$ – average growth rate of bank lending in Ukraine in year t; x^{t} – growth rate of bank lending in the region in year t; n – number of regions.

In addition to the coefficient of variation, the mean linear deviation, mean square deviation and variance of bank lending were calculated to assess the asymmetry of bank lending. The disadvantage of the mean linear deviation is that it does not take into account the signs of deviation. In this regard, preference was given to the coefficient of variation. Data from the National Bank of Ukraine website (n.d.) were used to calculate the indicators of variation in bank lending (coefficient of variation, mean linear deviation, variance, and mean square deviation). Based on this data for the last five years, the growth rate of bank loans by region and for Ukraine as a whole was determined. These data were used to calculate the variation indicators. By comparing the values of the coefficient of variation for individual periods, the strength of regional differentiation in bank lending in Ukraine was established. An increase in the coefficient of variation indicated a strengthening of regional differentiation in bank lending, while a decrease indicated a weakening. The following approach was used to study regional stratification trends. Asymmetric, or disharmonious, regional development over a given period is considered to be in which regions that had advantages in certain indicators at the beginning of the period subsequently increased them, while regions with relative lagging behind increased their lag; symmetrical (harmonious) – a type of regional development in which the gap in regional indicators is narrowing.

To assess regional differentiation in bank lending, the coefficient of variation was used as the main indicator, the value of which indicates an increase or decrease in regional differences from the average for Ukraine. It was calculated using the formula V. Horkavyi (2019):

$$V_{\sigma} = \frac{\sigma_{x}}{\bar{x}} \cdot 100\ \%, \quad (2)$$

where σ_{x} – standard deviation of regional bank lending indicators from the average level; $\bar{x}$ – average growth rates of credit investments across all regions of the country.

After establishing the level of regional differentiation in bank lending based on statistical methods, the problem arose of finding ways to eliminate or neutralise it. When calculating the volume of loans that could be redirected to regions with low levels of lending activity, indicators of the structure of loans by type of economic activity were used. These indicators should form the basis for setting lending standards (maximum values) for specific types of economic activity, i.e., these are the maximum indicators for bank

lending. Restrictions on lending to these types of economic activity should be set by the National Bank of Ukraine as the main regulator of the country's banking system. The amount of loans that can be redirected to regions with low credit activity was determined as the difference between the actual volume of lending and the volume of lending established on the basis of the standard. At the same time, calculations were made for different values of the standard. These standard indicators for lending to certain types of economic activity make it possible to assess the scale of the redistribution of bank loans to regions with low levels of lending activity.

RESULTS AND DISCUSSION

Economic recovery in Ukraine is impossible without providing businesses with affordable bank loans. To a large extent, the real sector of the economy is financed by bank loans, which are the most powerful segment of the capital market in terms of volume and accessibility. The total volume of loans provided to non-financial corporations increased from UAH 752.3 billion in 2021 to UAH 786.1 billion at the end of October 2024, or by 4.5% (National Bank of Ukraine, n.d.). At the same time, the recovery of bank lending is accompanied by increased regional differentiation. The intensification of regional differences in the bank loan market generates centrifugal tendencies, which exacerbates territorial stratification and leads to the emergence of several territories with a high concentration of banking resources. In recent years, a number of regions with a high concentration of bank credit have emerged in Ukraine in terms of lending to business entities. The extent of the intensification of regional differentiation in bank lending is shown in Table 1.

Table 1. Share of Ukrainian regions in loans granted to non-financial corporations as of the end of October 2024, %

Regions	Total	Including				
		agriculture, forestry and fisheries	manufacturing	construction	trade	real estate transactions
All regions of the country – total	100	100	100	100	100	100
Including in Kyiv and Kyiv region	65.5	32.9	44.8	71.0	75.9	87.4
Dnipropetrovsk region	4.2	5.9	8.1	2.9	3.7	0.5
Lviv region	5.4	6.5	8.5	6.2	4.4	4.0
Total in 3 regions	75.1	45.3	61.4	80.1	84.0	91.9
In other regions of Ukraine	24.9	54.7	38.6	19.9	16.0	8.1

Source: calculated by the author based on data National Bank of Ukraine (n.d.)

According to the data, three regions of Ukraine (Kyiv and Kyiv region, Dnipropetrovsk and Lviv regions) accounted for 75.1% of all bank loans granted to non-financial corporations. A particularly high concentration of bank loans was observed in construction (80.1%), real estate transactions (91.9%) and trade (84.0%). The remaining regions accounted for between 8.1% and 38.6% of the total volume of loans granted to business entities. Among the types of economic activity, only agriculture is characterised by a relatively lower level of concentration of bank lending. From the data in Table 1, it can be concluded that a small group of regions has a high level of concentration of bank lending. Kyiv stands out in this regard, where the concentration of banking capital is enormous. At the same time, the concentration of banking capital in a small group of centres is a consequence of the asymmetry of modern regional lending to entities in the real sector of the economy.

To study the intensity and strength of regional differentiation in bank lending to non-financial corporations, various mathematical statistics indicators can be used, such as range of variation, mean linear deviation, mean square deviation, and coefficient of variation. The use of these mathematical statistics indicators provides different quantitative characteristics of its intensity. This must be taken into account when interpreting the results obtained during data processing. The banking lending market in Ukraine is characterised by deep regional differentiation in terms of the volume of loans provided to non-financial corporations. The crisis of 2022-2023 led to a large-scale redistribution of bank lending operations between regions, resulting in increased differentiation in bank lending (Table 2).

Table 2. Dynamics of indicators characterising fluctuations (variation) in loans issued to non-financial corporations in 2021-2024

Indicators	2021	2022	2023	2024
Variance	1,607.4	1,047.3	267.0	219.1
Standard deviation	40.1	32.4	16.3	14.8
Average growth rate	103.9	100.3	97.5	105.3
Coefficient of variation	38.6	32.3	16.8	14.1
Mean linear deviation	24.0	25.0	12.2	11.6

Source: calculated by the author

There is a clear trend towards regional asymmetry, although this trend has slowed down in recent years. The coefficient of variation in the growth of bank lending to non-financial corporations, calculated for all regions of the country, is quite high. Overall, the variation in the volume of loans issued to non-financial corporations has steadily decreased from 38.6% in 2021 to 14.1% in 2024. This indicates a slowdown in the processes of regional asymmetry in bank lending. For certain types of economic activity, the process of differentiation in bank lending showed significant differences (Table 3).

Table 3. Dynamics of indicators characterising fluctuations (variation) in loans by type of economic activity in 2021-2024

	2021	2022	2023	2024
Manufacturing industry				
Variance	3,353.6	785.0	781.4	1,727.8
Standard deviation	57.9	28.0	28.0	41.6
Average growth rate	87.7	85.9	87.1	131.8
Coefficient of variation	66.1	32.6	32.1	31.5
Mean linear deviation	24.0	21.5	22.1	34.3
Wholesale and retail trade; repair of motor vehicles and motorcycles				
Variance	1,965.4	1,758.9	711.0	546.2
Standard deviation	44.3	41.9	26.7	23.4
Average growth rate	112.6	96.1	102.3	107.6
Coefficient of variation	39.4	43.7	26.1	21.7
Mean linear deviation	24.0	22.5	22.1	17.6
Transport, warehousing, postal and courier activities				
Variance	32,002.5	2,275.5	4,530.2	4,184.3
Standard deviation	178.9	47.7	67.3	64.7
Average growth rate	89.9	78.6	103.7	105.8
Coefficient of variation	199.1	60.7	64.9	61.1
Mean linear deviation	24.0	35.4	49.6	41.0

Source: calculated by the author

An analysis of the data in Table 3 suggests that regional asymmetry in bank lending declined for certain types of economic activity. Thus, the coefficient of variation in lending to manufacturing enterprises decreased from 66.1% in 2021 to 31.5% in 2024. Significant differences in bank lending were observed in trade and transport enterprises. At the same time, there were no significant changes in reducing the variation in bank lending to these types of economic activity. While in 2021 the coefficient of variation in bank lending to transport companies was 199.1%, in 2024 it decreased to 61.1%. Thus, the process of restoring bank lending in Ukraine took place simultaneously with a slowdown in regional asymmetry. However, an analysis of the differentiation of bank lending by type of economic activity showed a strengthening of the trend of regional asymmetry.

The main problem causing interregional disparities in bank lending is the significant borrowing by non-financial corporations in Kyiv and several economically developed regions, accompanied by slow growth or decline in the provinces. The analysis makes it possible to identify the factor that slows down the country's economic recovery: the intensification of regional asymmetry in bank lending. In order to eliminate interregional imbalances, it is necessary to take a number of measures to improve state regulation of the country's banking system (Krylova, 2020). Stimulus measures will not be able to quickly remedy the situation, which will continue to deteriorate. The only possible solution should be the introduction of restrictions by the National Bank of Ukraine on lending in Kyiv to entities engaged in certain types of economic activity. This primarily concerns trade and real estate transactions. Restrictions on lending to these types of economic activity are related to a number of factors. First, these types of economic activity do not create a material form of product, and their activity is related to purchase and sale transactions. Secondly, lending to trade largely involves imported goods (household appliances, cars, etc.), which does not directly lead to economic growth. Thirdly, the concentration of bank lending for real estate transactions in Kyiv has exacerbated the trend towards rising real estate prices. Reducing bank lending for these types of economic activity will allow significant amounts of credit resources to be redirected to other regions (Table 4).

Table 4. Volumes of credit resources that can be redirected by introducing restrictions on lending to trade and real estate transactions (2024)

Indicators	Actual, 2024	Introduction of the standard, %		
		40	30	20
Total volume of loans	498,360.5	420,363.8	395,445.7	370,527.7
Including:				
wholesale and retail trade; repair of motor vehicles and motorcycles, million UAH	232,811.4	167,337.8	146,420.5	125,503.3

Table 4. Continued

Indicators	Actual, 2024	Introduction of the standard, %		
		40	30	20
real estate transactions, million UAH	44,529.5	32,006.4	28,005.6	24,004.8
Volume of resources released upon introduction of standards, million UAH	–	77,996.7	102,914.8	127,832.8
Also, as a percentage of the total volume of loans provided to non-financial corporations	–	10.1	13.3	16.5

Source: calculated by the author

According to calculations, introducing a 50% standard for lending to trade and real estate transactions in Kyiv could free up an additional UAH 78.0 billion, which is 10.1% of the total volume of loans provided to non-financial corporations in Ukraine. If the standard is reduced from 50% to 30%, the additional amount of credit resources that can be redirected to other regions will increase to UAH 127.8 billion, or 16.5% of the total volume of loans. This amount of additional credit investments will allow other regions to double lending and increase investment, which will reduce regional asymmetry in economic development.

To assess the directions of differentiation in bank lending, the concept of asymmetric (convergence) and symmetric (divergence) types of regional development is used (Nechyporenko *et al.*, 2021; Couaillier *et al.*, 2023). Asymmetric is a type of regional development in which regions with relative advantages increase them, while regions with relative lag, on the contrary, intensify them; harmonious (symmetric) is a type of regional development in which the gap in regional indicators is reduced. The study by T. Yevenko (2021) examines the mechanism of short-term bank lending. V. Kremen *et al.* (2020) conclude that loans with a maturity of up to one year predominate in the structure of bank lending, which does not sufficiently contribute to economic development. In order to stimulate bank lending, D. Hladkykh (2020) proposes introducing a new economic standard that would limit the share of bank assets invested in domestic government bonds to 10-15% of total assets. Studying the dynamics of bank lending, I. Okhrimenko & V. Biloshapka (2022) noted that in recent years, banks have been characterised by a slowdown in lending until "better times". This has a negative impact on the development of the real sector of the economy. A. Shchetinin *et al.* (2021) conclude that the reduction in the volume of bank lending to the national economy is a restraining factor in ensuring the country's sustainable economic development. In a study, A. Meshcheryakov *et al.* (2024) noted an increase in the profitability of bank capital, which rose to 31.61% in January 2024.

Thus, the results of the study indicate the existence of persistent regional asymmetry in bank lending in Ukraine, which persists despite the overall growth in credit investments in the non-financial sector. The highest concentration of loans is observed in Kyiv and several economically developed regions, while other territories remain insufficiently covered by bank financing. Despite a slight decrease in variation coefficients in recent years, regional disparities remain significant, especially in certain types of economic activity. This points to the need to introduce state regulation tools, in particular restrictions on lending to certain types of activities in regions with excessive concentration of banking capital, which will ensure a more even distribution of financial resources and contribute to the harmonious development of the regional economy.

CONCLUSIONS

In recent years, an asymmetrical type of bank lending has developed in Ukraine. The differentiation in lending to transport and trade enterprises has become particularly pronounced, as evidenced by high correlation coefficients. The main problem with the increasing differentiation of bank lending is the high concentration of banks' lending operations in trade and real estate transactions in several regions of the country. The main reason for the high level of concentration of bank lending in these segments is the relatively high profitability and speed of capital turnover. The negative consequences of such a high level of concentration of bank capital in these types of economic activity are a decline in investment activity and the renewal of the material and technical base of enterprises in the real sector of the economy in regions with low levels of lending activity. To overcome the negative trends of increasing regional asymmetry in bank lending, the National Bank of Ukraine may introduce measures to restrict lending to trade and real estate transactions in Kyiv. The results of the study show that the state's monetary policy needs to be adjusted. With the introduction of a 50% standard, the volume of credit resources that can be released and directed to other regions amounts to UAH 78.0 billion. If the standard is reduced to 30%, an additional UAH 127.8 billion could be redistributed. This would enable other regions to significantly increase lending to non-financial corporations, which would reduce regional asymmetry in Ukraine's economic development. In order to support regional lending, the state may introduce state guarantee instruments and preferential lending programmes for enterprises in agriculture, industry and construction. Further research should focus on the economic evaluation of the effectiveness of redistributing credit resources in favour of regions with low credit activity.

ACKNOWLEDGEMENTS

None.

FUNDING

The study did not receive funding.

CONFLICT OF INTEREST

None.

REFERENCES

[1] Altavilla, C., Barbiero, F., Boucinha, M., & Burlon, L. (2023). The great lockdown: Pandemic response policies and bank lending conditions. *European Economic Review*, 156, article number 104478. doi: 10.1016/j.euroecorev.2023.104478.

[2] Andros, S.V. (2024). Bank lending as an effective way to solve the problem of economic development of agricultural enterprises. *Economic Journal Odessa Polytechnic University*, 1(27), 5-17. doi: 10.15276/EJ.01.2024.1.

[3] Barna, M., & Ruschyshyn, N. (2020). State and trends in the banking system development in the context of structural reform of the national economy of Ukraine. *Scientific Horizons*, 23(12), 84-98. doi: 10.48077/scihor.23(12).2020.84-98.

[4] Bellia, M., & Cousin, G. (2023). Drivers of bank profitability in the euro area. *Quarterly Report on the Euro Area*, 22(3), 7-23. doi: 10.2765/85502.

[5] Bochmann, P., Grodzicki, M., Kick, H., Klaus, B., & Pancaro, C. (2023). *Euro area bank fundamentals, valuations and cost of equity*. Retrieved from https://www.ecb.europa.eu/press/financial-stability-publications/fsr/focus/2023/html/ecb.fsrbox202311_05~519e436375.en.html.

[6] Charnay, N., Edwards, G., & Kroll, K. (2024). *Top European bank rating trends in 2024*. Retrieved from https://www.spglobal.com/_assets/documents/ratings/research/101592285.pdf.

[7] Couaillier, C., Dimou, M., & Parle, C. (2023). Banks' capital distributions and implications for monetary policy. *European Central Bank Economic Bulletin*, 6.

[8] Dzyublyuk, O. (2023). Problems of intensification of bank lending to the real sector of the economy in the conditions of martial law. *Bulletin of Economy*, 3, 8-25. doi: 10.35774/visnyk2023.03.008.

[9] Gaur, D., & Mohapatra, D.R. (2021). The nexus of economic growth, priority sector lending and non-performing assets: Case of Indian banking sector. *South Asian Journal of Business Studies*, 10(1), 70-90. doi: 1108/SAJBS-01-2020-0010.

[10] Hladkykh, D.M. (2020). *Priorities for the activation of bank lending in Ukraine*. Kyiv: National Institute for Strategic Studies.

[11] Horkavyi, V.K. (2019). *Statistics* (3rd ed.). Kyiv: Alerta.

[12] Korneev, V., Zabchuk, G., Ivashchuk, O., Vynnyk, T., & Rudan, V. (2024). Comparative analysis of bank lending to Ukrainian enterprises in wartime. *Financial and Credit Activity Problems of Theory and Practice*, 6(59), 11-23. doi: 10.55643/fcaptp.6.59.2024.4533.

[13] Kremen, V.M., Kremen, O.I., & Gulyaeva, L.P. (2020). The role of bank lending in the development of the economy of Ukraine. *Problems of Economy*, 3(45), 176-183. doi: 10.32983/2222-0712-2020-3-176-183.

[14] Krupka, M., Vankovych, D., & Kulchytskyi, M. (2024). Bank lending to priority sectors of the economy in the mechanism of implementing the financial policy of Ukraine. *Economy and Society*, 60. doi: 10.32782/2524-0072/2024-60-21.

[15] Krylova, O.V. (2020). Experience and features of the functioning of the banking system of the EU countries and Ukraine in the context of globalization. *Economy and State*, 4, 117-120. doi: 10.32702/2306-6806.2020.4.117.

[16] Meshcheryakov, A.A., Berezovyk, V.M., & Kireeva, K.O. (2024). Financial stability and the banking system of Ukraine: Challenges and opportunities for development. *Effective Economy*, 7. doi: 10.32702/2307-2105.2024.7.12.

[17] National Bank of Ukraine. (n.d.). *Statistics of the financial sector*. Retrieved from https://bank.gov.ua/ua/statistic/sector-financial#1ms.

[18] Nechyporenko, O., Nosenko, Yu., & Sinelnyk, L. (2021). Potential areas of financial incentives for the development of scientific and innovation clusters. *Ekonomika APK*, 28(10), 61-71. doi: 10.32317/2221-1055.202110061.

[19] Okhrimenko, I., & Biloshapka, V. (2022). The impact of bank lending on the economic development of Ukraine: Realities and prospects against the backdrop of war. *Scientific Innovations and Advanced Technologies*, 6(8), 405-423. doi: 10.52058/2786-5274-2022-6(8)-405-423.

[20] Rushchyshyn, N.M., Pelekh, O.R., Kozak, A.R., & Kryvoruchko, N.M. (2024). Current state of the banking system of Ukraine and prospects for its development. *Bulletin of the Lviv University of Trade and Economics. Economic Sciences*, 75, 27-37. doi: 10.32782/2522-1205-2024-75.

[21] Shchetinin, A.I., Ulianova, L.P., & Chaika, Yu.M. (2021). The banking system of Ukraine and ensuring its stability in the conditions of modern development. *Scientific View: Economics and Management*, 5(75), 75-82. doi: 10.32836/2521-666X/2021-75-10.

[22] Yaroshenko, I.V., & Semigulina, I.B. (2024). Factors influencing the socio-economic development of regions (territories) of Ukraine in conditions of threats and overcoming the consequences of military aggression. *Problems of Economy*, 3(61), 142-148. doi: 10.32983/2222-0712-2024-3-142-148.

[23] Yevenko T.I. (2021). Short-term bank lending mechanism. *East European Scientific Journal*, 3(67), 39-44.

Статистична оцінка регіональної асиметрії банківського кредитування в Україні

Андрій Непран
Кандидат економічних наук, доцент
Харківський національний автомобільно-дорожній університет
61002, вул. Ярослава Мудрого, 25, м. Харків, Україна
https://orcid.org/0000-0002-8329-7123

Анотація. Відновлення економічного зростання в Україні стримується посиленням диференціації банківського кредитування, що породжує ряд проблем для держави: виникнення депресивних регіонів, посилення соціальної напруги тощо. Збільшення регіональних відмінностей у системі банківського кредитування народжує доцентрові тенденції, які «накладаються» на тенденції посилення територіального розшарування і ведуть до виникнення своєрідних географічних пунктів із високою концентрацією банківських ресурсів. Метою даної статті була статистична оцінка регіональної асиметрії банківського кредитування в Україні, а також розробка основних напрямів удосконалення монетарної політики з точки зору перерозподілу кредитних ресурсів у напрямі зниження диференціації банківського кредитування. В дослідженні застосовані статистичні методи для оцінки регіональної диференціації банківського кредитування. Проведено статистичний аналіз диференціації банківського кредитування в Україні. Встановлено, що процес регіонального кредитування характеризується як асиметричний, хоча за останні роки спостерігається уповільнення процесів диференціації банківського кредитування. В цілому за усіма областями варіація обсягів кредитів, виданих нефінансовим корпораціям, послідовно знижувалася із 38,6 % у 2021 р. до 14,1 % у 2024 р. В той же час за окремими видами економічної діяльності спостерігалося уповільнення регіональної асиметрії банківського кредитування. Так, коефіцієнт варіації кредитування підприємств переробної промисловості знизився із 66,1 % у 2021 р. до 31,5 % у 2024 р. Зниження регіональної асиметрії банківського кредитування може бути досягнуто за рахунок вилучення та перерозподілу кредитних ресурсів із інших регіонів. Як свідчать розрахунки, при введенні нормативу в розмірі 50 % на кредитування торгівлі та операцій з нерухомим майном в м. Києві можна додатково вивільнити 78,0 млрд грн, що становить 10,1 % від загального обсягу кредитів, наданих нефінансовим корпораціям України. При зниженні нормативу з 50 до 30 % додатковий обсяг кредитних ресурсів, який може бути перенаправлено в інші регіони, зросте до 127,8 млрд грн, або 16,5 % від загального обсягу кредитів. Результати дослідження можуть бути використані при розробці заходів монетарної політики щодо зниження регіональної диференціації банківського кредитування нефінансових корпорацій

Ключові слова: кредит; асиметрія регіонального розвитку; нефінансові корпорації; банківська система; кредитний потенціал регіонів; економічне вирівнювання

University Economic Bulletin
Vol. 20, No. 2, 2025
Journal homepage: https://ue-bulletin.com.ua/en
Received: 28.06.2025. Revised: 30.11.2025. Accepted: 24.12.2025. Published: 26.12.2025

UDC 004.8:336.71:658.812(669) DOI: 10.69587/ueb/2.2025.44

Artificial intelligence and customer satisfaction in the Nigerian banking sector

Oluwayomi Omotayo Olota*
PhD in Business Administration
University of Ilorin
240003, 1 University Rd., Ilorin, Nigeria
https://orcid.org/0009-0008-6633-9919

Olatunde Nathaniel Akinkunmi
Master of Sciences in Business Administration
University of Ilorin
240003, 1 University Rd., Ilorin, Nigeria
https://orcid.org/0009-0005-3414-1236

Ebenezer Oluwadamilare Balogun
Master of Sciences in Business Administration
University of Ilorin
240003, 1 University Rd., Ilorin, Nigeria
https://orcid.org/0000-0003-0419-188X

Abstract. The integration of artificial intelligence (AI) into the banking sector has transformed customer satisfaction, particularly through innovations such as digital payment services and smart banking solutions. Hence, this study aimed to examine the effect of artificial intelligence on customer satisfaction in the banking sector. The specific objectives were to investigate the effect of digital payment systems on service reliability in the banking sector and the impact of smart banking solutions on digital support responsiveness within the banking sector. A descriptive survey research design was employed for the study, and a simple random sampling technique was adopted. The sample size was determined using T. Yamane's sample size determination formula. Data obtained through a questionnaire were analysed using PLS-SEM through SmartPLS. The findings revealed that digital payment systems positively and significantly affect service reliability in the banking sector – secure fund transfer ($\beta = 0.379$, $T = 6.962$, $p = 0.000$) and instant payment confirmation ($\beta = 0.367$, $T = 1.942$, $p = 0.057$). Smart banking solutions positively and partially significantly affect digital support responsiveness in the banking sector – automated account management ($\beta = 0.965$, $T = 41.759$, $p = 0.000$) and personalised financial insights ($\beta = -0.104$, $T = 1.209$, $p = 0.084$). It was concluded that artificial intelligence positively influences customer satisfaction in selected banks across Nigeria. The findings of this study hold practical value for the Nigerian banking sector, as they highlight how AI technologies can be effectively applied to enhance customer satisfaction and loyalty. Bank executives, digital strategy developers, and customer service managers can use these insights to guide investments in personalised AI solutions, real-time support systems, and intelligent service automation, thereby strengthening long-term customer relationships

Keywords: digital payment system; smart banking solution; digital support responsiveness; service reliability; customer loyalty

INTRODUCTION

The study of artificial intelligence and customer satisfaction in the Nigerian banking sector is justified by the growing eliance on digital technologies to enhance service delivery and strengthen competitiveness. Nigerian banks ncreasinglyintegrate AI-driven solutions such as chatbots, roboadvisers, fraud detection systems, and personalised financial

Suggested Citation:
Olota, O.O., Akinkunmi, O.N., & Balogun, E.O. (2025). Artificial intelligence and customer satisfaction in the Nigerian banking sector. *University Economic Bulletin*, 20(2), 44-56. doi: 10.69587/ueb/2.2025.44.

*Corresponding author

recommendations to improve efficiency and meet evolving customer expectations. In a market characterised by rising customer demands, financial inclusion goals, and intense competition, AI offers banks the ability to deliver faster, more accurate, and more tailored services that directly influence satisfaction levels. Furthermore, in the context of rapid digital transformation across Africa, examining the link between AI adoption and customer satisfaction provides valuable insights into how banks can leverage technology to build trust, loyalty, and long-term customer relationships.

The application of state-of-the-art technologies in service delivery has redefined the interaction between financial institutions and their clientele, especially in emerging economies. In Nigeria, the drive for innovation has become a strategic response to rising customer expectations and operational challenges. The author C. Gabriel-Okwuchi (2025) concluded that technological innovation in banking plays a pivotal role in enhancing customer experience, improving efficiency, and maintaining a competitive advantage. He also argued that modern technologies help to address long-standing challenges such as transaction delays, limited accessibility, and ineffective grievance mechanisms. Supporting this view, N. Dhiman *et al.* (2023) found that the integration of digital tools into banking operations enhances client experiences, particularly in terms of faster resolution of queries and overall service quality. Collectively, these studies emphasise that technology is no longer optional for Nigerian banks but a necessity for survival and growth.

This digitalisation trend has been accelerated by the growing penetration of smartphones and increased internet access across Nigeria. E. Ukpe (2025) concluded that the use of intelligent algorithms enables banks to predict customer needs and proactively offer relevant solutions, creating a more personalised banking experience. In addition, S. Akinepalli (2024) highlighted that automation reduces human error, a common source of frustration in traditional banking. Together, these findings illustrate how AI-based solutions are not only enhancing convenience but also addressing financial inclusivity in the Nigerian banking landscape.

Client expectations continue to evolve, pushing financial institutions to view loyalty and engagement as dynamic rather than static. M. Katragadda (2025) concluded that predictive analytics allow banks to anticipate client needs even before they are expressed, thereby strengthening customer satisfaction. Similarly, S. Agarwal *et al.* (2022) found that chatbots and virtual assistants have become increasingly popular because they efficiently manage routine enquiries and deliver instant responses. Reinforcing this perspective, Y. Chikaipa *et al.* (2025) observed that customers engaging with automated systems reported higher satisfaction levels due to the immediacy and consistency of support. However, J. Blümel *et al.* (2024) cautioned that excessive dependence on automation can result in impersonal experiences when addressing complex issues, indicating that banks must balance efficiency with empathy.

On the one hand, smart banking solutions employ AI and automation to gain efficiency; on the other hand, inefficiencies in digital support often cause customer dissatisfaction. A. Uzoka *et al.* (2024) concluded that although AI-powered chatbots and helpdesks enhance efficiency, they struggle to resolve complex issues, leading to prolonged grievance processes. Similarly, J.-C. Lee & X. Chen (2022) found that over 40% of smart banking app users reported delayed resolutions due to ineffective AI responses, which had a direct negative effect on satisfaction. To address this gap, V. Nagubathula (2025) argued for hybrid support models that combine AI efficiency with human oversight, ensuring responsiveness, empathy, and overall customer trust.

Specifically, the objectives of this study were: to determine the effect of digital payment systems on service reliability and to investigate the influence of smart banking solutions on digital support responsiveness. This study aimed to examine how artificial intelligence, through digital payment systems and smart banking solutions, influences service reliability and digital support responsiveness in the Nigerian banking sector.

LITERATURE REVIEW

Artificial intelligence (AI) is the simulation of human intelligence in machines that are programmed to think, learn, and perform tasks typically carried out by humans. This includes natural language processing, pattern recognition, decision-making, and visual perception (Enholm *et al.*, 2022). AI can generally be categorised into narrow AI, which focuses on solving specific tasks such as voice assistants or recommendation systems, and general AI, which seeks to emulate broader human cognitive capabilities (Fjelland, 2020). However, general AI remains largely theoretical. Narrow AI has gained wide-ranging applications across industries such as banking, healthcare, and retail, where it performs functions including fraud detection, customer personalisation, and predictive analytics (Jan *et al.*, 2023). With advancements in AI, the faster an AI system learns and adapts to new data, the more efficient and useful it becomes, leading to an expansion of its applications across multiple sectors.

With its rapid growth and widespread application, AI poses certain ethical dilemmas that require attention. Issues of transparency, job displacement, and data privacy have become increasingly significant as AI becomes embedded in daily life and business operations (Al-Kfairy *et al.*, 2024). AI holds great promise for transforming industries through process automation, improved decision-making, and optimised performance, yet its social implications must be carefully considered. In sectors such as education, healthcare, and finance, AI has already revolutionised service delivery and enhanced operational efficiency. However, the ethical concerns associated with large-scale AI adoption require ongoing research and a focus on responsible implementation for societal benefit (Huang *et al.*, 2022).

Customer satisfaction (CS) is defined as the degree to which customers' expectations of a product, service, or brand experience are met or exceeded. N. Rane *et al.* (2023)

state that CS is a key determinant of customer retention, loyalty, and the long-term success of any business, as it reflects how effectively a company's offerings meet customer needs. Customer satisfaction involves both rational evaluations of product or service quality and emotional responses that contribute to overall fulfilment. It is dynamic rather than static and evolves with factors such as product and service quality, after-sales support, and brand interaction (D. Lestari *et al*., 2025). A. Aziz (2025) emphasises the importance of post-purchase satisfaction, noting that events occurring after purchasing – from delivery time to customer support – play a crucial role in shaping customer perceptions. Furthermore, according to expectancydisconfirmation theory, customer satisfaction occurs when actual performance exceeds expectations. In the current era of intense market competition, systematic monitoring through customer feedback and CS surveys supports data-driven decision-making. The relationship between CS and organisational performance has been extensively researched; studies have shown that satisfied customers are more likely to repurchase and recommend brands to others, reflecting both their positive experiences and sustained loyalty (Otto *et al*., 2020).

The integration of AI into customer service is reshaping interactions between businesses and consumers, thereby enhancing customer satisfaction. Artificial intelligence employs methods such as machine learning, natural language processing, and predictive analytics to improve customer interaction, expedite service delivery, and anticipate customer needs. AI-driven systems are efficient, responsive, and personalised in nature (Huang *et al*., 2022; Lestari *et al*., 2025). Consequently, customer satisfaction results directly from the deliberate use of these intelligent systems. The speed, personalisation, and accuracy of AI-enabled services contribute to customers' perceptions of value and service quality (AlKfairy *et al*., 2024; Aziz, 2025).

AI is crucial in improving service speed and precision, ultimately enhancing customer satisfaction. A chatbot, for example, can provide round-the-clock assistance with minimal waiting time for customers. Handling queries in this way results in greater client satisfaction and retention (Fjelland, 2020; Rane *et al*., 2023). Predictive analytics further enhances satisfaction by enabling companies to foresee customer preferences through AI and address potential issues proactively to provide a seamless experience and anticipate client needs. The ability to personalise interactions through AI-client data networks in product recommending fosters a more engaging and fulfilling experience, which, in turn, strengthens trust and confidence (Otto *et al*., 2020; Enholm *et al*., 2022).

The adoption of digital payment systems has considerably enhanced service reliability by reducing delays associated with manual processing and minimising human error. Studies indicate that digital payment platforms meet the transactional demand for faster and more secure financial operations, thereby instilling greater confidence and satisfaction among customers (Khiaonarong *et al*., 2021). These systems are distinguished by their use of robust encryption and fraud detection mechanisms that prevent payment fraud, thus enhancing the overall reliability of financial services (Odio *et al*., 2025). Further research shows that organisations implementing digital payment systems experience fewer service interruptions than their cash-based counterparts, as cash transactions face physical limitations such as shortages or restricted availability (Sravan *et al*., 2024). This shift towards digital payments has been a major advantage in emerging markets, where banking infrastructure has traditionally faced obstacles that hindered financial inclusion (Dutta *et al*., 2024). Consequently, financial service availability and consistency have improved significantly.

Smart banking solutions, driven by machine learning and artificial intelligence, have transformed digital support responsiveness by offering real-time customer service and predictive problem resolution. These technologies enable banks to review customer queries in real time and provide timely, accurate feedback, thereby improving the user experience (Epstein & Quinn, 2020). For instance, AI-powered chatbots and virtual assistants have reduced customer waiting times by up to 70%, making service delivery highly efficient (Lee & Chen, 2022). Smart banking systems also use big data to predict customer requirements and act proactively before issues arise, thereby eliminating service delays (Nagubathula, 2025). Empirical evidence shows higher customer retention among financial institutions that adopt such technologies, owing to improved interaction quality and faster issue resolution (Agustiawan, 2024). These technologies have also enabled 24/7 customer support, removing traditional banking-hour restrictions and ensuring uninterrupted access to financial services (Uzoka *et al*., 2024).

The expectancy-disconfirmation theory (EDT) proposed by R. Oliver (1977) defines customer satisfaction as a comparison between expected and perceived performance before and after purchase. The theory assumes that satisfaction results from positive disconfirmation (better-than-expected performance) and dissatisfaction from negative disconfirmation (worse-than-expected performance). It suggests that customers consciously set expectations and rationally compare their service experiences against them. A criticism of EDT is that it oversimplifies satisfaction by excluding emotional and cultural factors (Lilliengren *et al*., 2016).

EDT accurately explains the application of AI in customer satisfaction within the Nigerian banking sector, where AI technologies (e.g. chatbots and fraud detection applications) must meet users' expectations to enhance satisfaction. Evidence shows that when expectations are met by AI services – such as faster transactions and continuous availability – customer satisfaction increases, whereas performance gaps lead to dissatisfaction (Prentice *et al*., 2020). Research by F. Alnaser *et al.* (2023) demonstrates that integrating AI features into digital banking applications, including problem-solving capabilities, visual appeal, innovation, communication quality, and customisation, positively influences customer satisfaction through expectation confirmation. This aligns well with EDT's focus on

expectation-performance evaluation and supports its application in analysing AI-driven satisfaction dynamics in Nigeria's banking sector through a systematic comparison of expectation-performance gaps.

MATERIALS AND METHODS

The study employed a descriptive survey design to assess the impact of artificial intelligence on customer satisfaction within Nigeria's banking sector. The design was appropriate, as it enabled the researcher to describe and quantify existing service delivery processes supported by AI technologies within the banking system. The study focused on five major commercial banks in Nigeria – Zenith Bank, Access Bank, First Bank, GTBank, and UBA – due to their extensive customer bases, high levels of digital adoption, and early integration of artificial intelligence in service delivery. These banks represented a balanced mix of innovation leadership, customer interaction points, and nationwide presence, making them suitable cases for assessing AI's role in enhancing customer satisfaction.

The target population comprised active customers of the principal branches of the five banks in Kwara State. Their estimated combined customer base was 20,000 across the principal branches in Ilorin, Offa, and Omu-Aran. A sample size of 377 respondents was determined using T. Yamane's (1967) formula for a known population, with a margin of error of less than 5%, ensuring statistical representativeness and generalisability of the results. The study was conducted in 2025 to capture recent trends in AI adoption and customer satisfaction in the Nigerian banking industry. It adhered to established ethical standards, including informed consent from all participants, voluntary participation without coercion, and confidentiality and anonymity of respondents' data. Ethical approval was obtained in accordance with the American Sociological Association's Code of Ethics (2018) to ensure compliance throughout the data collection process.

Participants were selected using purposive-proportional sampling, ensuring proportional representation across the selected banks relative to customer population size and digital service usage. Data were collected using a structured questionnaire. The validity of the instrument was confirmed through expert review and construct validation, while reliability was assessed using Cronbach's alpha and composite reliability (CR) in SmartPLS version 3.2.2, with thresholds of 0.6 and above. Descriptive statistics (mean and standard deviation) and inferential statistics were employed, with partial least squares structural equation modelling (PLS-SEM) used to analyse the structural relationship between artificial intelligence deployment and customer satisfaction among the sampled banks.

Hypothesis I

Ho_1: The digital payment system did not have a significant effect on service reliability.

A multivariate regression model was used to relate the independent variables to the dependent variable as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3$$
$$Y = \beta_0 + \beta_1 + \beta_2 + \beta_3,$$

where Y is the dependent variable (service reliability); X_1, X_2 and X_3 are the independent variables; X_1 is the secure fund transfer; X_2 is the instant payment confirmation; B_0 is the constant.

Hypothesis II

Ho_2: Smart banking solutions had no significant effect on digital support responsiveness.

A multivariate regression model was used to relate the independent variables to the dependent variable as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3$$
$$Y = \beta_0 + \beta_1 + \beta_2 + \beta_3,$$

where Y is the dependent variable (digital support responsiveness); X_1, X_2 and X_3 are the independent variables; X_1 is the personalised financial insights; X_2 is the automated account management; B_0 is the constant.

This methodology combined representative sampling of 377 banking customers, validated and reliable instruments, adherence to ethical standards, and the application of PLS-SEM to examine AI's impact on customer satisfaction in the Nigerian banking sector through multivariate regression analysis.

RESULTS AND DISCUSSION

In this study, 391 questionnaires were administered to obtain the required data from the selected respondents. A total of 321 valid responses were received and considered suitable for analysis. This indicates that 70 questionnaires were discarded due to incomplete responses, failure to meet the criteria set by the researcher, or non-response. Hence, the 321 valid questionnaires were used for subsequent analysis. Descriptive statistics and the normality test relating to Research Question One are presented in Table 1.

Table 1. Descriptive analysis and normality test

	Mean	Standard deviation	Excess kurtosis	Skewness	Number of observations used
Fund security	2.931	1.057	−0.717	−0.260	321.000
Fund transfer	3.109	0.881	−0.284	0.005	321.000
Instant payment	3.445	1.049	−0.294	−0.449	321.000
Payment confirmation	3.156	1.071	−0.646	−0.329	321.000
Service quality	2.533	1.026	−0.858	−0.028	321.000
Service standard	3.754	1.085	−0.036	−0.794	321.000

Source: calculated by the authors based on SmartPLS output

Descriptive statistics in Table 1 reveal that service standard recorded the highest mean value (3.754), indicating that customers place the greatest value on consistent service delivery, while service quality had the lowest mean (2.533), highlighting a perceived quality gap. All variables exhibited normal distributions, with skewness values ranging between -0.794 and 0.005 and kurtosis values between -0.858 and -0.036, confirming the suitability of the data for further analysis. The moderate standard deviations (0.881-1.085) suggest reasonable consistency in respondents' perceptions, implying that expectations regarding digital payment systems among banking customers are relatively aligned, which banks can leverage to enhance service reliability.

Objective and hypothesis one restatement. Objective one: To determine the effect of the digital payment system on service reliability. Ho_1: The digital payment system does not have a significant effect on service reliability. Figure 1 illustrates the direct relationship between digital payment system attributes – instant payment confirmation and secure fund transfer – and service reliability.

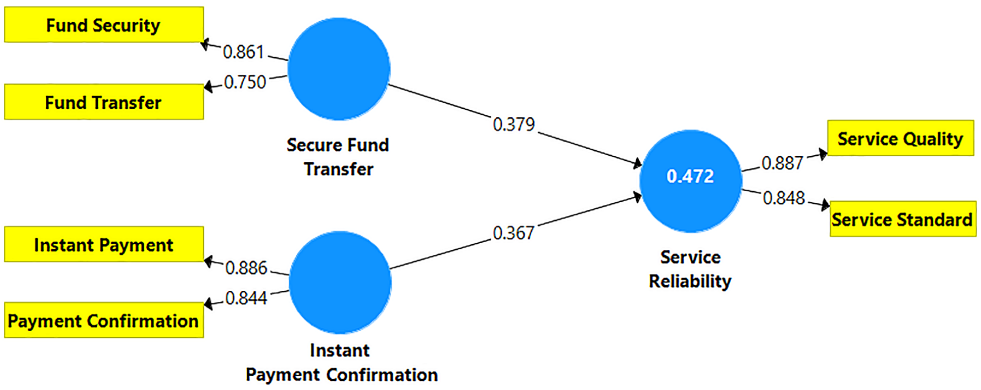

Figure 1. Path model of digital payment system and service reliability

Source: calculated by the authors based on SmartPLS output

Figure 1 shows the direct relationship between the digital payment system attributes (instant payment confirmation and secure fund transfer) and service reliability. Both independent variables exhibit strong factor loadings and positive path coefficients with the dependent variable. This finding confirms that secure payments and prompt payment confirmation enhance customers' perception of service reliability in online banking. Consequently, banks should prioritise investments in both areas to improve overall customer satisfaction.

Table 2. Construct reliability and validity

	Cronbach's alpha	Composite reliability	Average variance extracted (AVE)
Instant payment confirmation	0.765	0.856	0.748
Secure fund transfer	0.772	0.788	0.652
Service reliability	0.773	0.859	0.753

Source: calculated by the authors based on SmartPLS output

Table 2 indicates that all constructs demonstrate high reliability, with Cronbach's alpha values exceeding 0.7 (instant payment confirmation: 0.765; secure fund transfer: 0.772; service reliability: 0.773), confirming internal consistency. Composite reliability values (0.788-0.859) confirm construct reliability, while average variance extracted (AVE) values exceeding 0.5 (0.652-0.753) confirm high convergent validity. These strong psychometric properties affirm the reliability and validity of the measurement model, providing a sound basis for banks to develop digital payment strategies that enhance customer satisfaction. Table 3 presents the inter-construct correlations and the square roots of AVE values, demonstrating discriminant validity among the examined variables.

Table 3. Discriminant validity

	Instant payment confirmation	Secure fund transfer	Service reliability
Instant payment confirmation	**0.865**		
Secure fund transfer	0.700	**0.807**	
Service reliability	0.632	0.635	**0.868**

Source: calculated by the authors based on SmartPLS output

Square roots of AVE values (bold diagonal: instant payment confirmation – 0.865, secure fund transfer – 0.807, service reliability – 0.868) are greater than the inter-construct correlations in Table 3, thereby confirming discriminant

validity. Strong moderate-to-high correlations between instant payment confirmation and secure fund transfer (0.700), instant payment confirmation and service reliability (0.632), and secure fund transfer and service reliability (0.635) reflect significant relationships without evidence of multicollinearity. This verifies that each construct represents a distinct yet complementary concept, indicating that banks should address them as separate but mutually reinforcing variables when developing digital payment systems to enhance customer satisfaction. Table 4 presents the variance inflation factor (VIF) values, which confirm that the digital payment system variables are free from multicollinearity.

Table 4. Inner variance inflation factor values

	Instant payment confirmation	Secure fund transfer	Service reliability
Instant payment confirmation			1.959
Secure fund transfer			1.959
Service reliability			

Source: calculated by the authors based on SmartPLS output

The VIF values for instant payment confirmation and secure fund transfer are 1.959 each, well below the critical threshold of 5.0. This indicates the absence of multicollinearity, confirming that these digital payment components are independent predictors of service reliability. The lack of such problematic correlations implies that each variable can be effectively assessed to determine its individual contribution, enabling banks to identify the specific digital payment factors that most influence service reliability and customer satisfaction, and to design more targeted improvement strategies. The bootstrapping results further demonstrate that secure fund transfer significantly influences service reliability, whereas instant payment confirmation does not (Table 5).

Table 5. Bootstrapping results showing path coefficients for the structural model

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
Instant payment confirmation -> Service reliability	0.367	0.367	0.189	1.942	0.057
Secure fund transfer -> Service reliability	0.379	0.380	0.054	6.962	0.000

Source: calculated by the authors based on SmartPLS output

Bootstrapping outcomes in Table 5 indicate that secure fund transfer has a significant positive effect on service reliability ($\beta = 0.379$, $t = 6.962$, $p < 0.001$), whereas instant payment confirmation is not statistically significant ($\beta = 0.367$, $t = 1.942$, $p = 0.057$). This suggests that customers place greater importance on the security of fund transfers than on confirmation speed when assessing the reliability of digital banking services. Although both variables display comparable beta coefficients, the greater statistical significance of secure fund transfer underscores its critical role in fostering trust and satisfaction in online banking. Consequently, banks should prioritise strengthening payment security mechanisms to reinforce customer confidence and loyalty. Digital payment features collectively explain a substantial proportion of the variance in service reliability, as shown in Table 6.

Table 6. Coefficient of determination score

	R-square	R-square adjusted
Service reliability	0.472	0.469

Source: calculated by the authors based on SmartPLS output

In Table 6, the R-square value of 0.472 indicates that instant payment confirmation and secure fund transfer collectively explain 47.2% of the variance in service reliability, with an adjusted R-square of 0.469, which prevents overestimation of the finding due to multiple predictors. The moderate explanatory power confirms the significant influence of digital payment features on customers' perception of service reliability. Nevertheless, the remaining unexplained variance suggests that additional factors influence service reliability, highlighting the need for a holistic approach to service quality in banking. Table 7 presents the effect sizes (f^2), showing that both instant payment confirmation and secure fund transfer have moderate effects on service reliability.

Table 7. Assessment of the effect size (f2)

	Instant payment confirmation	Secure fund transfer	Service reliability
Instant payment confirmation			0.130
Secure fund transfer			0.139
Service reliability			

Source: calculated by the authors based on SmartPLS output

According to Table 7, the effect sizes (f^2) for instant payment confirmation (0.130) and secure fund transfer (0.139) both fall within Cohen's medium effect size range, indicating that both contribute comparably to service reliability. This suggests that banks should invest equally in secure transaction platforms and effective payment confirmation systems to enhance service reliability and customer satisfaction, rather than focusing on one element over the other in digital transformation. Descriptive statistics for responses related to research question two and the normality test are shown in Table 8. As shown in Table 8, the descriptive statistics demonstrate that personalised offers and account digitalisation receive the highest ratings among customers, indicating that customers place the greatest value on personalised experiences and digitalised account management. Response accuracy ranks lowest, marking it as a key area for improvement. All variables are normally distributed, with skewness values between -0.423 and 0.254 and kurtosis values between -0.908 and -0.173, confirming the suitability of the data for analysis. The standard deviations are moderate, ranging from 0.876 to 1.087, reflecting consistent perceptions among respondents. Therefore, banks should focus on enhancing the degree of personalisation and digital features, as well as improving response accuracy to achieve higher customer satisfaction.

Table 8. Descriptive analysis and normality test

	Mean	Standard deviation	Excess kurtosis	Skewness	Number of observations used
Account automation	2.863	0.995	−0.284	0.202	321.000
Account digitalisation	3.324	0.876	−0.812	−0.011	321.000
Fast response	2.863	0.995	−0.284	0.202	321.000
Financial insights	3.209	0.891	−0.173	−0.423	321.000
Personalised offers	3.340	0.973	−0.908	0.254	321.000
Response accuracy	2.769	1.087	−0.765	0.102	321.000

Source: calculated by the authors based on SmartPLS output

Objective and hypothesis two restatement. Objective two: To determine the effect of smart banking solutions on digital support responsiveness. Ho_2: Smart banking solutions have no significant effect on digital support responsiveness (Fig. 2). Figure 2 illustrates the path model, showing the correlations among the components of smart banking – automated account management, personalised financial insights, and digital support responsiveness. It reveals a strong positive relationship originating from automated account management, which facilitates responsiveness, and a slightly negative influence from personalised financial insights. This indicates that automation plays a more significant role in enhancing support responsiveness than do banking strategies focused primarily on personalisation. Table 9 presents the reliability and validity measures, confirming that all constructs exhibit high internal consistency, composite reliability, and convergent validity.

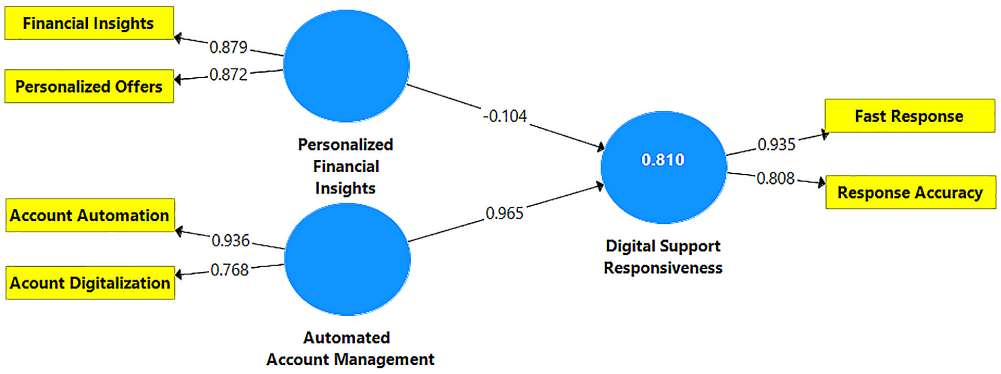

Figure 2. A path model of smart banking solutions and digital support responsiveness

Source: calculated by the authors based on SmartPLS output

Table 9. Construct reliability and validity

	Cronbach's alpha	Composite reliability	Average variance extracted (AVE)
Automated account management	0.761	0.845	0.733
Digital support responsiveness	0.707	0.865	0.764
Personalised financial insights	0.795	0.868	0.766

Source: calculated by the authors based on SmartPLS output

Table 9 shows that all constructs demonstrate strong reliability, as the Cronbach's alpha values exceed the recommended threshold of 0.7 (automated account management: 0.761, digital support responsiveness: 0.707, personalised financial insights: 0.795), confirming internal consistency of the measurement items. Further evidence of reliability is provided by the composite reliability values (0.8450.868). The average variance extracted (AVE) values exceed 0.5 across all constructs (0.7330.766), demonstrating a high level of convergent validity, whereby the indicators accurately reflect their respective constructs. These sound psychometric properties confirm that the measurement model is both reliable and valid, providing banks with assurance that the specified dimensions are useful for enhancing the responsiveness of digital support and improving customer satisfaction. Table 10 presents the AVE square roots and inter-construct correlations, demonstrating strong discriminant validity among the studied constructs.

Table 10. Discriminant validity

	Automated account management	Digital support responsiveness	Personalised financial insights
Automated account management	**0.856**		
Digital support responsiveness	0.796	**0.874**	
Personalised financial insights	0.654	0.527	**0.875**

Source: calculated by the authors based on SmartPLS output

Table 10 indicates that the square roots of the AVE values (bold diagonal: automated account management – 0.856, digital support responsiveness – 0.874, personalised financial insights – 0.875) are higher than the inter-construct correlations, thereby confirming strong discriminant validity. The correlation between automated account management and digital support responsiveness (0.796) is notably high, indicating a strong association, whereas the correlation between personalised financial insights and digital support responsiveness (0.527) is moderately high, suggesting a weaker connection. This confirms that all constructs capture distinct yet theoretically related concepts, implying that banking institutions should prioritise automation elements, which have a stronger link to support responsiveness, over personalisation initiatives. The VIF values indicate that the components of smart banking solutions are free from multicollinearity and can therefore be evaluated as independent predictors of digital support responsiveness (Table 11).

Table 11. Inner variance inflation factor values

	Automated account management	Digital support responsiveness	Personalised financial insights
Automated account management		1.747	
Digital support responsiveness			
Personalised financial insights		1.747	

Source: calculated by the authors based on SmartPLS output

In Table 11, the VIF values for automated account management and personalised financial insights are both 1.747, which is well below the critical threshold of 5.0. This confirms that the independent variables do not exhibit problematic multicollinearity and, therefore, the independent variables (components of smart banking solutions) can be regarded as distinct yet independent predictors of digital support responsiveness. The absence of problematic correlations allows for a more accurate assessment of each variable's contribution. Accordingly, banks can better identify which functions of smart banking solutions most strongly enhance support responsiveness and design more targeted improvement measures to increase customer satisfaction. The bootstrapping results indicate that

automated account management has a strong and statistically significant effect on digital support responsiveness, while personalised financial insights show a negative and non-significant effect (Table 12).

Table 12. Bootstrapping results showing path coefficients for the structural model

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
Automated account management -> Digital support responsiveness	0.965	0.965	0.023	41.759	0.000
Personalised financial insights -> Digital support responsiveness	−0.104	−0.103	0.086	1.209	0.084

Source: calculated by the authors based on SmartPLS output

The bootstrapping outcomes in Table 12 reveal that automated account management exerts a strong and significant influence on digital support responsiveness ($p < 0.001$, $\beta = 0.965$, $t = 41.759$), whereas personalised financial insights exhibit a negative and non-significant effect ($p = 0.084$, $\beta = 0.104$, $t = 1.209$). These results indicate that customers primarily associate the effectiveness and speed of digital support with automated account functions rather than with personalised financial advice. The marked difference in the strength and significance of coefficients underscores that the primary objective for banking organisations implementing AI should be to invest in automated account management services, thereby improving responsiveness levels and customer satisfaction within the identified banking context. Table 13 shows that automated account management and personalised financial insights together explain a substantial proportion of the variance in digital support responsiveness, highlighting the crucial role of smart banking solution features.

Table 13. Coefficient of determination score

	R-square	R-square adjusted
Digital support responsiveness	0.810	0.809

Source: calculated by the authors based on SmartPLS output

Table 13 shows an R-square value of 0.810, indicating that 81.0% of the variance in digital support responsiveness is explained by automated account management and personalised financial insights. The adjusted R-square of 0.809 suggests that the result is not inflated by multiple predictors. This represents a remarkably high level of explanatory power, indicating that smart banking solution features are key determinants of responsiveness in digital banking support. The minimal difference between the two Rsquare values also demonstrates that the model is highly parsimonious, implying that banks can confidently focus on these specific aspects of smart banking solutions to enhance support responsiveness and, consequently, customer satisfaction, without unnecessary resource expenditure. Table 14 presents the effect sizes (f^2), showing that automated account management has a very strong practical impact on digital support responsiveness, while personalised financial insights play only a minor role.

Table 14. Assessment of the effect size (f^2)

	Automated account management	Digital support responsiveness	Personalised financial insights
Automated account management		2.802	
Digital support responsiveness			
Personalised financial insights		0.033	

Source: calculated by the authors based on SmartPLS output

The effect size (f^2) of automated account management on digital support responsiveness in Table 14 is very large (2.802), indicating strong practical significance, whereas the value for personalised financial insights is very small (0.033). Based on the criteria developed by Cohen, the effects of account automation are substantial, while the personalisation features play a negligible role in determining digital support responsiveness. This pronounced difference in effect sizes highlights the importance of allocating resources to the development of advanced account automation systems rather than heavily investing in enhanced customisation options when the main aim is to improve digital customer support responsiveness and increase customer satisfaction levels.

Based on the main findings of this study, the following recommendations are proposed: over the next six months, banks should enhance fund transfer encryption and implement multi-factor authentication to further increase customer satisfaction following security upgrades. They should also display real-time payment alerts (including transaction details) and electronic receipts to reduce customer contact requests. In the particular cases of Zenith Bank, Access Bank, First Bank, GTBank, and UBA, quarterly audits of digital services are recommended to evaluate the efficiency of security and confirmation against industry standards, ensuring competitiveness in Nigeria's rapidly developing digital banking market.

Furthermore, to improve account responsiveness and enhance customer satisfaction, banks should implement end-to-end account automation, including AI-driven chatbots and predictive services. The relevance of personalised financial insights should be redefined to complement rather than compete with automated systems through timely and relevant information sharing during service interactions – a strategy capable of strengthening customer engagement. Zenith Bank, Access Bank, First Bank, GTBank, and UBA should also conduct quarterly reviews of the digital customer experience, measuring automation performance in terms of resolution speed, accuracy, and customer effort to maintain a competitive advantage.

The results indicate a significant effect of digital payment systems on service reliability, with secure fund transfers having a stronger and statistically significant impact ($\beta = 0.379$, $t = 6.962$, $p < 0.001$) compared to instant payment confirmations, which show no significant effect ($\beta = 0.367$, $t = 1.942$, $p = 0.057$). Together, these two factors account for 47.2% of the variance in service reliability ($R^2 = 0.472$), with moderately large effect sizes for secure fund transfers ($f^2 = 0.139$) and instant payment confirmations ($f^2 = 0.130$). These findings support those of J. Dutta *et al.* (2024) and L. AlHchemi (2024), who concluded that transaction security strengthens trust in digital banking, and align with T. Khiaonarong *et al.* (2021), who emphasised the crucial role of payment confirmations in perceived trustworthiness. The customer benefits of secure and reliable digital payments – such as higher satisfaction and loyalty – led S. Sravan *et al.* (2024) to prioritise this as a strategic element of digital banking.

Similarly, the responsiveness of digital support has a substantial impact on smart banking solutions, which differ in their components. Automated account management shows a very strong and significant effect ($\beta = 0.965$, $t = 41.759$, $p < 0.001$), while personalised financial insights exhibit a weak and non-significant negative effect ($\beta = -0.104$, $t = 1.209$, $p = 0.084$). Together, they explain 81.0 per cent of the variance in digital support responsiveness ($R^2 = 0.810$); automated account management demonstrates a large impact ($f^2 = 2.802$), whereas personalised financial insights have a small impact ($f^2 = 0.033$). Those findings are consistent with V. Nagubathula (2025), who highlighted the potential of automation to increase digital responsiveness and satisfaction. Nonetheless, the insignificance of the personalisation effect differs from that reported by D. Epstein & K. Quinn (2020), suggesting that it is likely to be a matter of implementation. A. Uzoka *et al.* (2024) also noted that an appropriate level of personalisation is required to maintain optimal AI-driven outcomes in banking.

In summary, the results suggest that the reliability and efficiency of digital banking services are largely determined by the quality of secure fund transfers and the functionality of automated account management, whereas payment confirmations and personalised financial insights play a secondary role. These findings emphasise the need for banks to prioritise investment in technologies that ensure security and automation, as these are the key drivers of customer trust, improved digital support responsiveness, and overall satisfaction and loyalty.

CONCLUSIONS

The research supports the conclusion that digital payment systems have a significant influence on the reliability of services in the Nigerian banking sector. The correlation for secure fund transfers was shown to be the strongest statistically significant predictor, whereas instant payment confirmation was not found to be significant. Together, these variables accounted for nearly 50% of the variance in service reliability. These findings highlight the importance of strengthening both security infrastructure and confirmation mechanisms, since customers are concerned about their transactions being secure and timely. The likelihood of similar effects points to the need for banks to adopt a comprehensive, systemwide approach to enhancing digital payment mechanisms rather than a selective or fragmented strategy.

Similarly, the study demonstrates that smart banking solutions exert a strong influence on the responsiveness of digital support. Automated account management emerged as the most influential predictor, showing both high statistical and practical significance, whereas personalised financial insights had a weak and statistically insignificant impact overall. To enhance their ability to meet digital needs effectively, banks should invest in a high degree of automation, not only through workflow optimisation and self-service solutions but also by reviewing personalisation features to ensure they do not hinder the speed of digital engagement. The varied influence of these factors implies that resource allocation must be strategically managed to achieve optimal customer satisfaction. Future studies could explore AI's impact on other banking metrics, such as customer retention or loyalty, or conduct cross-industry comparisons to better understand AI's broader implications. Longitudinal research could also assess the long-term effects of AI innovations, enriching the understanding of AI's role in shaping dynamic customer satisfaction trends.

ACKNOWLEDGEMENTS

Sincere appreciation is extended to Opeyemi Emmanuel Babawale for valuable feedback and contributions throughout the study. Gratitude is also expressed to Zenith Bank, Access Bank, First Bank, GTBank, and UBA Bank, Ilorin Branch, for providing the necessary facilities and environment for this research. Appreciation is likewise extended to all participants and contributors whose cooperation was vital to the project's success.

FUNDING

The authors declare no competing interests and no relevant financial or non-financial interests to disclose, either directly or indirectly related to this publication.

CONFLICT OF INTEREST

There is no conflict of interest relevant to the content of this manuscript.

REFERENCES

[1] Agarwal, S., Agarwal, B., & Gupta, R. (2022). Chatbots and virtual assistants: A bibliometric analysis. *Library Hi Tech*, 40(4), 1013-1030. doi: 10.1108/lht-09-2021-0330.

[2] Agustiawan, D.A. (2024). Digital banking transformation AI enhances efficiency and customer experience seminar perspective industry. *WACANA Jurnal Ilmiah Ilmu Komunikasi*, 23(1), 191-200. doi: 10.32509/wacana.v23i1.4130.

[3] Akinepalli, S. (2024). Societal impact of test automation: Reducing human error in critical systems. *International Journal of Scientific Research in Computer Science, Engineering and Information Technology*, 10(6), 527-535. doi: 10.32628/cseit24106184.

[4] Al-Hchemi, L.H. (2024). Evaluating generative AI in enhancing banking services efficiency. *Economic Forum*, 14(4), 47-54. doi: 10.62763/ef/4.2024.47.

[5] Al-kfairy, M., Mustafa, D., Kshetri, N., Insiew, M., & Alfandi, O. (2024). Ethical challenges and solutions of generative AI: An interdisciplinary perspective. *Informatics*, 11(3), article number 58. doi: 10.3390/informatics11030058.

[6] Alnaser, F.M., Rahi, S., Alghizzawi, M., & Ngah, A.H. (2023). Does artificial intelligence (AI) boost digital banking user satisfaction? Integration of expectation confirmation model and antecedents of artificial intelligence enabled digital banking. *Heliyon*, 9(8), article number e18930. doi: 10.1016/j.heliyon.2023.e18930.

[7] American Sociological Association's Code of Ethics. (2018, June). Retrieved from https://surl.lu/tjcklz.

[8] Aziz, A.A. (2025). The mediating role of customer satisfaction on the effect of service quality on post-purchase intention. *Journal of Management and Business Insight*, 2(2), 135-143. doi: 10.12928/jombi.v2i2.1190.

[9] Blümel, J.H., Zaki, M., & Bohné, T. (2024). Personal touch in digital customer service: A conceptual framework of relational personalization for conversational AI. *Journal of Service Theory and Practice*, 34(1), 33-65. doi: 10.1108/jstp-03-2023-0098.

[10] Chikaipa, Y., Jailosi, L.D., & Tyagi, A.D. (2025). engagement and retention enhancement using machine learning in customer service & support. *International Journal of Advanced Research in Science, Communication and Technology*, 5(4), 233-243. doi: 10.48175/ijarsct-25131.

[11] Dhiman, N., Jamwal, M., & Kumar, A. (2023). Enhancing value in customer journey by considering the (ad)option of artificial intelligence tools. *Journal of Business Research*, 167, article number 114142. doi: 10.1016/j.jbusres.2023.114142.

[12] Dutta, J., Barman, S., Sen, S., Routh, A., Chattopadhyay, M., & Chattopadhyay, S. (2024). Easypay: A user-friendly blockchain-powered payment gateway. *Cluster Computing*, 27, 10633-10652. doi: 10.1007/s10586-024-04506-3.

[13] Enholm, I.M., Papagiannidis, E., Mikalef, P., & Krogstie, J. (2022). Artificial intelligence and business value: A literature review. *Information Systems Frontiers*, 24, 1709-1734. doi: 10.1007/s10796-021-10186-w.

[14] Epstein, D., & Quinn, K. (2020). Markers of online privacy marginalization: Empirical examination of socioeconomic disparities in social media privacy attitudes, literacy, and behavior. *Social Media + Society*, 6(2), 1-13. doi: 10.1177/2056305120916853.

[15] Fjelland, R. (2020). Why general artificial intelligence will not be realized. *Humanities and Social Sciences Communications*, 7, article number 10. doi: 10.1057/s41599-020-0494-4.

[16] Gabriel-Okwuchi, C.J. (2025). Analysis of emerging technologies and banking industry service delivery in Nigeria. *Asian Journal of Economics, Business and Accounting*, 25(2), 77-90. doi: 10.9734/ajeba/2025/v25i21665.

[17] Huang, C., Zhang, Z., Mao, B., & Yao, X. (2022). An overview of artificial intelligence ethics. *IEEE Transactions on Artificial Intelligence*, 4(4), 799-819. doi: 10.1109/tai.2022.3194503.

[18] Jan, Z., Ahamed, F., Mayer, W., Patel, N., Grossmann, G., Stumptner, M., & Kuusk, A. (2023). Artificial intelligence for industry 4.0: Systematic review of applications, challenges, and opportunities. *Expert Systems with Applications*, 216, article number 119456. doi: 10.1016/j.eswa.2022.119456.

[19] Katragadda, M.K.C. (2025). Transforming financial services through predictive analytics and banking systems integration. *World Journal of Advanced Research and Reviews*, 26(1), 1264-1272. doi: 10.30574/wjarr.2025.26.1.1167.

[20] Khiaonarong, T., Leinonen, H., & Rizaldy, R. (2021). Operational resilience in digital payments: Experiences and issues. *IMF Working Papers*, 288, 3-36. doi: 10.5089/9781616355913.001.

[21] Koldovskiy, A. (2024). Strategic infrastructure transformation: Revolutionizing financial sector management for enhanced success. *Acta Academiae Beregsasiensis. Economics*, 5, 323-332. doi: 10.58423/2786-6742/2024-5-323-332.
[22] Lee, J.-C., & Chen, X. (2022). Exploring users' adoption intentions in the evolution of artificial intelligence mobile banking applications: The intelligent and anthropomorphic perspectives. *International Journal of Bank Marketing*, 40(4), 631-658. doi: 10.1108/ijbm-08-2021-0394.
[23] Lestari, D., Octavianti, S., & Suhartono, A. (2025). The impact of product quality and service quality on customer satisfaction. *International Journal Multidisciplinary Science*, 4(1), 34-44. doi: 10.56127/ijml.v4i1.1924.
[24] Lilliengren, P., Johansson, R., Lindqvist, K., Mechler, J., & Andersson, G. (2016). Efficacy of experiential dynamic therapy for psychiatric conditions: A meta-analysis of randomized controlled trials. *Psychotherapy*, 53(1), 90-104. doi: 10.1037/pst0000024.
[25] Nagubathula, V. (2025). AI and human-AI collaboration in enterprise integration and document automation. *International Journal on Science and Technology*, 16(1), 1-38. doi: 10.71097/ijsat.v16.i1.2317.
[26] Odio, P.E., Okon, R., Adeyanju, M.O., Ewim, C.P.-M., & Onwuzulike, O.K. (2025). Blockchain and cybersecurity: A dual approach to securing financial transactions in Fintech. *Gulf Journal of Advance Business Research*, 3(2), 380-409. doi: 10.51594/gjabr.v3i2.89.
[27] Oliver, R.L. (1977). Effect of expectation and disconfirmation on postexposure product evaluations: An alternative interpretation. *Journal of Applied Psychology*, 62(4), 480-486. doi: 10.1037/0021-9010.62.4.480.
[28] Otto, A.S., Szymanski, D.M., & Varadarajan, R. (2020). Customer satisfaction and firm performance: Insights from over a quarter century of empirical research. *Journal of the Academy of Marketing Science*, 48, 543-564. doi: 10.1007/s11747-019-00657-7.
[29] Prentice, C., Weaven, S., & Wong, I.A. (2020). Linking AI quality performance and customer engagement: The moderating effect of AI preference. *International Journal of Hospitality Management*, 90(1), article number 102629. doi: 10.1016/j.ijhm.2020.102629.
[30] Rane, N.L., Achari, A., & Choudhary, S.P. (2023). Enhancing customer loyalty through quality of service: Effective strategies to improve customer satisfaction, experience, relationship, and engagement. *International Research Journal of Modernization in Engineering Technology and Science*, 5(5), 427-452. doi: 10.56726/irjmets38104.
[31] Sravan, S.S., Mandal, S., Alphonse, P.J.A., & Ramesh, P.L. (2024). A partial offline payment system for connecting the unconnected using internet of things: A survey. *ACM Computing Surveys*, 57(2), article number 31. doi: 10.1145/3687132.
[32] Ukpe, E. (2025). Empowering Nigeria's e-society: A comprehensive exploration of cutting-edge digital services. *East African Journal of Information Technology*, 8(1), 80-91. doi: 10.37284/eajit.8.1.2995.
[33] Uzoka, A., Cadet, E., & Ojukwu, P.U. (2024). Leveraging AI-powered chatbots to enhance customer service efficiency and future opportunities in automated support. *Computer Science & IT Research Journal*, 5(10), 2485-2510. doi: 10.51594/csitrj.v5i10.1676.
[34] Yamane, T. (1967). *Statistics: An introductory analysis* (2nd ed.). New York: Harper and Row.

Штучний інтелект та задоволеність клієнтів у банківському секторі Нігерії

Олувайомі Омотайо Олота
Кандидат наук з бізнес-адміністрування
Університет Ілоріна
240003, вул. Університетська, 1, м. Ілорін, Нігерія
https://orcid.org/0009-0008-6633-9919

Олатунде Натаніель Акінкунмі
Магістр з бізнес-адміністрування
Університет Ілоріна
240003, вул. Університетська, 1, м. Ілорін, Нігерія
https://orcid.org/0009-0005-3414-1236

Ебенезер Олувадаміларе Балогун
Магістр з бізнес-адміністрування
Університет Ілоріна
240003, вул. Університетська, 1, м. Ілорін, Нігерія
https://orcid.org/0000-0003-0419-188X

Анотація. Інтеграція штучного інтелекту (ШІ) у банківський сектор трансформувала рівень задоволеності клієнтів, зокрема завдяки таким інноваціям, як цифрові платіжні сервіси та «розумні» банківські рішення. Тому це дослідження було спрямоване на вивчення впливу штучного інтелекту на задоволеність клієнтів у банківському секторі. Конкретними завданнями було визначено: дослідити вплив цифрової платіжної системи на надійність послуг у банківському секторі; а також вплив «розумних» банківських рішень на оперативність цифрової підтримки, яку надає банківський сектор. Для проведення дослідження було використано описовий дизайн опитування. Застосовано метод простої випадкової вибірки. Розмір вибірки було визначено за формулою визначення вибірки Т. Ямана. Дані, отримані за допомогою анкетування, були проаналізовані із застосуванням PLS-SEM у програмі SmartPLS. Результати показали, що цифрові платежі позитивно та суттєво впливають на надійність послуг у банківському секторі; безпечний переказ коштів ($\beta = 0{,}379$, $T = 6{,}962$, $p = 0{,}000$); миттєве підтвердження платежу ($\beta = 0{,}367$, $T = 1{,}942$, $p = 0{,}057$). Також встановлено, що «розумні» банківські рішення позитивно та частково суттєво впливають на оперативність цифрової підтримки, яку надає банківський сектор (автоматизоване управління рахунками ($\beta = 0{,}965$, $T = 41{,}759$, $p = 0{,}000$); персоналізовані фінансові поради ($\beta = -0{,}104$, $T = 1{,}209$, $p = 0{,}084$). Зроблено висновок, що штучний інтелект позитивно впливає на задоволеність клієнтів у вибраних банках Нігерії. Результати дослідження мають практичну цінність для банківського сектору Нігерії, оскільки висвітлюють, як технології штучного інтелекту можуть бути ефективно застосовані для підвищення задоволеності та лояльності клієнтів. Керівники банків, розробники цифрових стратегій та менеджери з обслуговування клієнтів можуть використати ці висновки для ухвалення рішень щодо інвестицій у персоналізовані ШІ-рішення, системи миттєвої підтримки та інтелектуальну автоматизацію сервісів, що сприятиме зміцненню довгострокових відносин із клієнтами

Ключові слова: цифрова платіжна система; розумне банківське рішення; оперативність цифрової підтримки; надійність послуг; лояльність клієнтів

University Economic Bulletin
Vol. 20, No. 2, 2025
Journal homepage: https://ue-bulletin.com.ua/en
Received: 31.07.2025. Revised: 02.12.2025. Accepted: 24.12.2025. Published: 26.12.2025

UDC 332.1:658.87:004-025.14(477) DOI: 10.69587/ueb/2.2025.57

Assessment of the attractiveness of regional retail markets in Ukraine using the combined GRDI-IMI methodology

Anastasiia Kyrychenko*
PhD in Economic Sciences, Associate Professor
National University of Life and Environmental Sciences of Ukraine
03041, 15 Heroiv Oborony Str., Kyiv, Ukraine
https://orcid.org/0000-0002-5647-7698

Abstract. In the current conditions of economic transformation caused by the COVID-19 pandemic and the full-scale invasion by the Russian Federation (24 February 2022), research into the attractiveness of regional retail markets in Ukraine was particularly relevant. Despite socio-economic shocks, the market is showing gradual recovery, but regional disparities in economic potential, trade infrastructure saturation and investment levels created uneven conditions for development. The aim of the study was to assess the attractiveness and potential of regional retail markets, taking into account the macroeconomic situation, infrastructure, investment activity, and market digitalisation based on the combined GRDI-IMI index. Statistical data from government agencies, open sources, and methods of indicator normalisation, weighted indexing, and integration of macroeconomic and market factors were used. The results obtained showed that combining the Global Retail Development Index (GRDI) approach with the Index of Macroeconomic Integrality (IMI) allows for a comprehensive assessment of the prospects for regional market development. Significant heterogeneity in the attractiveness of regional markets was revealed: the leaders were Kyiv City, Dnipropetrovsk and Lviv regions, powerful regional centres – Kyiv and Kharkiv regions, medium potential – Poltava, Odesa and Vinnytsia regions, and low potential – regions that have experienced significant economic shocks due to the war. The study offered practical guidelines for strategic planning of retail network development. The proposed GRDI-IMI methodology provided a comprehensive approach to assessing the market and macroeconomic attractiveness of regions, which could become the basis for a differentiated retail development policy in Ukraine. The results can be used by both state institutions to develop regional economic policy and by retail enterprises and investors to make strategic management decisions

Keywords: retail trade development index; regional competitiveness; investment attractiveness of regions; integrated assessment indicators; macroeconomic market analysis; methods of ranking regions; strategic planning of retail networks

INTRODUCTION

Retail trade is one of the leading sectors of the national economy, shaping domestic demand, creating jobs and influencing the investment climate in the regions. Its dynamics and structure are a sensitive indicator of socio-economic changes, and the level of development of the trade infrastructure is directly linked to the competitiveness of territories. In the context of global challenges, in particular the consequences of the pandemic and military actions, the issue of assessing the attractiveness of regional markets is of particular importance, as economic recovery, consumer market balance and Ukraine's integration into global economic processes depend on their development. That is why research into the attractiveness of regional retail markets is relevant for both public policy and business. In this context, it is important to record not only the volume and rate of change in consumer demand, but also structural shifts in the geography of sales, population movements, logistics flexibility and the digitalisation of sales channels (e-commerce,

Suggested Citation:
Kyrychenko, A. (2025). Assessment of the attractiveness of regional retail markets in Ukraine using the combined GRDI-IMI methodology. *University Economic Bulletin*, 20(2), 57-66. doi: 10.69587/ueb/2.2025.57.

*Corresponding author

marketplaces), as these are the factors that influence regional attractiveness for investors and chain retailers.

The issue of measuring the attractiveness of retail markets in global practice is addressed by constructing integrated indices, among which the Global Retail Development Index (GRDI), developed by Kearney (2023), occupies a special place. This index evaluates markets in four areas – attractiveness, saturation, risks and time pressure – combining macroeconomic and institutional parameters. Thanks to this structure, the GRDI reflects not only demand potential and competitive pressure, but also time windows of opportunity for market entry, taking into account risks. It has been used in studies by Serbian researchers S. Mladenović *et al.* (2020) and Colombian researchers C. Arango *et al.* (2021) to compare retail trade in different countries around the world. Although the GRDI was created to analyse national markets, its logic can be adapted to the regional level, as confirmed by a study by O. Nikishyna & A. Shcherbak (2023a), which provides similar blocks for analysing Ukrainian retail trade, including saturation level, investment climate, foreign direct investment volume, and market attractiveness.

Ukrainian scientific literature has accumulated considerable experience in developing integrated indicators of regional development. In particular, the work of V. Derykhovska (2021), aimed at measuring the investment attractiveness of regions, uses weighting schemes, standardisation and benchmarking, which are relevant for constructing an index of retail market attractiveness. Such tools allow combining heterogeneous variables into a single integrated indicator and ensure the comparability of regions in dynamics.

Separate comparative reviews of the retail market in Ukraine by I. Horodniak & Y. Hnativ (2023), O. Chupryna *et al.* (2024), T. Oliinyk & M. Ivanova (2024) provide valuable indicators for the formation of the index system, including trade turnover dynamics, sales structure and regional disparities, emphasising the importance of taking into account spatial differences in trade development. In particular, some studies provide a detailed analysis of individual regions of Ukraine. For example, A. Lialiuk (2021) examines trends in the development of the Volyn region and identifies key factors in regional development. Such regional approaches allow for a more accurate assessment of local market characteristics and their integration into the combined GRDI-IMI index. This enhances the validity of the assessment, as local effects (demographics, cross-border trade, infrastructure conditions) are often not apparent at the macro level.

Conceptual approaches to determining market potential as a key parameter of regional market attractiveness allow for a theoretical justification of the integration of macroeconomic and market characteristics into a single model (Teslya, 2021). For Ukrainian regions, it is advisable to additionally take into account the restoration of logistics, business relocation, the digitalisation of sales channels, and the role of international assistance in rebuilding the consumer sector. Thus, the combination of the international GRDI methodology and national regional development indices makes it possible to create a combined GRDI-IMI index that can objectively reflect the attractiveness of regional retail markets in Ukraine. The scientific novelty of the approach lies in combining the global logic of GRDI with the regional specificity of indicators and their standardisation for the Ukrainian context.

The aim of the study was to develop and test a combined GRDI-IMI methodology for assessing the attractiveness of regional retail markets in Ukraine. To achieve this goal, the following tasks were set: to analyse global and Ukrainian approaches to assessing the attractiveness of retail markets, identifying opportunities for regional adaptation of GRDI; to develop an author's system of indicators for the GRDI-IMI combined index; to calculate and conduct a comparative analysis of indices for regions of Ukraine, with the formation of recommendations for the development of retail trade.

MATERIALS AND METHODS

The study proposes an author's methodology for assessing the attractiveness of regional retail markets, based on the combined Global Retail Development Index (GRDI) and the author's macroeconomic index, the IMI (Index of Macroeconomic Integrality). The methodology is based on the use of official statistical information from the State Statistics Service of Ukraine (n.d.), its quantitative processing, standardisation and aggregation of indicators into a single integrated indicator. Microsoft Excel was used to calculate and process data at all stages of the study. The programme was used to normalise indicators, calculate weighted GRDI and IMI indices, integrate both indices into a combined GRDI-IMI indicator, and group regions according to the attractiveness of the retail market. Excel ensured the verification of calculations through control calculations, checking of sums, weights and normalised values, as well as the construction of tables for visual analysis of the results. The use of Excel ensured the accuracy, reliability, and reproducibility of the results obtained at all stages of the study. GRDI includes the following indicators: volume of retail sales; average salary; number of enterprises in the retail sector; consumer price index. The indicators were normalised using the min-max formula:

$$X_{NORM} = \frac{X - X_{min}}{X_{max} - X_{min}}, \quad (1)$$

where X – the value of the indicator for a specific region; X_{min} – the minimum value of the indicator among all region; X_{max} – the maximum value of the indicator among all regions; X_{NORM} – the normalised value of the indicator, which brings the data to the interval [0;1].

The study used the following indicators: volume of retail sales – reflects the sales potential and purchasing power of the population in the region; average salary – characterises the income level of the population and the solvency of consumers; number of retail enterprises – an indicator of

market saturation and the level of competition; consumer price index – taken into account as a factor in the affordability of goods and its impact on the purchasing power of the population. This normalisation allows all indicators to be brought to a single scale, which is necessary for the correct calculation of the GRDI integral index and further integration with the IMI macroeconomic index. Further aggregation was carried out using weighting coefficients: sales volume – 40%; wages – 30%; number of enterprises – 20%; consumer price index – 10%. The IMI was created to reflect the macroeconomic situation in the region and includes: gross regional product (weight – 50%); foreign direct investment in trade (40%); consumer price index (10%). The integrated indicator of the attractiveness of regional retail markets was calculated as a weighted combination of two indices: GRDI (70%) and IMI (30%).

Statistical data for the five-year period 2019-2023 was used for the comprehensive assessment. This time frame made it possible to track the dynamics of regional development and verify the stability of the indicators. At the same time, the final calculations focused on the 2023 indicators, taking into account: relevance – reflecting the current state of the markets, which is key to making business and political decisions; the instability of previous years – due to the impact of the COVID-19 pandemic and military events, which led to high data volatility; unification and comparability – using one year as a basis for normalisation ensures the accuracy of interregional comparisons. At the same time, data from 2019-2022 was used to verify and confirm the stability of the results obtained. Based on the integrated index, the regions of Ukraine were grouped into five categories according to the attractiveness of the retail market: market leaders, powerful regional centres, regions with average potential, regions with low potential, and crisis regions. Thus, the GRDI-IMI methodology made it possible to combine indicators of market activity and macroeconomic development, which provides a comprehensive and up-to-date assessment of Ukraine's regional retail markets.

RESULTS AND DISCUSSION

Current socio-economic changes, including the consequences of the COVID-19 pandemic and military events, highlight the need for a detailed assessment of the development and potential of regional retail markets in Ukraine. Despite socio-economic shocks, the market is showing gradual recovery, reflected in the growth of retail trade volumes, increased household incomes and growing investment activity in the regions. Given the current challenges, including war and economic turmoil, the development of e-commerce is becoming increasingly important. Research by M. Ilchuk *et al.* (2023) shows that consumer adaptation to online shopping and active use of digital sales channels can reduce the negative impact of crisis factors on regional markets. This confirms the need to take digital presence into account when assessing market attractiveness and formulating retail network development strategies. At the same time, regional differences in economic potential, retail infrastructure saturation and investment levels create uneven market attractiveness. In this context, the use of the combined GRDI-IMI index allows for a comprehensive assessment of the potential and competitiveness of different regions, a comparison of macroeconomic and infrastructure characteristics with investment attractiveness, and the formulation of sound recommendations for the development of the retail network.

During 2019-2023, the volume of sales (goods, services) of economic entities in the retail trade sector, except for trade in motor vehicles and motorcycles, was characterised by significant interregional differences. The largest volumes are traditionally concentrated in Kyiv City, Dnipropetrovsk and Kyiv regions, due to the high concentration of retail infrastructure and purchasing power of the population. At the same time, a number of western and northern regions show relatively lower indicators. Despite fluctuations caused by both internal economic factors and full-scale war, the overall dynamics indicate the preservation of regional asymmetry in the development of retail trade (Fig. 1).

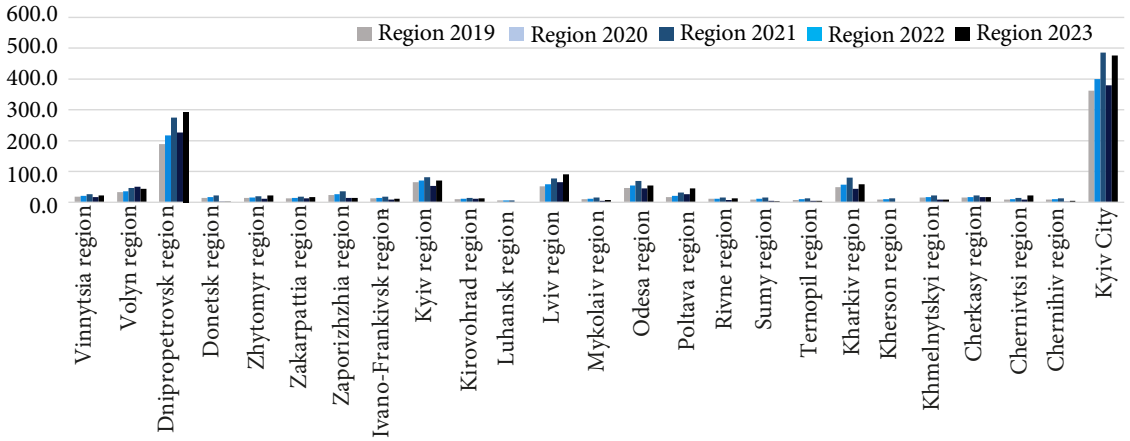

Figure 1. Volume of realised products (goods, services) of economic entities in the sphere of retail trade, excluding the trade of motor vehicles and motorcycles, broken down by regions in 2019-2023, bln UAH

Source: developed by the author based on the State Statistics Service of Ukraine (n.d.)

The results shown in Figure 1 provide only a general idea of product sales volumes by region, but they do not allow for a comprehensive assessment of the attractiveness of retail markets. For a more detailed study, it is necessary to take into account a wider range of indicators, including economic, infrastructural and investment characteristics of the regions. That is why it is advisable to use the combined GRDI-IMI methodology, which provides a systematic approach to analysis and allows for more informed conclusions about the potential for retail development. Below are the methodological approaches of the combined GRDI-IMI index and the research algorithm (Fig. 2).

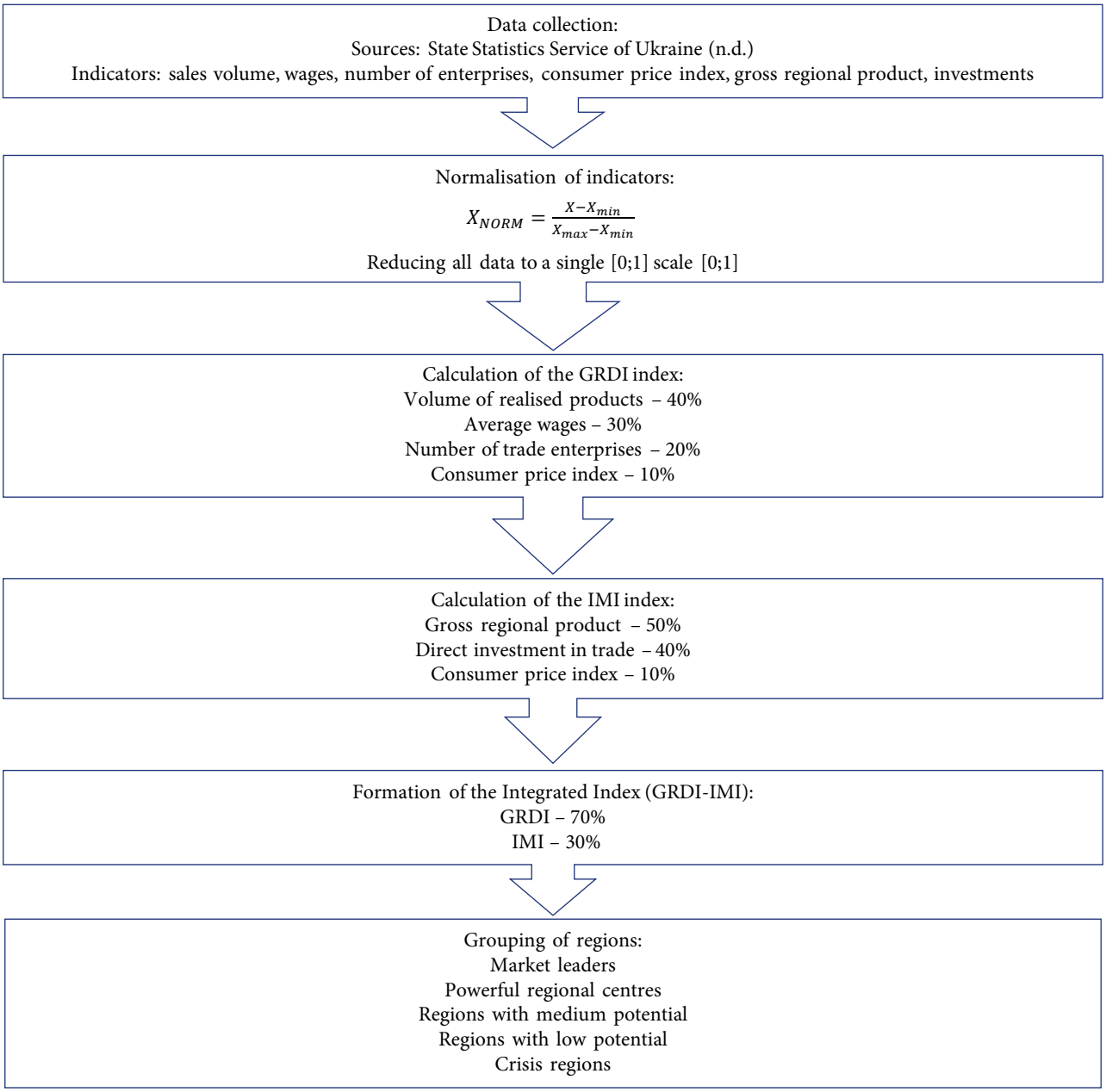

Figure 2. Algorithm for assessing the attractiveness of regional retail markets in Ukraine using the combined GRDI-IMI methodology

Source: compiled by the author

This approach allows for a comprehensive comparison of the region's economic indicators (GRP, investment level, average salary, number of enterprises) with infrastructure and market characteristics, identification of the most promising regions for retail trade development, and assessment of their competitiveness and investment risks. The methodology provides a structured analysis that combines quantitative and qualitative indicators and allows recommendations to be made for strategic planning of the development of retail chains in different regions (Table 1).

Table 1. Author's structure of the GRDI-IMI composite index blocks

Block	Name	What it assesses	Key indicators
A	Macroeconomic potential (IMI)	Overall economic condition and stability of the region	IMI= (Gross Regional Product, Direct foreign investment in trade, Consumer price index)
B	Market capacity and dynamics	Sales potential and purchasing power of the population	Volume of realised retail trade products (excluding motor vehicles), Average wages
C	Market environment and competition	Number of players and market saturation level	Number of retail trade enterprises
D	Infrastructure and price accessibility	Conditions for trade development and impact of the price situation	Consumer price index (in the context of purchasing power and goods accessibility)

Source: compiled by the author

Thus, the GRDI calculation for the regions of Ukraine was based on the following indicators: volume of retail sales (excluding motor vehicles); average wage; number of retail enterprises; consumer price index. The following weights were used for these indicators: volume of retail sales – 40%; average salary – 30%; number of enterprises – 20%; consumer price index – 10%. This was followed by a separate analysis of macroeconomic factors: gross regional product; foreign direct investment in trade; consumer price index (as a supporting factor).

The data for each region and indicator was normalised using formula (1). This is a basic procedure for GRDI to ensure that all indicators are on the same scale [0;1].

Calculation of the weighted GRDI index for each region:

$$GRDI_i = 0.4 * P_{i,sale} + 0.3 * P_{i,salary} + \\ + 0.2 * P_{i,enterprises} + 0.1 * P_{i,price\ index}, \quad (2)$$

where P_i – the normalised value for region i.

The calculations are presented in Table 2.

Table 2. Assessment of the attractiveness of regional retail markets in Ukraine using the GRDI methodology, 2023

Region	Normalised indicators				GRDI (combined)
	Sales	Salary	Enterprises	Price index	
Kyiv City	1.000	1.000	0.959	1.000	0.990
Dnipropetrovsk	0.222	0.243	0.786	0.979	0.239
Lviv	0.199	0.210	0.979	0.979	0.225
Kyiv	0.155	0.174	0.834	0.979	0.178
Kharkiv	0.143	0.154	0.925	0.979	0.169
Poltava	0.112	0.117	0.546	0.979	0.120
Odesa	0.115	0.122	0.638	0.979	0.127
Vinnytsia	0.087	0.091	0.567	0.979	0.093
Zaporizhzhia	0.053	0.061	0.627	0.979	0.057
Volyn	0.033	0.035	0.633	0.979	0.035
Zhytomyr	0.069	0.070	0.586	0.979	0.073
Khmelnytskyi	0.066	0.068	0.543	0.979	0.070
Cherkasy	0.062	0.063	0.525	0.979	0.065
Ternopil	0.039	0.041	0.504	0.979	0.042
Rivne	0.041	0.042	0.595	0.979	0.044
Ivano-Frankivsk	0.046	0.047	0.541	0.979	0.049
Chernivtsi	0.045	0.046	0.519	0.979	0.048
Mykolaiv	0.044	0.046	0.513	0.979	0.047
Chernihiv	0.041	0.042	0.486	0.979	0.043
Sumy	0.034	0.035	0.505	0.979	0.036
Kirovohrad	0.033	0.034	0.521	0.979	0.035
Kherson	0.022	0.023	0.138	0.979	0.023
Luhansk	0.004	0.004	0.017	0.979	0.004
Donetsk	0.002	0.002	0.020	0.979	0.002

Source: author's calculations based on State Statistics Service of Ukraine (n.d.)

The calculations allow to draw the following conclusions: Kyiv City is the market leader due to its high concentration of sales, high salaries and number of enterprises. Kyiv also has the best conditions in terms of the consumer price index, which supports purchasing power; powerful regional markets: Dnipropetrovsk, Lviv, Kyiv and Kharkiv regions demonstrate relatively high sales and enterprise indicators. These are the main retail

centres outside Kyiv; the middle positions are occupied by such regions as Poltava, Odesa, Vinnytsia, and Zaporizhzhia, where the indicators are lower but still noticeable; low attractiveness in regions that have experienced significant economic shocks due to the war (Luhansk, Donetsk, and Kherson regions). Sales, businesses and salaries are very low there.

The weights of the indicators reflect the balance between economic activity (sales, number of businesses) and the level of household income (salaries). The price index has little impact as it is relatively stable. Studies by G. Kharlamova (2014) and M. Ilchuk *et al.* (2025) emphasise that wholesale trade in food products in Ukraine is undergoing significant changes under martial law: optimisation of logistics, adaptation of supply chains and integration of digital inventory management tools are becoming critically important. These factors directly influence regional differences in the attractiveness of retail markets.

A macroeconomic analysis of Ukraine's regions was conducted using the following key indicators: gross regional product; foreign direct investment in trade; consumer price index. To compare data between regions, each indicator was normalised to the maximum value across the country (maximum region value = 1). Weights reflecting their significance in the macroeconomic context: gross regional product – 0.5 (main indicator of economic power); direct investment – 0.4 (indicator of investment attractiveness); consumer price index – 0.1 (indicator of inflationary pressure). The calculation of the integrated macroeconomic index is presented in Table 3.

Table 3. Assessment of the attractiveness of regional retail markets in Ukraine according to the IMI methodology, 2023

Region	Normalised indicators			IMI
	Gross regional product	Direct investment	Consumer price index	
Ukraine	1	1	1	1
Vinnytsia	0.033	0.006	1	0.018
Volyn	0.017	0.001	1	0.009
Dnipropetrovsk	0.11	0.159	1	0.112
Donetsk	0.016	0.000	1	0.009
Zhytomyr	0.021	0.001	1	0.012
Zakarpattia	0.015	0.003	1	0.009
Zaporizhzhia	0.045	0.001	1	0.025
Ivano-Frankivsk	0.024	0.001	1	0.014
Kyiv	0.058	0.089	1	0.056
Kirovohrad	0.02	0.003	1	0.012
Luhansk	0.005	0.000	1	0.003
Lviv	0.063	0.021	1	0.042
Mykolaiv	0.026	0.001	1	0.015
Odesa	0.058	0.005	1	0.033
Poltava	0.056	0.028	1	0.045
Rivne	0.019	0.001	1	0.011
Sumy	0.022	0.007	1	0.015
Ternopil	0.017	0.002	1	0.011
Kharkiv	0.028	0.012	1	0.019
Kherson	0.009	0	1	0.005
Khmelnytskyi	0.024	0.003	1	0.015
Cherkasy	0.027	0.006	1	0.017
Chernivtsi	0.011	0.001	1	0.007
Chernihiv	0.023	0.001	1	0.013
Kyiv City	0.253	0.648	1	0.312

Source: author's calculations based on State Statistics Service of Ukraine (n.d.)

Table 3 shows that the leader in terms of macroeconomic attractiveness is Kyiv (index = 1), which is the capital and a centre of business and finance. Dnipropetrovsk region ranks second (0.363) thanks to its significant gross regional product and investments; Lviv, Kyiv and Poltava regions have average values, with a noticeable gross regional product and moderate investments. Regions with low direct investments (Odesa, Zaporizhzhia, Volyn) have low indices, even if their gross regional product is average. The consumer price index is virtually the same for all, so it has little impact on the result in this calculation.

For a comprehensive assessment of regional retail markets using the GRDI-IMI methodology, the integration of the main GRDI index and the macroeconomic index (IMI) is provided for. Integration model: main GRDI (blocks B, C, D) – 70%; macroeconomic IMI index (block A) – 30%:

$$\text{Complex Index} = 0.7 * \text{GRDI} + 0.3 * \text{IMI}, \quad (3)$$

where GRDI (Global Retail Development Index) – an index of retail development that assesses market capacity, purchasing power of the population, level of competition and accessibility of commercial infrastructure; IMI (Macroeconomic Interest Index) – an index that reflects the overall economic condition of the region, investment activity and price stability. Using formula (3), the data presented in Table 4 was obtained.

Table 4. Integrated calculation of the GRDI-IMI comprehensive retail market attractiveness index for regions, 2023

Region	GRDI	IMI	GRDI_ Integrate
Kyiv City	0.990	0.312	0.819
Dnipropetrovsk	0.239	0.112	0.205
Lviv	0.225	0.042	0.168
Kyiv	0.178	0.056	0.140
Kharkiv	0.169	0.019	0.124
Poltava	0.120	0.045	0.102
Odesa	0.127	0.033	0.101
Vinnytsia	0.093	0.018	0.073
Zaporizhzhia	0.057	0.025	0.049
Volyn	0.035	0.009	0.029
Zhytomyr	0.073	0.012	0.054
Khmelnytskyi	0.070	0.015	0.052
Cherkasy	0.065	0.017	0.051
Ternopil	0.042	0.011	0.034
Rivne	0.044	0.011	0.034
Ivano-Frankivsk	0.049	0.014	0.040
Chernivtsi	0.048	0.007	0.034
Mykolaiv	0.047	0.015	0.038
Chernihiv	0.043	0.013	0.035
Sumy	0.036	0.015	0.031
Kirovohrad	0.035	0.012	0.029
Kherson	0.023	0.005	0.017
Luhansk	0.004	0.003	0.004
Donetsk	0.002	0.009	0.004

Source: compiled by the author

Kyiv City remains the undisputed leader, but macroeconomic integration slightly lowers its rating (taking into account dependence on investment and gross regional product). Dnipropetrovsk, Lviv, and Kyiv regions maintain high ratings, but these are declining due to average macroeconomic indicators. Regions with low GRDI (retail activity) and weak macroeconomic index (IMI) – Luhansk, Donetsk, Kherson – receive minimum integrated scores, which signals low attractiveness for retail trade. The calculations of the GRDI-IMI integrated index made it possible to classify the regions of Ukraine according to the level of attractiveness of the retail market. The proposed approach combines market and macroeconomic indicators in a single integrated assessment, which provides a more comprehensive reflection of development potential. Based on the results obtained, not only was the differentiation of regions by their level of attractiveness determined, but also the strategic development guidelines for each group were substantiated, taking into account the specifics of their economic environment and market opportunities. The generalised results are presented in Table 5, which serves as a basis for the further development of recommendations for improving regional trade policy.

Table 5. Grouping of Ukrainian regions by retail market attractiveness (GRDI-IMI) and strategic development guidelines

Group	Integrated index range	Regions	Strategic guidelines
Market leaders	>0.200	Kyiv City, Dnipropetrovsk, Lviv	Retention and expansion strategy: development of premium formats and omnichannel sales; maintaining high service quality; modernisation of retail space; stimulating innovation; development of logistics hubs for e-commerce
Powerful regional centres	0.140-0.199	Kyiv, Kharkiv	Intensive growth strategy: increasing presence in the market of national and international chains; developing a new generation of shopping centres; actively implementing loyalty programmes; investing in fast delivery

Table 5 . Continued

Group	Integrated index range	Regions	Strategic guidelines
Regions with average potential	0.070-0.139	Poltava, Odesa, Vinnytsia	Selective expansion strategy: opening retail outlets in satellite cities and agglomerations; developing a network of discounters and local markets; adapting the product range to regional preferences; using franchising to reduce risks
Regions with low potential but stable presence	0.030-0.069	Zaporizhzhia, Volyn, Zhytomyr, Khmelnytskyi, Cherkasy, Ternopil, Rivne, Ivano-Frankivsk, Chernivtsi, Mykolaiv, Chernihiv, Sumy, Kirovohrad	Spot expansion strategy: development of retail facilities in regional centres and largest district towns; support for local producers; expansion of the product range through own brands; development of partnership programmes with online platforms
Crisis regions	<0.030	Kherson, Luhansk, Donetsk	Recovery and support strategy: focus on basic goods and mobile retail formats; creation of humanitarian and commercial hubs; involvement of donor and government support programmes; development of e-commerce as an alternative to physical presence

Source: developed by the author based on research by V. Hryniv (2023), M. Usova (2024), I. Hrabovska (2025)

The grouping of regions based on the integrated GRDI-IMI index allows for clear identification of market leaders and regions with potential risks. This classification serves as a basis for the informed formulation of retail development strategies and investment planning at the regional level. In addition, it provides practical guidelines for adapting business models to the specific economic environment of each group of regions. The results of the study, which provide an integrated assessment of the attractiveness of Ukraine's regional retail markets using the combined GRDI-IMI index, confirm the importance of a comprehensive approach to analysing the economic potential of regions. This is consistent with the findings of N. Sirenko *et al.* (2025), who emphasise the importance of multifactor models for assessing regional development in conditions of economic instability. The authors note that the integration of consumer demand, investment attractiveness and macroeconomic stability indicators allows for a more accurate identification of priority regions for investment in the retail sector. A comparison with the study demonstrates a common understanding of the need for a comprehensive approach to assessing the attractiveness of regional markets. However, unlike their study, which focuses on the analysis of macroeconomic indicators, the authors' study includes a detailed assessment of market indicators, such as sales volume and the number of enterprises in the retail sector, which allows for a more in-depth assessment of regional development dynamics.

According to the studies, in the near future, the attractiveness of Ukraine's regional retail markets will remain uneven, but they will gradually recover provided that the external environment stabilises. This coincides with the conclusions of L. Stanca *et al.* (2025), who argued that in the post-pandemic period, the main factor in the development of retail trade will be adaptation to the conditions of the new socio-economic reality and increased resilience through consumer clustering and omnichannel strategies. A similar opinion is held by S. Kovalchuk (2024), who emphasised that digitalisation and reorientation of trade formats are the defining trends in Ukrainian retail. However, as the author's research shows, the spatial aspect of development will remain key in the coming years – the heterogeneity of regional markets' attractiveness, which requires targeted strategies. An important confirmation of the results obtained is the study by S. Pepchuk & T. Palonna (2023), who pointed to the concentration of chain trade in the capital and several large regional centres. This is consistent with the author's calculations using the GRDI-IMI integral indicator, which also revealed a concentration of attractiveness in these regions. In the context of crisis conditions, it is advisable to take into account the conclusions of T. Sak & N. Hrytsiuk (2020), who emphasised the need for flexible anti-crisis retail strategies. The authors' results specify this approach, demonstrating which regions have greater potential for recovery in the future.

Another strategic direction is state support and regulatory measures. This is emphasised by O. Nikishyna & A. Shcherbak (2023b), who argued that the effective functioning of retail trade requires transparent regulation, equal conditions for all market participants, and support for small and medium-sized businesses. Similar conclusions are confirmed by the results of the author's analysis, since the typology of regions formed using GRDI-IMI can become the basis for a differentiated development policy. At the same time, the conclusions of K. Huk & A. Zeynalov (2022) should be taken into account, who emphasised the deep regional disparities in Ukraine that determine the inequality of socio-economic development conditions. The author's research details this problem, showing how these disparities manifest themselves in the retail trade sector. The study complements the existing scientific base and provides strategic guidelines for regions of Ukraine belonging to different groups in terms of the attractiveness of the retail trade market.

CONCLUSIONS

The study showed that retail trade in Ukraine is characterised by significant regional heterogeneity, which is due to differences in macroeconomic potential, investment activity and the saturation of trade infrastructure. The use of the combined GRDI-IMI index made it possible to comprehensively assess the attractiveness of regional markets by comparing economic, infrastructure and market indicators. According to the results of the integrated calculation, Kyiv City remains the market leader, which is explained by the high concentration of sales, significant household incomes, the number of enterprises and a favourable consumer price index. Its integral indicator was 0.819, which is almost 4-6 times higher than that of other developed regions. Powerful regional centres – Dnipropetrovsk, Lviv, Kyiv and Kharkiv regions – demonstrate high retail activity, but their average macroeconomic potential slightly lowers their integrated assessment. Thus, Dnipropetrovsk region received an index of 0.205, Lviv – 0.168, Kyiv – 0.140, Kharkiv – 0.124, which indicates the presence of significant but uneven potential for further development. Regions with average potential (Poltava, Odesa, Vinnytsia) are characterised by moderate sales and business indicators. Their index values vary between 0.073 and 0.102, in particular Poltava region – 0.102, Odesa – 0.101, Vinnytsia – 0.073. This indicates the possibility of selective expansion and the formation of specialised retail formats. Regions with low potential but a stable presence require targeted strategies for expansion and development of local trade. This group includes Zhytomyr (0.054), Khmelnytskyi (0.052), and Zaporizhzhia (0.049) regions, where the level of market attractiveness is 15-20 times lower than in the capital. Crisis regions (Kherson, Luhansk, Donetsk) need to focus on basic goods, mobile formats and support for e-commerce. Their index values are minimal: Kherson – 0.017, Luhansk and Donetsk – 0.004 each, reflecting the critical state of the market infrastructure. The weights of the indicators reflect the balance between economic activity (sales, number of enterprises) and the level of household income (salaries), while the consumer price index has a negligible impact due to its relative stability. The results obtained emphasise the importance of a comprehensive approach to assessing regional development, integrating macroeconomic and market indicators, and the need to adapt retail development strategies to local conditions. Further research could focus on the development of online commerce and omnichannel strategies. Particular attention should be paid to analysing the role of digital technologies in stabilising retail trade in the context of military challenges, as well as assessing the effectiveness of adaptive business models for different categories of regions.

ACKNOWLEDGEMENTS

None.

FUNDING

None.

CONFLICT OF INTEREST

None.

REFERENCES

[1] Arango, C., Pinzón, R.W.A., & Karachas, D. (2021). Global retail development index. Year & area. 2004-2019. In *2nd South American international conference on industrial engineering and operations management* (pp. 1422-1433). São Paulo: IEOM Society International. doi: 10.46254/SA02.20210586.

[2] Chupryna, O., Arakelova, I., & Popova, Y. (2024). Development of domestic retail trade: Current trends and perspectives. *Economy and Society*, 70, 1-8. doi: 10.32782/2524-0072/2024-70-104.

[3] Derykhovska, V.I. (2021). The typification of regions of Ukraine according to the level of development of the trade industry by the method of cluster analysis. *Business Inform,* 10, 159-164. doi: 10.32983/2222-4459-2021-10-159-164.

[4] Horodniak, I.V., & Hnativ, Y.P. (2023). Analysis of the retail trade market in Ukraine. *Economic Space*, 187, 49-54. doi: 10.32782/2224-6282/187-8

[5] Hrabovska, I. (2025). Methodological aspects of strategic management of enterprise development in the trade sphere. *Herald of Khmelnytskyi National University. Economic Sciences*, 342(3(1)), 59-64. doi: 10.31891/2307-5740-2025-342-3(1)-8.

[6] Hryniv, V.B. (2023). Conceptualization of innovative development of retail trade in a fast-changing environment. *Herald of Lviv University of Trade and Economics. Economic Sciences,* 73, 118-127. doi: 10.32782/2522-1205-2023-73-17.

[7] Huk, K., & Zeynalov, A. (2022). Regional disparities and economic growth in Ukraine. *arXiv.* doi: 10.48550/arXiv.2211.05666.

[8] Ilchuk, M., Kyrychenko, A., & Vodnitskyi, M. (2023). Development of e-commerce in Ukraine in the war and post-war conditions. *Science and Innovation*, 19(3), 3-14. doi: 10.15407/scine19.03.003.

[9] Ilchuk, M., Kyrychenko, A., Tomashevska, O., Zanizdra, A., & Zanizdra, A. (2025). Development of wholesale food trade in Ukraine's domestic market under martial law. *Science and Innovation*, 21(3), 67-85. doi: 10.15407/scine21.03.067.

[10] Kearney. (2023). *Expanding markets: Demographics, technologies, and regulation drive retail growth in developing nations*. Retrieved from https://www.kearney.com/global-retail-development-index/.

[11] Kharlamova, G. (2014). Investment attractiveness of Ukrainian regions: Rating assessment and marketing promotion. *Journal of International Studies*, 7(1), 9-26. doi: 10.14254/2071-8330.2014/7-1/1.

[12] Kovalchuk, S. (2024). Analysis of the state and transformations of retail: Global trends and the Ukrainian segment. *Innovation and Sustainability*, 1, 120-132. doi: 10.31649/ins.2024.1.120.132.

[13] Lialiuk, A. (2021). Trends development trends in Volyn region: Regional development factors. *Economic Journal of Lesya Ukrainka Volyn National University*, 2(26), 119-127. doi: 10.29038/2786-4618-2021-02-119-127.
[14] Mladenović, S.S., Mladenović, I., & Randelović, M.P. (2020). Emerging markets and internationalization of retail: The case of BRIC countries. *Economic Themes*, 58(4), 479-500. doi: 10.2478/ethemes-2020-0027.
[15] Nikishyna, O.V., & Shcherbak, A.V. (2023a). Transition to selective regulation of retail trade in Ukraine on the basis of EU experience. *Economy and Forecasting*, 1, 65-82. doi: 10.15407/econforecast2023.01.065.
[16] Nikishyna, O.V., & Shcherbak, A.V. (2023b). Retail trade in Ukraine: Status, trends and institutional ways to improve selective regulation. *Food Industry Economics*, 15(1), 3-12.
[17] Oliinyk, T., & Ivanova, M. (2024). Development of retail in Ukraine. *Young Scientist*, 1(125), 126-129. doi: 10.32839/2304-5809/2024-1-125-1.
[18] Pepchuk, S., & Palonna, T. (2023). Overview of network retail in Ukraine and prospective directions of its development. *Economic Bulletin of Cherkasy State Technological University*, 24(4), 47-55. doi: 10.62660/ebcstu/4.2023.47.
[19] Sak, T., & Hrytsiuk, N. (2020). Retail market in Ukraine: Trends and perspectives of development in a crisis. *Economic Journal of Lesya Ukrainka Volyn National University*, 2(22), 33-42. doi: 10.29038/2411-4014-2020-02-33-42.
[20] Sirenko, N., Mikuliak, K., & Oreshko, A. (2025). Development of retail in Ukraine. *Modern Economics*, 50, 167-174. doi: 10.31521/modecon.V50(2025)-22.
[21] Stanca, L., Dabija, D.-C., & Câmpian, V. (2025). Adaptation and resilience in retail: Exploring consumer clusters in the new normal. *Journal of Retailing and Consumer Services*, 82, article number 104112. doi: 10.1016/j.jretconser.2024.104112.
[22] State Statistics Service of Ukraine. (n.d.). Retrieved from https://www.ukrstat.gov.ua/.
[23] Teslya, D.V. (2021). *Formation and use of the market potential of regions of Ukraine*. (Doctoral dissertation, Institute of Regional Research named after M.I. Dolishniy of the National Academy of Sciences of Ukraine, Lviv, Ukraine).
[24] Usova, M.A. (2024). A conceptual approach to risk resistance management of retail trade enterprises. *Economic Journal Odessa Polytechnic University*, 1(27), 89-98. doi: 10.15276/EJ.01.2024.10.

Оцінка привабливості регіональних ринків роздрібної торгівлі України за комбінованою методикою GRDI-IMI

Анастасія Кириченко
Кандидат економічних наук, доцент
Національний університет біоресурсів і природокористування України
03041, вул. Героїв Оборони, 15, м. Київ, Україна
https://orcid.org/0000-0002-5647-7698

Анотація. У сучасних умовах економічних трансформацій, спричинених пандемією COVID 19 та повномасштабним вторгненням РФ (24 лютого 2022 р.), особливої актуальності набуває дослідження привабливості регіональних ринків роздрібної торгівлі в Україні. Незважаючи на соціально-економічні шоки, ринок демонструє поступове відновлення, однак регіональні диспропорції щодо економічного потенціалу, насиченості торговельної інфраструктури та рівня інвестицій створюють неоднорідні умови для розвитку. Метою дослідження була оцінка привабливості та потенціалу регіональних ринків роздрібної торгівлі з урахуванням макроекономічного стану, інфраструктури, інвестиційної активності та цифровізації ринку на основі комбінованого індексу GRDI-IMI. Використано статистичні дані державних органів, відкриті джерела та методи нормалізації показників, зваженого індексування та інтеграції макроекономічних та ринкових факторів. Отримані результати показали, що поєднання глобального підходу GRDI з індексом макроекономічної інтегральності (IMI) дозволяє комплексно оцінити перспективи розвитку регіональних ринків. Виявлено значну неоднорідність привабливості регіональних ринків: лідерами стали м. Київ, Дніпропетровська та Львівська області, потужні регіональні центри – Київська і Харківська області, середній потенціал – Полтавська, Одеська та Вінницька області, а низький – регіони, що зазнали значних економічних потрясінь через війну. Дослідження запропонувало практичні орієнтири для стратегічного планування розвитку торговельної мережі. Запропонована методика GRDI-IMI забезпечила комплексний підхід до оцінки ринкової та макроекономічної привабливості регіонів, що може стати основою для диференційованої політики розвитку роздрібної торгівлі в Україні. Отримані результати можуть бути застосовані як державними інституціями для розробки регіональної економічної політики, так і підприємствами роздрібної торгівлі та інвесторами для ухвалення стратегічних управлінських рішень

Ключові слова: індекс розвитку роздрібної торгівлі; регіональна конкурентоспроможність; інвестиційна привабливість регіонів; інтегральні показники оцінювання; макроекономічний аналіз ринку; методи ранжування регіонів; стратегічне планування роздрібної мережі

University Economic Bulletin
Vol. 20, No. 2, 2025
Journal homepage: https://ue-bulletin.com.ua/en
Received: 04.08.2025. Revised: 28.11.2025. Accepted: 24.12.2025. Published: 26.12.2025

UDC 336.71:305(8-21) DOI: 10.69587/ueb/2.2025.67

Banking on equality: Closing the gender divide in Latin America's financial systems

Biliqees Ayoola Abdulmumin*
PhD
University of Ilorin
240003, 1 University Rd., Ilorin, Nigeria
https://orcid.org/0000-0003-2803-3114

Abstract. Financial inclusion has emerged as a pivotal strategy for promoting inclusive economic growth, reducing poverty, and fostering social equity everywhere in the world. However, significant gender disparities persist in Latin America, where millions of women remain excluded from formal financial systems. The purpose of this study was to investigate the impact of gender disparities in financial access on overall financial inclusion in Latin American countries using panel data spanning 2011, 2014, 2017, and 2021 from the World Bank's global financial development database. Descriptive analysis revealed persistent gender gaps in financial access, with male populations consistently outperforming their female counterparts in account ownership, savings, credit, and credit/debit card usage. Among the countries studied, Costa Rica and Ecuador exhibited relatively wider gaps, while Uruguay showed more gender parity across indicators. Correlation analysis showed a significant negative relationship between the financial inclusion index and account ownership gap and the debit/credit card gap, suggesting that gender disparity in these areas is associated with lower overall financial inclusion. Results from the random effects panel regression model showed that account ownership gap ($\beta = -6.283$, $p > 0.05$), savings gap ($\beta = -3.193$, $p > 0.05$), credit gap ($\beta = 0.1337$, $p > 0.05$), and debit/credit card gap ($\beta = 2.6216$, $p > 0.05$) had insignificant effects on financial inclusion in the Latin American region. The results of this study can be utilised by policymakers, financial institutions, and international organisations in Latin America to develop targeted strategies aimed at reducing gender gaps in access to financial services and enhancing overall financial inclusion

Keywords: financial inclusion; gender disparities; account ownership gap; panel data; financial services

INTRODUCTION

This study is relevant as it examines the persistent gender gap in financial inclusion across Latin America, a region where financial access remains uneven despite significant economic and technological progress. Women in many Latin American countries continue to face barriers to formal banking, credit, and digital financial services which limit their ability to save, invest, and participate in economic activities. Addressing these disparities is essential for fostering inclusive growth and reducing structural inequalities that hinder social and economic development.

According to S. Hundie & D. Tulu (2023), financial inclusion is important for helping countries grow fairly, reduce poverty, and achieve long-term development. It means making sure everyone can use basic financial services like saving money, getting loans, investing, or buying insurance at low cost. P. Raffaelli *et al.* (2025) mentioned that these services help people handle money better, stay strong during hard times, and improve their quality of life. In places like Latin America, financial inclusion helps the economy by giving people and businesses access to the right financial tools in a fair, affordable, and responsible way. Despite global advancements in financial access, significant disparities remain, particularly along gender lines and across regions, with Latin America representing a compelling context for investigation. Latin America and the Caribbean (LAC) region have experienced notable progress in financial inclusion over the past two decades, driven by financial sector reforms, digital transformation, and increased investment

Suggested Citation:
Abdulmumin, B.A. (2025). Banking on equality: Closing the gender divide in Latin America's financial systems. *University Economic Bulletin*, 20(2), 67-77. doi: 10.69587/ueb/2.2025.67.

*Corresponding author

in mobile banking infrastructure. Nevertheless, S. Ansar *et al.* (2023) noted that in many Latin American and Caribbean (LAC) countries, women from rural and low-income areas are more likely to be left out of the formal financial system. The gap between men and women in owning bank accounts, saving money, and using credit or debit cards is still larger than the global average.

A. Galindo-Manrique & N. Rojas-Vargas (2025) argued that factors like social norms, income levels, education, and access to technology all contribute to this gender gap in account ownership, which is the first step to using other financial services. Even with efforts to improve access, women remain less likely than men to have bank accounts, limiting their ability to make digital payments, save money, or get credit. Similarly, S. Peter *et al.* (2025) identified disparities in savings behaviour reflect deeper structural and cultural barriers, ranging from lower income levels to lack of financial literacy and limited financial autonomy, that hinder women's ability to build financial resilience. These barriers not only inhibit women's economic participation but also constrain household welfare and broader macroeconomic development, as gender equality in financial access has been positively linked to economic resilience, entrepreneurship, and human capital investment.

The gender gap in credit access is another crucial dimension of exclusion. C. Johnen & O. Mußhoff (2022) identified that women are often perceived as riskier borrowers and face obstacles such as lack of collateral, discriminatory lending practices, and limited access to information. This not only restricts their ability to invest in businesses or human capital but also impedes broader economic development. In addition, S. Hundie & D. Tulu (2023) indicated that women's participation in formal financial systems is further limited by their lower ownership and use of debit and credit cards, especially as financial services become more digital. According to H. Ndoya & C. Tsala (2021) and N. Kowsick & K. Ramasamy (2024), these gender-specific gaps collectively weaken the impact of financial inclusion initiatives and exacerbate existing inequalities. Apart from scarcity of empirical research on financial inclusion in Latin America, existing studies, which are mostly descriptive in nature, tend to overlook the roles of gender-specific constraints in shaping financial inclusions or treat gender gap in aggregate terms, missing the nuances across different financial behaviours. As such, policy interventions often remain generalised and fail to address the gender-specific determinants of the financial inclusion. Without a nuanced understanding of how each component of the gender gap contributes to financial exclusion, policies may fall short of effectively addressing the root causes of inequality.

This study, therefore, sought to fill this empirical gap by examining the extent to which gender disparities in account ownership, savings, credit access, and debit/credit card usage influence financial inclusion across selected Latin American countries.

LITERATURE REVIEW

A. Okello (2025) explained financial inclusion as making sure people and businesses can get useful and affordable financial services, like making payments, saving money, getting loans, and buying insurance in a fair and lasting way. These services are often available online through digital platforms. Yet, across Latin America, as in other developing regions, a persistent gender gap undermines equitable financial access. S. Peter *et al.* (2025) mentioned that women, especially those from low-income or rural areas, are still largely left out of formal financial systems due to barriers related to institutions, society, and basic structures. According to H. Ndoya *et al.* (2024), financial inclusion means making sure everyone can access and use financial services that meet their needs. S. Hundie & D. Tulu (2023) explained that financial inclusion has three key parts: access, usage, and quality. Access means that financial services are easy to find, affordable, and not blocked by legal or institutional rules. Usage captures the frequency and regularity with which individuals engage with financial products. A. Galindo-Manrique & N. Rojas-Vargas (2025) mentioned that quality addresses whether these services are tailored to diverse client needs, particularly those of marginalised or low-income populations.

From a developmental perspective, having access to financial services is important for reducing poverty, promoting fair income distribution, and supporting economic growth. Researchers like G. Desalegn & G. Yemataw (2017) noted that financial inclusion helps people save, invest, start businesses, and manage daily expenses, encouraging more participation in the economy. S. Neaime & I. Gaysset (2018) also reported that inclusive financial systems support the sustainable development goals (SDGs) by making sure economic opportunities are shared more fairly. A. Shaikh *et al.* (2023) argued that in Latin America, while efforts have been made to reach low-income groups, many financial products are still too costly or not suited to their needs. From a gender perspective, financial inclusion goes beyond simply giving women access to financial services, it also involves broader issues like equal rights, opportunities, and fairness. According to H. Ndoya *et al.* (2024), the human rights approach argues that women deserve equal access to financial services as a matter of justice. However, in many regions, including Africa and Latin America, women still face systemic barriers due to institutional rules, legal restrictions, and cultural traditions. A. Demirguc-Kunt *et al.* (2022) identified that these barriers range from the inability to own property or access national identification documents, to requiring a husband's permission to engage in financial transactions.

Women's understanding of financial matters and their ability to use formal financial services are often limited by gender gaps in financial inclusion. According to A. Kara *et al.* (2021), M. Harijan & D. Kumari (2025), these gaps usually reflect wider inequalities, like differences in education, income, and job opportunities between men and women. S. Sharif *et al.* (2022) mentioned education is especially critical: it enhances women's understanding of financial services and increases their likelihood of inclusion. Gender disparities in access to credit or bank accounts often stem from broader socio-cultural norms and gendered

expectations that restrict women's economic roles. Studies by J. Akhter & K. Cheng (2020), A. Galindo-Manrique & N. Rojas-Vargas (2025) have attributed the gender gap to four broad factors: education, legal barriers, cultural and social norms, and socio-professional status.

Gender gap in account ownership is the difference in the percentage of men and women aged 15 and above, who have an account at a formal financial institution. A. Demirguc-Kunt *et al.* (2022) and N. Vyhovska *et al.* (2024) reported that having an account is the simplest way to measure financial inclusion because it is the first step to using other financial services. S. Balasubramanian *et al.* (2018) and H. Ndoya *et al.* (2024) argued that gender gap in this domain signifies structural and institutional barriers preventing women from initiating formal financial relationships, often rooted in discriminatory laws, socio-cultural norms, or lack of legal identification. Gender gap in formal savings behaviour captures the differential between men and women who report saving money at formal financial institutions. Savings behaviour reflects not only access but also trust in financial systems and the capacity to accumulate surplus income. According to S. Sharif *et al.* (2022), P. Ozili (2022), gender disparities here often stem from wage inequality, informal employment, or limited financial literacy, factors that restrict women's ability to build financial buffers or invest in long-term goals. Gender gap in credit access is the difference in how many men and women have borrowed money from a bank or other formal financial institution within a given time. Credit access is a critical enabler of entrepreneurship, asset acquisition, and social mobility. However, systemic biases, collateral requirements, and gendered financial stereotypes often limit women's access to formal credit markets (Akhter & Cheng, 2020). This gap reflects not just financial exclusion but also embedded inequalities in economic opportunity.

According to A. Kara *et al.* (2021), gender gap in debit and credit card usage refers to the difference between male and female usage rates of debit and credit cards, which are proxies for active engagement with digital and formal financial ecosystems. Usage of these instruments goes beyond mere access, it reflects financial capability, digital literacy, and transactional behaviour. Disparities in card usage often point to unequal exposure to financial education, infrastructural barriers like not having enough ATMs in rural areas, and social beliefs that limit women's financial freedom. The dependent variable in this study is a financial inclusion index (FII) constructed from multiple indicators reflecting access, usage, and quality of financial services. Disaggregated by gender, the index offers a nuanced view of inclusion that captures more than mere account ownership. The independent variables include gender gap in account ownership, gender gap in formal savings behaviour, gender gap in credit access, and gender gap in the usage of debit and credit cards.

This study was based on two related theories: the capability approach by A. Sen (1995) and feminist economic theory by N. Folbre (1994) and L. Benería *et al.* (2015). Together, these theories help explain the different factors behind the gender gap in financial inclusion in Latin America by looking at the issue from many angles. The capability approach says that real development should be measured by how free people are to live the lives they value. From this view, financial inclusion helps people build better lives by giving them tools to handle risks, invest in health and education, start businesses, and lift themselves out of poverty. When women have limited access to financial services, it not only hurts them financially but also limits their choices and well-being. This theory points out that it is not enough to just give people access, what matters is giving them real freedom to take part in economic and social life. In this study, financial inclusion helps women gain more control over their money, start businesses, and build wealth over time. Feminist economic theory, developed by researchers like N. Folbre (1994) and L. Benería *et al.* (2015), challenges conventional economic models that fail to account for gender-based inequalities in access to resources. This theory emphasises the influence of social norms, unpaid care responsibilities, legal frameworks, and power imbalances in shaping women's financial behaviours and outcomes. It critiques the assumption of a level playing field in economic participation and highlights how systemic discrimination, asset ownership disparities, and cultural expectations can hinder women's financial inclusion. In the Latin American context, where patriarchal norms and structural inequalities persist, this framework is particularly useful for understanding how exclusionary mechanisms operate beyond market forces.

A growing body of empirical literature has investigated the gender gap in financial inclusion across different regions, emphasising the role of income, education, digital access, and structural barriers. The following studies provide insights into key determinants and contextual dynamics of gendered financial inclusion, though there remains a notable paucity of work focused specifically on Latin America. H. Ndoya & C. Tsala (2021) studied why men and women in Cameroon have different levels of access to financial services, using data from Finscope 2017 and a method called Fairlie's decomposition. They found that men still have better access to and use of financial services than women. Their findings showed that women's lower income and education levels are major reasons for this gap, with income explaining more than half of the difference in access, and education explaining over a third of the difference in usage. M. Wagbafor *et al.* (2021) conducted a similar study in Nigeria using Global Findex 2014 data. They found a financial inclusion rate of 61% among men and 43% among women, with an 18% gender gap. Key determinants included education level, income quintile, and financial behaviours such as remittance sending and bill payments. Their findings underscored the role of socioeconomic "endowments" in perpetuating gender inequality in access to finance.

A. Demirguc-Kunt *et al.* (2022), using the Global Findex data, reported that although global account ownership has risen significantly, the gender gap persists, particularly in developing regions. In many cases, women are 7-9 percentage

points less likely to have a financial account than men. C. Johnen & O. Mußhoff (2022) explored the influence of digital credit on financial inclusion. Contrary to expectations, digital credit did not narrow but instead widened the gender gap. This was attributed to unequal socio-economic endowments and a lack of contract heterogeneity in digital lending platforms, revealing potential risks in assuming that digitisation is inherently inclusive. B. Fowowe (2023) examined the effect of financial inclusion and gender gaps on agricultural productivity in Mali using data from Living Standards Measurement Study – Integrated Surveys on Agriculture (LSMS-ISA). The study showed that financial inclusion improved productivity, but also revealed a 44.5-49.8% productivity gap between men and women, implying that financial gaps translate directly into real economic disadvantages for women. S. Hundie & D. Tulu (2023) used Global Findex 2017 data to investigate financial inclusion gender gaps in Ethiopia. Through decomposition methods, they found males were significantly more likely to possess formal accounts, savings, credit, and digital access tools. Education, mobile phone ownership, employment status, and wealth were all significant predictors of financial inclusion, reinforcing the structural nature of gender disparities.

N. Kowsick & K. Ramasamy (2024) conducted a systematic literature review showing that while digital tools (like mobile banking) offer potential to bridge the gap, challenges persist, including technological literacy, cultural barriers, and regulatory constraints. Their study emphasised the importance of not just access, but effective and equitable usage. M. Harijan & D. Kumari (2025) focused on digital financial inclusion in India, constructing a composite index to capture availability, accessibility, and use. Their results showed a significant gender gap (16.81% of men vs. 5.07% of women). Income and education were the most significant determinants, underscoring how structural inequalities impede digital inclusion for women. S. Peter *et al.* (2025) studied how digital financial literacy affects financial inclusion and business success among female entrepreneurs. Using survey data and Hayes Process macro modelling, they found that digital financial literacy strongly improved both. However, poor financial behaviour reduced this positive effect. This shows that behaviour, not just access or structure, plays an important role in financial inclusion.

A. Okello (2025) provided a rare reversal, showing that in Kenya's Kakuma refugee camp, women were more financially included than men. This was attributed to specific programmatic targeting, income-generating activities, and stronger social networks among women, highlighting that policy design and context matter greatly. A. Galindo-Manrique & N. Rojas-Vargas (2025) used Global Findex data to study gender gaps and digital money in low- and middle-income countries. Their research, which covered more than just Latin America, showed that digital finance helps close the gap between men and women in owning and using financial accounts. Women's financial inclusion improved when they had access to tools like smartphones, the Internet, and digital payments. This study also highlighted the important role digital technology could play in Latin America. Despite this, few empirical studies have explicitly examined the gender gap in financial inclusion in Latin America using panel econometric techniques. Most existing studies are descriptive in nature.

MATERIALS AND METHODS

This study created a financial inclusion index to measure the gender gap in Latin America using three factors: the number of ATMs per 100,000 people, the number of bank branches per 100,000 adults, and the number of bank borrowers per 1,000 adults. The selection of these indicators was substantiated primarily based on data availability and cross-country consistency. Latin American countries, such as Mexico and Panama, do not have complete data on individual-level. The data related to financial inclusion were sourced from the World Development Indicators (WDI). To measure the gender gap in financial inclusion across Latin America, this study considered data specifically for men and women. The data included how many men and women have accounts at financial institutions, save money there, take out loans, and have debit or credit cards. These numbers came from the World Bank's Global Financial Development Database for the years 2011, 2014, 2017, and 2021. The Pesaran CD test was conducted to check if the observations from different cross-sectional units are independent of each other.

The gender gap in financial inclusion was calculated for each variable as the difference between the male and female percentages (i.e., male % – female %). If the result was positive, it meant men had an advantage; if negative, women had an advantage. To ensure consistency across countries and time, only countries with complete data across all selected years were included in the gender gap analysis. Countries such as Mexico and Panama were excluded due to incomplete records. This approach strengthened the reliability of the analysis by reducing data gaps and measurement inconsistencies. The study sample consisted of 9 countries in the Latin American region including Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Paraguay, Peru, and Uruguay.

The functional model for this study was specified as:

$$\text{Financial inclusion}_{it} = f(\text{Gender-specific variables}). \quad (1)$$

The functional model was further expressed as:

$$\text{FII} = f(\text{ACCT,SAVE,BORR,CARD}). \quad (2)$$

Then, the functional model can be expressed in panel model as:

$$\text{FII}_{it} = \alpha + \beta_1 \text{ACCT}_{it} + \beta_2 \text{SAVE}_{it} + \\ + \beta_3 \text{CRED}_{it} + \beta_4 \text{CARD}_{it} + \mu_i + \varepsilon_{it}, \quad (3)$$

where FII_{it} – financial inclusion index for country *i* in year *t*; α = intercept, ACCT – gender gap in account ownership (% male – % female); SAVE – gender gap in savings at

financial institutions; CRED – gender gap in access to credit/borrowing from financial institutions; and CARD – gender gap in credit/debit card ownership, β_1 to β_4 are the coefficients of the explanatory variables, μ_i – unobserved country-specific effects (random or fixed); ε = error term.

Given the structure of the dataset, which included multiple countries observed over several years, a panel data approach was deemed appropriate. Initially, a pooled ordinary least squares (pooled OLS) regression was estimated, but this approach assumes that all countries are homogeneous and fails to account for unobserved heterogeneity. As such, it may produce biased results due to omitted variable bias. Subsequently, the study employed two models: fixed effects (FE) and random effects (RE). The fixed effects model used more data points to control for factors that do not change over time within each country. The random effects model, if its assumptions held, was more efficient because it assumed the unseen differences between countries were not linked to the other variables in the study. To decide which model was better, FE or RE, Hausman test was used. If the test showed that RE model was a better fit, the result would not reject the null hypothesis ($p > 0.05$). As such, RE model would be employed for the analysis.

RESULTS AND DISCUSSION

This section presents and interprets the findings from the analysis of gender disparities and financial inclusion across selected Latin American countries. The results are structured to present key patterns identified through descriptive statistics and correlation analysis, examine statistical relationships using panel regression analysis, and discuss how gender gaps in financial access (account ownership, savings, credit, and debit/credit card usage) affect financial inclusion in Latin America. Table 1 shows the gender-specific indicators across Latin American countries (2011, 2014, 2017, 2021).

Table 1. Summary statistics table

Variable	Mean	Min	Max	Std. Dev.
Financial inclusion index	0.0291	-0.9367	4.5791	-0.9395
Financial institution account, female	48.30%	18%	87%	16.61
Financial institution account, male	55.47%	21%	88%	16.48
Saved at a financial institution, female	11.52%	3%	34%	7.91
Saved at a financial institution, male	15.23%	4%	38%	9.23
Borrowed from formal institution, female	19.22%	6%	45%	9.35
Borrowed from formal institution, male	22.07%	5%	48%	9.97
Owns debit or credit card, female	39.53%	13%	78%	15.78
Owns debit or credit card, male	46.97%	12%	81%	16.45
Gender gap variables				
Account ownership gap	0.066111	-0.0500	0.200000	0.061052
Savings gap	0.040278	-0.0300	0.100000	0.034599
Credit gap	0.048889	-0.0300	0.180000	0.045656
Debit/Credit card gap	0.075000	-0.0600	0.21000	0.069261

Source: calculated by the author

In Table 1, financial inclusion has a mean value of 0.0291, indicating relatively low average financial inclusion levels across the sample, with considerable variation ranging from -0.9367 (lowest observed value) to 4.5791 (highest observed value), and a standard deviation of 0.9395, suggesting notable differences across countries. In terms of account ownership, the average proportion of females with financial institution accounts is 48.30%, compared to 55.47% for males. This reveals a gender gap of roughly 7 percentage points on average. The standard deviations for both variables (16.61 for females and 16.48 for males) suggest moderate variability across countries.

For saving behaviour, only 11.52% of women reported saving at a financial institution, compared to 15.23% of men. This implies a noticeable gender gap in formal savings, with women participating less in institutional saving. Again, there is substantial cross-country variation, with standard deviations of 7.91 and 9.23, respectively. When it comes to borrowing from formal financial institutions, 19.22% of women and 22.07% of men reported having done so. Although the gap is narrower here than in savings, men still slightly outperform women in access to formal credit. Ownership of debit or credit cards shows a mean of 39.53% for women and 46.97% for men. This indicates another significant gender disparity in access to financial tools for transactions, with a difference of over 7 percentage points. Both variables show relatively high standard deviations (15.78 and 16.45), reflecting notable differences across countries.

Account ownership gap shows a mean of 0.0661, indicating that, on average, men are about 6.61 percentage points more likely to own an account at a financial institution than women. However, the range spans from -5 to 20%, suggesting that while men generally have higher account ownership, some countries exhibit a reverse trend where women actually outperform men. The savings gap has a mean of 0.0403, meaning that men are on average 4.03 percentage points more likely than women to save at a financial institution. The gap ranges between -3 and 10%, indicating a smaller disparity compared to account ownership. This narrower gap suggests that while men tend to

save more formally, the difference is less severe, and in a few countries, women save more than men.

For borrowing from formal institutions, the gap averages 0.0489, with a minimum of -3 and a maximum of 18%. This shows that men are generally more likely to access formal credit, potentially reflecting structural barriers such as lower creditworthiness or limited collateral among women. Nonetheless, the presence of negative values points to instances where women surpass men in borrowing, though these are less common. The debit/credit card ownership gap exhibits the highest average disparity, with a mean of 0.0750. This suggests that men are, on average, 7.5 percentage points more likely than women to own a debit or credit card. The gap ranges from -6 to 21%, reflecting the widest variability among the indicators. This significant gap may be attributed to differences in digital literacy, employment status, income levels, and overall financial autonomy, which are more pronounced when it comes to owning and using formal financial instruments.

In summary, the data clearly indicate that men enjoy greater financial inclusion than women across all four indicators, though the magnitude of these gaps varies. While positive mean values confirm general male advantage, the negative minimum values show that gender-inclusive financial ecosystems do exist within the region. These findings are consistent with the findings of S. Hundie & D. Tulu (2023), H. Ndoya *et al.* (2024), and N. Kowsick & K. Ramasamy (2024). Table 2 shows the gender gap by country (2011, 2014, 2017, 2021).

Table 2. Country-level summary statistics table

Country	Account ownership gap	Savings gap	Credit gap	Debit/Credit card gap
Argentina	-1.25	+3.75	+3.00	+2.00
Brazil	+6.75	+7.00	+8.25	+10.75
Chile	+4.50	+6.25	+5.25	+2.50
Colombia	+9.25	+4.25	+6.00	+10.50
Costa Rica	+14.25	-0.25	+6.25	+15.50
Ecuador	+12.25	+6.75	+7.75	+14.50
Paraguay	+1.75	+3.25	+1.75	+4.25
Peru	+11.75	+5.25	+3.25	+10.25
Uruguay	+2.75	+2.75	+0.25	+0.50

Source: calculated by the author

The country summary table, as seen in Table 2, shows the gender gaps in four key financial areas, owning debit/credit cards, borrowing, saving, and having bank accounts, in some Latin American countries. For each area, the gap is calculated by subtracting the percentage of women from the percentage of men (male % – female %). Positive outcome means more men participate, while negative means more women do. The gap between men and women owning accounts is very different across countries. The largest gaps are in Costa Rica (+14.25), Ecuador (+12.25), and Peru (+11.75), where men are much more likely than women to have accounts. Argentina is the only country with a small negative gap (-1.25), meaning women are slightly more likely than men to have accounts, which is unusual for the region.

The savings gap also generally favours men, with the largest gaps observed in Brazil (+7.00), Chile (+6.25), and Ecuador (+6.75). These figures imply that men are more likely than women to save at formal financial institutions. Notably, Costa Rica is an exception with a small negative gap (-0.25), suggesting a near-equal savings rate among women compared to men. In terms of borrowing from formal institutions, countries such as Brazil (+8.25), Ecuador (+7.75), and Colombia (+6.00) have relatively high gaps, indicating that men are more likely to access formal credit. Uruguay shows a minimal gap (+0.25), suggesting a more balanced borrowing pattern between genders. The debit/credit card ownership gap shows some of the widest disparities in financial inclusion. Costa Rica (+15.50), Ecuador (+14.50), and Brazil (+10.75) show double-digit gaps, suggesting that men are much more likely to own these financial instruments. Even in countries with lower gaps, such as Uruguay (+0.50) and Argentina (+2.00), the advantage still favours males. Overall, these results highlight a consistent gender gap across financial inclusion dimensions, with men generally having greater access to accounts, savings, credit, and card ownership. While a few exceptions exist, such as Argentina in account ownership and Costa Rica in savings, the prevailing pattern underscores persistent structural and socioeconomic barriers limiting women's access to financial services in Latin America.

The Pesaran CD test was conducted to check if the observations from different cross-sectional units are independent of each other. If p-value < 0.05, reject the null hypothesis of no cross-section dependence (i.e., no correlation between the observations across countries), meaning sampled countries behave independently. Table 3 shows the cross-section dependence test results.

Table 3. Cross-section dependence test

Variables	Pesaran CD
Financial inclusion index	0.0356
Account ownership gender gap	0.3178

Table 3. Continued

Variables	Pesaran CD
Savings gender gap	0.0001
Credit gender gap	0.0001
Owns debit/credit card gender gap	0.6366

Source: calculated by the author

The Pesaran CD test in Table 3 showed a p-value of 0.0356, meaning financial inclusion is connected across countries, if one country's financial inclusion changes, nearby or similar countries might be affected too. This could be due to shared financial systems or economic policies. But with a p-value of 0.3178, the gender gap in account ownership does not show this connection, meaning the differences between men and women in each country are more likely caused by local laws, culture, or institutions, not regional factors. However, both the savings gender gap and the credit gender gap show strong evidence of cross-sectional dependence, with p-values of 0.0001. This implies that gender disparities in saving and borrowing behaviours are not isolated phenomena, but rather reflect broader regional patterns. These could be attributed to common socio-economic conditions, gender norms, or structural barriers affecting women's access to financial services across the region.

The debit/credit card ownership gender gap does not show significant cross-sectional dependence, as evidenced by a high p-value of 0.6366. This indicates that gender disparities in access to card-based financial services vary independently from one country to another, reflecting the uneven penetration of card infrastructure or differing consumer behaviour across countries. These findings highlight that while certain aspects of gendered financial inclusion (like savings and credit) are influenced by regional trends, others (like account and card ownership gaps) are more country-specific. Table 4 shows the correlation coefficients.

Table 4. Correlation coefficients table

Correlation probability	1	2	3	4	5
Financial inclusion index	1.0000 -				
Account ownership gender gap	-0.2922 0.0038	1.0000 -			
Savings gender gap	-0.1155 0.2604	0.0154 0.2899	1.0000 -		
Credit gender gap	-0.0682 0.4835	0.3121 0.0639	0.5257 0.0010	1.0000 -	
Owns debit/credit card gender gap	-0.1486 0.0027	0.6615 0.0000	0.1279 0.4605	0.5474 0.0006	1.0000 -

Source: calculated by the author

In Table 4, the correlation coefficients results provide insights into the relationships between the financial inclusion and various gender gap variables in Latin America. Financial inclusion has a significant negative correlation with the account ownership gender gap ($r = -0.2922$, $p = 0.0038$). This implies that as gender disparities in account ownership increase (i.e., the gap widens in favour of men), the overall financial inclusion level tends to decrease. Conversely, when the gender gap narrows and more women gain access to financial accounts at a level comparable to men, financial inclusion improves. A. Demirguc-Kunt *et al.* (2022) also established that efforts to reduce the gap between men and women owning accounts can help make financial services fairer for everyone in the region.

The savings gender gap has a weaker and statistically insignificant negative correlation with the financial inclusion index ($r = -0.1155$, $p = 0.2604$). This suggests that although greater disparities in formal saving behaviour are associated with slightly lower financial inclusion, the relationship is not strong or statistically reliable. This implies that gender differences in savings behaviour, may not play a substantial or direct role in shaping the overall level of financial inclusion in Latin America. Similarly, the credit gender gap shows a very weak negative correlation with financial inclusion ($r = -0.0682$, $p = 0.4835$), indicating no meaningful relationship. This suggests that although there is tendency for financial inclusion to decrease as the gender gap in borrowing from formal financial institutions widens. In other words, variations in the difference between male and female access to credit do not strongly explain changes in financial inclusion levels across Latin America.

Similarly, financial inclusion has a significant negative correlation with debit/credit card ownership gender gap ($r = -0.1486$, $p = 0.0038$). This implies that as the gender disparity in debit or credit card ownership increases the overall level of financial inclusion in the country tends to decrease. As such, equitable access to financial tools like debit and credit cards is important for promoting

financial inclusion. When women have lower access to these financial instruments compared to men, it reflects broader exclusion from the formal financial system, limiting their ability to participate in digital payments, credit markets, and financial decision-making. To determine the appropriate panel model, both fixed effects (FE) and random effects (RE) estimations were run. The Hausman test result ($\chi^2 = 2.5186$, $p = 0.6413$) indicates that the RE model is preferred, as the null hypothesis of no systematic difference between RE and FE coefficients could not be rejected. This implies that the unobserved heterogeneity across countries is uncorrelated with the explanatory variables, validating the use of RE. Table 5 presents the result of the random effects panel regression.

Table 5. Random effects panel regression results

Dependent variable = financial inclusion				
Variable	**Coefficient**	**Std. Error**	**t-statistic**	**p-value**
ACCT (Account ownership gap)	-6.2832	3.7374	-1.6811	0.1035
SAVE (Savings gap)	-3.1929	6.0552	-0.5277	0.6029
CRED (Credit gap)	0.1337	4.8723	0.0273	0.9781
CARD (Debit/Credit card gap)	2.6216	3.7599	0.6978	0.4915
Constant	0.3415	0.3768	0.9066	0.3722
Model diagnostics				
R-squared	0.4152			
F-statistic	8.0707			
F-statistic (prob)	0.0303			
Durbin-Watson	1.9849			
Hausman test				
Chi-square statistic	2.5195			
Degrees of freedom	4			
p-value	0.6411			
Number of observations	36			
Number of countries	9			

Source: calculated by the author

The results in Table 5 indicate that none of the gender gap variables are statistically significant predictors of financial inclusion. Although the coefficient for account ownership gender gap is negative ($\beta = -6.283$), suggesting that wider gaps may reduce financial inclusion, this relationship is not statistically significant ($p = 0.1035$). Similarly, the gender gaps in savings ($\beta = -3.192$, $p = 0.6029$), credit access ($\beta = 0.1337$, $p = 0.9781$), and debit/credit card ownership ($\beta = 2.6216$, $p = 0.4915$) do not show significant associations with financial inclusion. The insignificance of the gender gap indicators suggests that, over the study period, variations in gender-based access to financial services may not have had measurable impact on financial inclusion at the regional level. This could be conditioned by institutional factors, digital financial policies, or regional heterogeneity that were not fully captured in the model. Nonetheless, the negative trend of key coefficients, especially for account ownership and savings, still points toward areas where gender disparity may impede financial inclusion in the long term.

The model's R-squared value of 0.4152 means that about 41.52% of the changes in financial inclusion can be explained by the variables used. The model is statistically significant, shown by the F-statistic of 8.0707 and its p-value of 0.0303. The Durbin-Watson statistic is 1.98, close to the ideal 2, meaning there is no problem with serial correlation in the errors. The Hausman test result (Chi-square = 2.5195, $p = 0.6411$) supports using the RE model instead of the FE model, confirming that the model's assumptions are valid for this study. The result of the diagnostics test is shown in Table 6.

Table 6. Diagnostic tests: Multicollinearity, heteroscedasticity, serial correlation

Diagnostic test	**Test used**	**Statistic**	**p-value**	**Interpretation**
Multicollinearity	Variance inflation factor (VIF)	3.51	-	No serious multicollinearity
Heteroskedasticity	Breusch-Pagan test	14.5	0.2821	Heteroskedasticity is absent
Serial correlation	Wooldridge test	F = 8.34	0.1051	No serial correlation detected

Source: calculated by the author

The VIF value is below the commonly accepted threshold of 5, and tolerance values are above 0.1, indicating no significant multicollinearity among the independent variables. This means the predictors are not excessively correlated with each other, so the estimated coefficients are reliable. The Breusch-Pagan test for heteroscedasticity returned a p-value of 0.2821, which is greater than 0.05, indicating no evidence of heteroscedasticity, meaning the variance of the error terms is constant. The p-value of Wooldridge test for autocorrelation in panel data is above 0.05. Thus, the null hypothesis of no serial correlation cannot be rejected. This means autocorrelation is not a problem, and the error terms are not systematically related over time.

The regression results indicate that none of the gender gap coefficients are statistically significant at conventional levels, although the point estimates suggest that wider account and savings gaps are associated with lower financial inclusion, while the credit and card gaps carry opposite signs. Nonetheless, placing results in conversation with the wider literature reveals important patterns and clarifies why outcomes diverge across studies. At the descriptive level, evidence of men exhibiting higher account ownership, savings, credit, and card usage is consistent with prior cross-country and regional research. A. Demirguc-Kunt *et al.* (2022) documented that, despite improvements in access over the last decade, a global gender gap in account ownership of around four percentage points persists. Similarly, the Alliance for Financial Inclusion (AFI) (2024) reports baseline gender disparities in financial inclusion across Latin America and the Caribbean and has developed a policy roadmap to close these gaps. O. Olaoye *et al.* (2024) likewise observed persistent though declining gender gaps in financial service access in the region. The alignment between descriptive evidence and these regional findings strengthens the conclusion that gender disparities in financial access remain a robust empirical feature across diverse contexts.

However, the absence of statistically significant coefficients in panel regression contrasts with several country-specific studies that have applied decomposition or micro-data approaches. For instance, H. Ndoya *et al.* (2024) used Fairlie-type decomposition for Cameroon and found gender gaps across multiple financial inclusion indicators, attributing part of the disparity to observable socioeconomic characteristics and part to unexplained structural factors. Similarly, S. Hundie & D. Tulu (2023) reported significant gender gaps in Ethiopia's financial inclusion indicators and identified education, income, and employment status as key explanatory variables. Unlike the current research, which modelled a composite financial inclusion index at the country-year level, the above studies employed micro-level data and decomposition techniques that are well suited to isolating the drivers of gendered disparities.

Several factors may explain why results differ from those of other researchers. First, the choice of dependent variable matters. By using a composite financial inclusion index, specification may dilute the impact of individual gender gaps that are more directly visible when account ownership or credit usage is studied separately. Second, methodological differences are important. The decomposition methods have greater capacity to partition observed versus unexplained components of disparities, whereas random-effects panel regression relies on cross-country variation with a relatively small sample. Ultimately, evidence of cross-sectional dependence suggests that regional shocks or common policy initiatives such as those highlighted in AFI's (2024) gender inclusive finance roadmap for Latin America and the Caribbean study documenting simultaneous narrowing of gender gaps across several countries may obscure the effect of gender gaps on financial inclusion when modelled at the aggregate level. In summary, findings are consistent with the literature in documenting persistent gender gaps in financial inclusion but diverge in showing that, at the country-panel level, these gaps are not statistically significant predictors of a composite financial inclusion index. This divergence underscores the importance of measurement choice and methodology in shaping inferences about gender disparities.

CONCLUSIONS

This study examined the influence of gender gaps in financial access, specifically account ownership, savings, loans, and debit/credit card usage, on financial inclusion in Latin America. Despite evidence from correlation analysis indicating strong negative links between financial inclusion and gaps in account ownership and debit/credit card ownership, the panel regression results showed that none of the gender gap variables had significant effect on the financial inclusion in the region. Therefore, this study concludes that while gender-based financial disparities in access to financial services exist, their direct impact on financial inclusion may be influenced by other structural or institutional factors, such as economic policies, governance quality, and technological infrastructure.

The persistence of gender disparities, however, underscores the need for proactive measures to foster equitable financial access. Governments and financial institutions should introduce gender-sensitive financial products and services that address cultural, educational, and economic barriers to women's participation; educational campaigns and training programmes focusing on digital and financial literacy are particularly vital for empowering women in rural and underserved communities to adopt and effectively use formal banking services; central banks and regulatory bodies should strengthen policies that promote gender equity in financial equity by requiring gender-disaggregated data reporting, setting inclusion targets, and incentivising financial institutions to expand outreach to female clients; financial institutions should come up with FinTech solutions tailored to women's needs, such as mobile banking services that can help bridge access gaps where conventional banking networks are limited. Future study using larger panels, alternative estimators robust to cross-sectional dependence, and disaggregated indicators would be valuable in reconciling these contrasting results.

ACKNOWLEDGEMENTS

None.

FUNDING

None.

CONFLICT OF INTEREST

None.

REFERENCES

[1] Akhter, J., & Cheng, K. (2020). Sustainable empowerment initiatives among rural women through microcredit borrowings in Bangladesh. *Sustainability,* 12(6), article number 2275. doi: 10.3390/su12062275.

[2] Alliance for Financial Inclusion (AFI). (2024). *Gender inclusive finance roadmap for the Latin America and Caribbean region*. Retrieved from https://www.findevgateway.org/paper/2024/05/gender-inclusive-finance-roadmap-for-latin-america-and-caribbean-region.

[3] Ansar, S., Klapper, L., & Singer, D. (2023). *The importance of financial education for the effective use of formal financial services* (Policy research working paper No. 10345). Washington: World Bank Group.

[4] Balasubramanian, S.A., Kuppusamy, T., & Natarajan, T. (2018). Financial inclusion and land ownership status of women. *International Journal of Development Issues*, 18(1), 51-69. doi: 10.1108/IJDI-06-2018-0091.

[5] Benería, L., Berik, G., & Floro, M. (2015). *Gender, development, and globalization: Economics as if all people mattered*. New York: Routledge.

[6] Demirguc-Kunt, A., Ansar, S., Klapper, L., & Singer, D. (2022). *The global findex database 2021: Financial inclusion, digital payments, and resilience in the age of COVID-19*. Washington: World Bank Group.

[7] Desalegn, G., & Yemataw, G. (2017). Financial inclusion in Ethiopia: Using LSMS (Ethiopia socioeconomic survey) data. *Ethiopian Journal of Economics*, 26(2), 31-58. doi: 10.4314/eje.v26i2.

[8] Folbre, N. (1994). *Who pays for the kids? Gender and the structures of constraint*. London: Routledge.

[9] Fowowe, B. (2023). Financial inclusion, gender gaps and agricultural productivity in Mali. *Review of Development Economics*, 29(1), 3-42. doi: 10.1111/rode.13034.

[10] Galindo-Manrique, A.F., & Rojas-Vargas, N.P. (2025). The role of digital financial services in narrowing the gender gap in low-middle-income economies: A Bayesian machine learning approach. *Risks*, 13(5), article number 96. doi: 10.3390/risks13050096.

[11] Harijan, M., & Kumari, D.S.S. (2025). Digital financial inclusion in India: Evidence for gender disparities. *Aarthika Charche FPI Journal of Economics & Governance*, 9(2), 64-80.

[12] Hundie, S.K., & Tulu, D.T. (2023). Determinants of financial inclusion gender gap in Ethiopia: Evidence from decomposition analysis. *Cogent Business & Management*, 10(2), article number 2238124. doi: 10.1080/23311975.2023.2238124.

[13] Johnen, C., & Mußhoff, O. (2022). Digital credit and the gender gap in financial inclusion: Empirical evidence from Kenya. *Journal of International Development*, 35, 272-295. doi: 10.1002/jid.3687.

[14] Kara, A., Zhou, H., & Zhou, Y. (2021). Achieving the United Nations' sustainable development goals through financial inclusion: A systematic literature review of access to finance across the globe. *International Review of Financial Analysis*, 77, article number 101833. doi: 10.1016/j.irfa.2021.101833.

[15] Kowsick, N.P., & Ramasamy, K. (2024). Gender and financial inclusion – a review of existing literature. *ShodhKosh: Journal of Visual and Performing Arts*, 5(6), 1550-1558. doi: 10.29121/shodhkosh.v5.i6.2024.1988.

[16] Ndoya, H., Tsala, C., & Kamguia, B. (2024). What drive financial inclusion gender gap in Cameroon? A Fairlie decomposition approach. *Bulletin of Economic Research,* 77(6), 822-838. doi: 10.1111/boer.12447.

[17] Ndoya, H.H., & Tsala, C.O. (2021). What drives the gender gap in financial inclusion? Evidence from Cameroon. *African Development Review,* 33(4), 674-687. doi: 10.1111/1467-8268.12608.

[18] Neaime, S., & Gaysset, I. (2018). Financial inclusion and stability in MENA: Evidence from poverty and inequality. *Finance Research Letters,* 24, 230-237. doi: 10.1016/j.frl.2017.09.007.

[19] Okello, A.O. (2025). Gender gaps, financial inclusion and social integration in Kakuma Refugee Camp, Kenya. *Economies,* 13(3), article number 75. doi: 10.3390/economies13030075.

[20] Olaoye, O.O., Zerihun, M.F., Shaddady, A., & Tabash, M.I. (2024). FinTech – a pathway to financial inclusion? Evidence from Southern African development community member states. *African Development Review*, 36(2), 252-265. doi: 10.1111/1467-8268.12754.

[21] Ozili, P.K. (2022). Financial inclusion and sustainable development: An empirical association. *Journal of Money and Business*, 2(2), 186-198. doi: 10.1108/JMB-03-2022-0019.

[22] Peter, S., Elangovan, G., & Gupta, A. (2025). Digital engagement in financial inclusion for bridging the gendered entrepreneurial financial gap: Evidence from India. *Cogent Business & Management*, 12(1), article number 2518492. doi: 10.1080/23311975.2025.2518492.

[23] Raffaelli, P., Correa-García, J.A., & Verón, C.S. (2025). Financial inclusion and fintech: Catalysts for the sustainable development goals in Latin America. *Retos: Journal of Administrative and Economic Sciences*, 15(29), 47-63. doi: 10.17163/ret.n29.2025.03.

[24] Sen, A. (1995). Gender inequality and theories of justice. In M.C. Nussbaum & J. Glover (Eds.), *Women, culture and development: A study of human capabilities* (pp. 259-273). Oxford: Clarendon Press.

[25] Shaikh, A.A., Glavee-Geo, R., Karjaluoto, H., & Hinson, R.E. (2023). Mobile money as a driver of digital financial inclusion. *Technological Forecasting and Social Change*, 186, article number 122158. doi: 10.1016/j.techfore.2022.122158.
[26] Sharif, S.P., Naghavi, N., Waheed, H., & Ehigiamusoe, K.U. (2022). The role of education in filling the gender gap in financial inclusion in low-income economies. *International Journal of Emerging Markets*, 18(12), 5755-5777. doi: 10.1108/ijoem-07-2021-0991.
[27] Vyhovska, N., Ortina, G., Iierusalymov, V., Diachek, S., & Lytvynchuk, I. (2024). Gender budgeting in Ukraine: Tools, financial security and gender equality in economic sectors. *Scientific Bulletin of Mukachevo State University. Series "Economics"*, 11(2), 18-29. doi: 10.52566/msu-econ2.2024.18.
[28] Wagbafor, M.O., Adenegan, K.O., Oladokun, Y.O.M., & Olasehinde, T. (2021). Financial inclusion in Nigeria: A gender gap approach. *Macro Management & Public Policies,* 3(3), 1-9. doi: 10.30564/mmpp.v3i3.3546.

Ставка на рівність: подолання гендерного розриву у фінансових системах Латинської Америки

Білікіс Аюола Абдулмумін
Доктор філософії
Університет Ілоріна
240003, вул. Університетська, 1, м. Ілорін, Нігерія
https://orcid.org/0000-0003-2803-3114

Анотація. Фінансова інклюзія стала ключовою стратегією для сприяння інклюзивному економічному зростанню, скорочення бідності та сприяння соціальній рівності в усьому світі. Однак у Латинській Америці зберігаються значні гендерні відмінності, де мільйони жінок залишаються виключеними з формальних фінансових систем. Дослідження мало на меті проаналізувати вплив гендерних відмінностей у доступі до фінансових ресурсів на загальну фінансову інклюзію в країнах Латинської Америки, використовуючи панельні дані за 2011, 2014, 2017 та 2021 роки з глобальної бази даних фінансового розвитку Світового банку. Описовий аналіз виявив постійні гендерні розриви у доступі до фінансових послуг, причому чоловіче населення постійно перевершувало жіноче населення за рівнем володіння рахунками, заощадженнями, кредитами та використанням карток. Серед досліджуваних країн, Коста-Рика та Еквадор демонстрували відносно більші розриви, тоді як Уругвай продемонстрував більший гендерний паритет за всіма показниками. Кореляційний аналіз показав значний негативний зв'язок між індексом фінансової інклюзії та розривом у володінні рахунками, а також розривом у дебетових/кредитних картках, що свідчило про те, що гендерна нерівність у цих сферах пов'язана з нижчою загальною фінансовою інклюзією. Результати панельної регресійної моделі випадкових ефектів показали, що розрив у володінні рахунками ($\beta = -6{,}283$, $p > 0{,}05$), розрив у заощадженнях ($\beta = -3{,}193$, $p > 0{,}05$), розрив у кредитуванні ($\beta = 0{,}1337$, $p > 0{,}05$) та розрив у дебетових/кредитних картках ($\beta = 2{,}6216$, $p > 0{,}05$) мали незначний вплив на фінансову інклюзію в регіоні Латинської Америки. Результати цього дослідження можуть бути використані політиками, фінансовими установами та міжнародними організаціями в Латинській Америці для розробки цільових стратегій зменшення гендерних розривів у доступі до фінансових послуг та підвищення загальної фінансової інклюзії

Ключові слова: фінансова інклюзія; гендерна нерівність; розрив у володінні рахунками; панельні дані; фінансові послуги

University Economic Bulletin
Vol. 20, No. 2, 2025
Journal homepage: https://ue-bulletin.com.ua/en
Received: 08.07.2025. Revised: 23.11.2025. Accepted: 24.12.2025. Published: 26.12.2025

UDC 330.322:658.155(575.2) DOI: 10.69587/ueb/2.2025.78

Evaluation of investment projects in Kyrgyzstan: Modern methods and errors in controlling practice

Tilek Toichiev*
Graduate Student
University of Nevada
89154, 4505 South Maryland Parkway, Las Vegas, United States of America
https://orcid.org/0009-0005-6196-2208

Abstract. The study aimed to improve methodological approaches to assessing the effectiveness of investment projects in the Kyrgyz Republic. The study was based on the comparative economic, structural-dynamic, correlation-regression and scenario analysis, as well as methods of content analysis of regulatory acts and financial modelling, including calculations of discounted cash flows, net present value, internal rate of return and payback period. The results showed that in 2024, the total volume of investment in fixed capital increased by 14% compared to 2019, which indicated a gradual recovery of the investment cycle and a transition to a more active phase of capital investment. The highest growth rates were recorded in the energy (+5.8%) and infrastructure (+4.4%) sectors, where there is a steady expansion of the project portfolio and a strengthening of the role of long-term investments. Scenario analysis confirmed the high stability of energy projects amid fluctuations in key macroeconomic indicators, while agricultural and infrastructure initiatives are more sensitive to inflation and currency risks, requiring the use of risk-adjusted valuation methods. At the same time, the structure of funding sources is shifting towards private and mixed capital, reflecting the strengthening of public-private partnership mechanisms and the accelerated digitalisation of the investment process, including the use of online platforms for project registration and monitoring. The econometric model $E = f(I, r, \sigma)$ showed that a 1% increase in investment increases integral efficiency by 0.63 units, while a 1 p.p. increased in the cost of capital reduces it by 0.27 units, which highlighted the importance of the cost of capital and the structure of financing for the sustainability of investment decisions. The results obtained can be used by government agencies, financial and analytical departments, and consulting structures to improve the processes of evaluation, planning, and control of investment projects

Keywords: financial modelling; discounting; net present value; internal rate of return; integral efficiency; payback period

INTRODUCTION

Investment activity in the Kyrgyz Republic is considered one of the key factors for sustainable economic growth and structural transformation. The effectiveness of investment projects depends not only on the volume of resources attracted, but also on the quality of analytical procedures that determine the correctness of management decisions. The regulatory framework for investment policy is gradually being improved, but the methodological component of project evaluation remains underdeveloped. As a result, decisions are often made on an intuitive or formal basis, without the use of comprehensive controlling and financial modelling tools.

Several studies highlighted the institutional and methodological weaknesses of Kyrgyzstan's investment policy. As shown by R. Asizbaev & N. Djeenbekova (2022), without a methodological update of approaches to investment assessment, it is impossible to ensure the rational allocation of resources and the sustainability of the investment cycle. They emphasised that traditional practices based on administrative decisions and average indicators do not meet the requirements of a modern economy focused on capital returns and measurable performance. An analysis of the structure of foreign investment revealed that Kyrgyzstan remains dependent on short-term and poorly diversified

Suggested Citation:
Toichiev, T. (2025). Evaluation of investment projects in Kyrgyzstan: Modern methods and errors in controlling practice. *University Economic Bulletin*, 20(2), 78-90. doi: 10.69587/ueb/2.2025.78.

*Corresponding author

flows, which limit the possibilities for long-term planning. As noted by O. Melkher & G. Ermekova (2023), capital inflows are highly volatile, and investment decisions are often made without considering macroeconomic and currency risks. The authors concluded that the main factor reducing efficiency is not a lack of capital, but a lack of an analytical basis for forecasting and controlling project profitability. The situation in the real sector of the economy reflects the same patterns. A study by I. Myrzaibraimova (2023) demonstrated that in the real estate and construction segment, investment decisions are often based on investors' subjective expectations, without analysing cash flows and calculating discounted indicators. According to the author, this approach creates an illusion of profitability, whereas in reality, many projects do not achieve the recovery threshold.

Addressing regional differences, B. Satyvaldieva (2024) found that the economic growth potential of regions is unevenly utilised. The study concluded that the lack of comprehensive management analysis and controlling tools limits the effectiveness of investment programmes, especially in agricultural and mountainous areas. It emphasised that implementing projects without strategic coordination turns investments into fragmented initiatives that are unable to create a multiplier effect. Kyrgyzstan's foreign economic orientation reinforces the importance of methodological consistency in evaluation. According to G. Duysen *et al.* (2025), the national participation in Chinese-Central Asian programmes requires the unification of approaches to analysing the effectiveness and transparency of calculation criteria. The study emphasised that the lack of consistency in methodological standards reduces investor confidence and hinders the implementation of transregional projects. Their conclusions confirmed the need to introduce controlling tools capable of synchronising national and international assessment procedures. The problem of investment risk management remained one of the key issues. As demonstrated by U. Nadirkhanov (2024), the use of a single discount rate without the incorporation of industry, inflation, and currency factors distorts net present value and internal rate of return indicators. The researcher noted that the practice of adjusting the discount rate using scenario modelling would improve the accuracy of forecasts and prevent overestimation of returns. An analysis of international experience conducted by T. Tyulebekov *et al.* (2025) confirmed that successful investment projects under intergovernmental agreements were based on the coordination of analytical methods. The authors demonstrated that the unification of assessment procedures and the use of comparative models (benchmarking) increases the reliability of results and facilitates the attraction of partner capital.

Several studies addressed the role of non-financial factors in shaping investment sustainability. In particular, R. Hassibullah & M. Ahmad (2023) used a comparative analysis of Kyrgyzstan and Afghanistan to show that environmental considerations are largely overlooked in capital investment planning. Underestimating long-term social and environmental effects decreases the overall effectiveness of investments, whereas integrating environmental and management criteria into the assessment system could significantly increase project sustainability. In the industrial sector, the emphasis was on the use of modern analytical tools. As noted by J. Shaturaev (2023), the use of discounted cash flow (DCF), net present value (NPV) and internal rate of return (IRR) methods can be used to analyse investments not in isolation, but in the context of the innovative transformation of enterprises. The study demonstrated that the use of these methods increases the accuracy of forecasts and reduces the likelihood of errors in choosing strategic directions. In the context of the Kyrgyz Republic's investment activities, the integration of investment appraisal procedures into the management control system is regarded as an element of improving monitoring and planning mechanisms. R. Karlibaeva *et al.* (2022) concluded that investment analysis should be viewed as a continuous cycle comprising the stages of planning, implementation, and post-investment monitoring. The authors emphasised that only the combination of financial and non-financial indicators provides a comprehensive overview of investment performance and creates a basis for strategic management control.

The combination of the reviewed studies revealed a general trend: the Kyrgyz investment project evaluation system is in the process of transitioning from static, accounting-based methods to dynamic models based on discounting, scenario analysis, and the integration of controlling elements. Despite growing attention to the methodological side of the issue, errors remain related to the use of incorrect discount rates, limited use of data, and a lack of connection between evaluation and corporate strategy. Solving these problems requires the development of a comprehensive approach that would not only improve the accuracy of analysis but also strengthen the management framework for investment activities in Kyrgyzstan.

The study aimed to analyse and improve methodological approaches to assessing the effectiveness of investment projects in the Kyrgyz Republic. The objectives of the study included theoretical generalisation and systematisation of approaches to evaluating investment projects, identifying methodological and practical limitations of controlling, developing recommendations for their improvement, and determining ways to adapt modern analytical tools to the economic conditions of the Kyrgyz Republic.

MATERIALS AND METHODS

The study was conducted in the Kyrgyz Republic between January and September 2025 and was theoretical and analytical in nature, with elements of quantitative modelling. The time frame of 2019-2024 ensured the use of up-to-date data from the National Statistical Committee of the Kyrgyz Republic (n.d.a; n.d.b), analysed using comparative economic and content analysis methods. In addition, materials from the Ministry of Economy and Commerce of the Kyrgyz Republic (n.d.) were considered, which clarified the dynamics of investment activity and the structural features of projects. Information from the Investment Portal of the

Kyrgyz Republic (n.d.) was also used, which clarified the structure of investment flows and the characteristics of their distribution. Analytical reports from the World Bank (n.d.) and the Asian Development Bank (Kyrgyz Republic: Country…, 2023) were processed using a structural-dynamic approach, ensuring the comparison of macroeconomic trends and sectoral changes (Kyrgyz Republic country…, 2023). The material basis of the study was formed by the regulatory and legal acts of the Kyrgyz Republic, including Law of the Kyrgyz Republic No. 66 "On Investments in the Kyrgyz Republic" (2003) and the National Development Programme of the Kyrgyz Republic until 2026 (2021), analysed using content analysis. To clarify the macroeconomic parameters, statistical yearbooks and fiscal reports were used, processed using the correlation-structural comparison method.

The methodological procedure consisted of three stages. The preparatory stage involved systematising sources, classifying DCF, NPV, IRR and payback period assessment approaches, as well as standardising terminology and verifying statistical data. During the analytical stage, the effectiveness of investment projects was modelled using key financial indicators. The basic tool was the DCF method, in which the net present value was calculated using formula (1):

$$NPV = \sum_{t=1}^{n} \frac{CF_t}{(1+r)^t} - I_0, \quad (1)$$

where CF_t – cash flow during the period t; r – discount rate; I_0– initial investment; n – project duration.

Formula (2) was used to calculate the internal rate of return (IRR):

$$0 = \sum_{t=1}^{n} \frac{CF_t}{(1+IRR)^t} - I_0, \quad (2)$$

where IRR – Internal Rate of Return; at which $NPV = 0$, CF_t – finance flow at period t; t – sequence number of the accounting period; n – total number of periods; I_0 – initial investment.

Formula (3) was used to determine the payback period (PP):

$$PP = \frac{I_0}{\overleftarrow{CF}}, \quad (3)$$

where $\overleftarrow{CF}$ – average annual cash flow; P – investment project payback period; I_0 – initial investment.

To assess the stability of financial indicators, sensitivity analysis was additionally applied to determine the degree of influence of macroeconomic parameters (discount rate, inflation, exchange rate) on changes in NPV.

The sensitivity analysis of the results to macroeconomic factors was performed using formula (4):

$$S_{NPV} = \frac{(\Delta NPV/NPV)}{(\Delta X/X)}, \quad (4)$$

where ΔNPV – change in Net Present Value; NPV – base Net Present Value; ΔX – change in the macroeconomic parameter under investigation; X – variable factor, including inflation π, exchange rate E and discount rate r.

The cumulative effect of efficiency factors was described by the functional formula (5):

$$E = f(I, r, \sigma), \quad (5)$$

where E – integral performance indicator; I – investment volume; r – discount rate; σ – aggregate risk modifier (inflationary and currency).

The calculation was based on a generalised sample of data on 27 typical investment projects distributed across four sectors of the Kyrgyz Republic's economy: energy, agriculture, infrastructure and renewable solar power generation. In the energy sector, an example of the construction of a small hydroelectric power plant similar to the projects presented in the United Nations Development Programme report (n.d.) was analysed. For the agro-industrial complex, data comparable to the Agriculture Productivity and Nutrition Improvement Project (APNIP) (World Bank, n.d.) was used. In the renewable energy sector, materials from the International Renewable Energy Agency (2022) were used, which emphasised the economic feasibility of distributed photovoltaic systems. The infrastructure case reflected logistics and construction projects comparable to the initiatives of the Asian Development Bank (Kyrgyz Republic: Country..., 2023). The general principles and institutional parameters were agreed with the Kyrgyz Republic country partnership framework 2024-2028 (2023). Calculations and scenario modelling were performed in MS Excel 2021 and IBM SPSS Statistics 28.0 (IBM Corp.). The parameterisation of scenarios (baseline, optimistic and pessimistic) was performed with a deviation of ±3-5 p.p. relative to the base discount rate and projected cash flow values.

RESULTS

Investment activity dynamics and project structure in the Kyrgyz economy (2019-2024)

An analysis of investment activity in the Kyrgyz Republic for 2019-2024 showed steady, albeit uneven, growth in capital investment. According to data from the National Statistical Committee of the Kyrgyz Republic (n.d.a; n.d.b), in 2024, total investment in fixed capital increased by approximately 14% compared to 2019, reflecting a gradual recovery after the crisis year of 2020 and the intensification of projects under the state programme for industrial and innovative development. At the same time, growth rates vary across sectors: the greatest acceleration is observed in the infrastructure and energy sectors (on average +8-10% per year), while the agricultural sector shows moderate positive dynamics (+3-4% per year), due to its dependence on external investment and seasonality.

As shown by the summary materials of the Ministry of Economy and Commerce of the Kyrgyz Republic (n.d.), the structure of capital investments has shifted in favour of large infrastructure and transport-logistics projects financed by international programmes of the Asian Development Bank (Kyrgyz Republic: Country…, 2023) and the World Bank (2024). The share of the public sector in the

investment balance has stabilised at 32-35%, with private investment forming the core of economic growth (about 65%). This ratio confirms the trend towards expanding public-private partnerships (PPPs) and diversifying sources of financing, especially through the Investment Portal of the Kyrgyz Republic (n.d.). The dynamics of investment in the main sectors of the Kyrgyz Republic's economy for 2019-2024 are presented in Table 1.

Table 1. Investment dynamics by major sectors of the Kyrgyz Republic economy (2019-2024)

Economy branch	2019	2020	2021	2022	2023	2024	Average annual rate, %
Energy sector	25.1	22.8	26.3	28.5	30.4	31.9	5.8
Infrastructure and construction	19.7	18.4	20.5	22.9	23.8	24.5	4.4
Agriculture	14.6	13.8	15.1	15.4	16.3	16.8	2.8
Industry	13.4	12.7	14.3	14.9	15.2	15.8	2.9
Services sector	13.2	12.1	13.8	15.7	16.2	16.7	4.0
Other sectors	14.0	14.3	10.0	9.7	8.1	8.3	-6.5
Total, billion som	100	94.1	100	107.1	110	114	3.8

Source: compiled by the author based on National Statistical Committee of the Kyrgyz Republic (n.d.a; n.d.b), Ministry of Economy and Commerce of the Kyrgyz Republic (n.d.), Ministry of Finance of the Kyrgyz Republic (n.d.), Kyrgyz Republic: Country partnership strategy 2023-2027 (2023), World Bank (2024), Organisation for Economic Co-operation and Development (2024)

As shown in Table 1, the most intensive growth in capital investment in 2019-2024 was observed in energy and infrastructure, where investment increased by more than 25% compared to the base period. These sectors accounted for more than half of all capital investment in the country and provided the main recovery of the economy after the pandemic recession of 2020. Agriculture and industry developed more moderately, showing positive but limited dynamics, which is associated with low availability of credit resources and high dependence on external investment. This structure of capital investment distribution confirmed the priority of state policy on the development of infrastructure and energy projects, supported by programmes from the World Bank (2024) and the Asian Development Bank (Kyrgyz Republic: Country..., 2023). The increase in the private sector's share in 2022-2024, reflected in Figure 1, demonstrates a gradual transition to a public-private partnership (PPP) model, in which investment efficiency is determined by a combination of budgetary and market financing mechanisms.

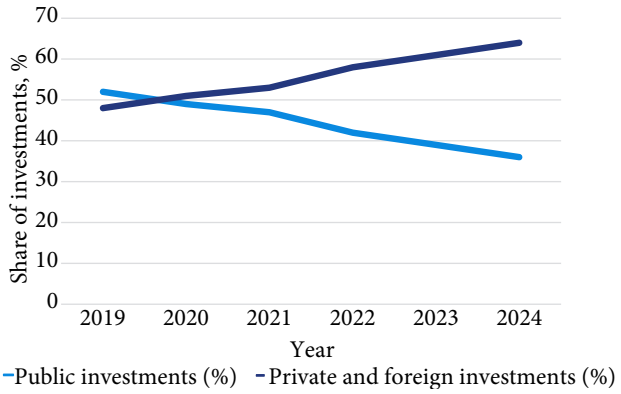

Figure 1. Structure and growth rates of investment activity: Private and public sectors, 2019-2024

Source: compiled by the author based on National Statistical Committee of the Kyrgyz Republic (n.d.a; n.d.b), Ministry of Finance of the Kyrgyz Republic (n.d.)

Following Figure 1, the share of public sources in total investment declined steadily from 52% in 2019 to 36% in 2024, while private and foreign capital increased its presence from 48% to 64%, with the trend reversal occurring after 2021-2022, reflecting a shift towards market-based financing instruments and the expansion of PPP mechanisms. The analysis confirms that the period 2019-2024 was a transitional one for Kyrgyzstan's investment policy: the country moved from an extensive financing model to structural modernisation and digitalisation of the investment sphere. Data from the Investment Portal of the Kyrgyz Republic (n.d.) show an increase in the number of online project registrations and greater transparency in capital investments.

Quantitative assessment of investment project effectiveness using DCF, NPV and IRR methods

The application of basic cash flow discounting methods can be used for a quantitative assessment of the effectiveness of typical investment projects in key sectors of the Kyrgyz Republic's economy. Calculations are performed using average discount rates of 10-12% and projected CF_t flows based on official macroeconomic data. The analysis includes four representative types of projects – energy, agriculture, infrastructure and solar power generation – reflecting the structure of national investments. The results of the modelling are presented in Table 2. Following Table 2, energy projects will provide the greatest sustainability and investment attractiveness: with an average investment of KGS 60 million, the net present value will be KGS +8.7 million, the internal rate of return will be 14.5%, and the payback period will be approximately 7 years. Agricultural projects will demonstrate a higher nominal IRR (up to 18%), but actual returns may decline with fluctuations in exchange rates and resource prices, indicating the need for a risk-adjusted approach. The solar power generation sector will be characterised by a minimum payback period (around 5 years) and stable long-term returns, making it promising for small and medium-sized businesses. Infrastructure

projects will maintain moderate profitability (IRR≈13%) and high NPV values (KGS ≈6.2 million) due to their scale and multiplier effect, although their long investment cycle will require effective capital expenditure management. This distribution of results confirms that efficiency and sensitivity to the discount rate vary across sectors: energy remains the least vulnerable, while agriculture and infrastructure require the implementation of comprehensive analysis models that incorporate risk modifiers and scenario fluctuations in macroeconomic parameters. Figure 2 shows a comparative distribution of IRR and NPV indicators by economic sector.

Table 2. Estimated values of NPV, IRR and Payback Period for typical investment projects

Project type	Investment volume, million som	Average annual CF, million som	Rate r, %	NPV, million som	IRR, %	PP, years	Economic interpretation
Mini-HPP (Narynsk region)	60	10	12	8.7	14.5	7.0	High profitability with stable cash flows
Agricultural project (southern Kyrgyzstan)	25	4.5	11	2.1	18.0	5.5	Sensitive to currency risks
Solar panels (residential sector)	10	2.3	10	1.4	15.2	5.0	Fast return on investment, long life cycle
Infrastructure (logistics)	80	11	12	6.2	13.0	7.5	Average return on long-term investments

Note: CF – cash flow, NPV – net present value, IRR – internal rate of return

Source: compiled by the author based on National Statistical Committee of the Kyrgyz Republic (n.d.a; n.d.b), Ministry of Finance of the Kyrgyz Republic (n.d.), United Nations Development Programme (n.d.), World Bank (n.d.), Investment Portal of the Kyrgyz Republic (n.d.), Kyrgyz Republic: Country partnership strategy 2023-2027 (2023)

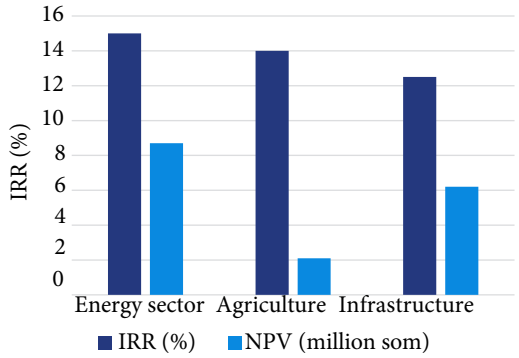

Figure 2. Comparison of IRR and NPV values by sector (energy, agribusiness, infrastructure)

Source: compiled by the author based on National Statistical Committee of the Kyrgyz Republic (n.d.a; n.d.b), Ministry of Finance of the Kyrgyz Republic (n.d.), United Nations Development Programme (n.d.), World Bank (n.d.), Investment Portal of the Kyrgyz Republic (n.d.), Kyrgyz Republic: Country partnership strategy 2023-2027 (2023)

Based on the data in Figure 2, it is possible to note that the energy sector demonstrated the highest rate of return (IRR≈15%) with the maximum NPV (KGS ~8.7 million), which confirmed the sector's resistance to changes in the cost of capital and the predictability of cash flows. Infrastructure projects, on the other hand, showed a moderate IRR (~12.5%), but a high NPV (KGS ~6.2 million), reflecting economies of scale, long asset life cycles and a multiplier effect on related sectors. The agro-industrial complex had a rate of return close to that of the energy sector at the upper limit (up to ~14% in some cases), but a significantly lower NPV (KGS ~2.1 million), which was explained by the lower capital intensity of projects and sensitivity to price and currency shocks. A comparison of IRR and NPV indicated that when ranking projects according to controlling priorities, it is advisable to consider energy and infrastructure initiatives as the basis for portfolio stability, while agricultural projects required more stringent assumptions regarding exchange rates, inflation and operating costs. Thus, the analysis of estimated indicators using the DCF, NPV and IRR methods confirms that capital-intensive industries with predictable cash flows have the greatest investment stability, while agriculture requires the introduction of adaptive controlling and risk modelling tools.

Scenario and sensitivity analysis of project effectiveness

The scenario analysis conducted made it possible to assess how changes in macroeconomic parameters affect the performance indicators of typical projects in the energy, agricultural and infrastructure sectors. The results of the scenario calculations are summarised in Table 3. Following Table 3, energy projects will demonstrate the greatest stability in the long term: even under unfavourable macroeconomic conditions, their NPV remains in positive territory (around KGS 5.4-10.2 million), IRR remains above 12%, and the payback period varies from 6.5 to 8.2 years, indicating low sensitivity to inflation and capital rate growth. Agricultural projects, on the contrary, will be most sensitive to currency and price fluctuations: in an optimistic scenario, they will provide a high IRR (up to 20%), but under unfavourable conditions, the net present value may decrease almost threefold (to KGS 0.6 million), which highlights the need to apply risk-adjusted discount rates. Infrastructure projects will maintain balanced performance indicators: NPV within KGS 3.3-7.5 million, IRR – 11.5-14.2%, payback period – 7-8.9 years. Despite rising costs, economies of scale and a long-life cycle will ensure the sustainability

of their financial results. Thus, scenario analysis shows that energy will remain the core and least risky sector, agricultural projects will be the most sensitive to macroeconomic fluctuations, and infrastructure initiatives will be stable, provided that costs and capital resources are managed effectively. Figure 3 demonstrates the comparative sensitivity of the NPV of investment projects in various sectors of the Kyrgyz Republic's economy to changes in key macroeconomic parameters: the discount rate (r), inflation (π), exchange rate (E) and volatility (σ).

Table 3. Scenario calculations of NPV, IRR and PP for baseline, optimistic and pessimistic scenarios

Project type	Scenario	NPV (million som)	IRR (%)	PP (years)	Economic interpretation
Mini-HPP (Narynsk region)	Optimistic	10.2	16.1	6.5	Resistance to inflationary fluctuations
	Basic	8.7	14.5	7.0	High predictability of flows
	Pessimistic	5.4	12.2	8.2	Decrease in margin due to interest rate increase
Agricultural project (southern Kyrgyzstan)	Optimistic	3.4	20.0	5.0	Sensitive to currency stability
	Basic	2.1	18.0	5.5	Average profitability
	Pessimistic	0.6	10.8	7.1	Loss of profitability as prices rise
Infrastructure (logistics)	Optimistic	7.5	14.2	7.0	Economies of scale, high capital intensity
	Basic	6.2	13.0	7.5	Balanced profile
	Pessimistic	3.3	11.5	8.9	Increased costs reduce NPV

Source: compiled by the author based on National Statistical Committee of the Kyrgyz Republic (n.d.a; n.d.b), Ministry of Finance of the Kyrgyz Republic (n.d.), United Nations Development Programme (n.d.), World Bank (n.d.), Investment Portal of the Kyrgyz Republic (n.d.), Kyrgyz Republic: Country partnership strategy 2023-2027 (2023)

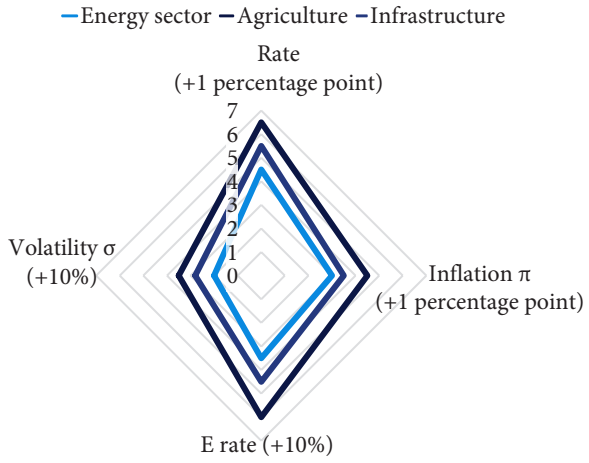

Figure 3. Diagram showing the sensitivity of NPV to changes in the rate r, inflation π, exchange rate E, and volatility σ

Source: compiled by the author based on National Statistical Committee of the Kyrgyz Republic (n.d.a; n.d.b), Ministry of Finance of the Kyrgyz Republic (n.d.), United Nations Development Programme (n.d.), World Bank (n.d.), Investment Portal of the Kyrgyz Republic (n.d.), Kyrgyz Republic: Country partnership strategy 2023-2027 (2023)

Following Figure 3, energy projects are characterised by the lowest NPV sensitivity: when the rate r changes by 1 percentage point or inflation changes by 1 percentage point, the NPV decreases by only 4-5%, which indicates high predictability of cash flows and relative independence from inflation risks. In the agro-industrial sector, sensitivity is higher: a change in the rate or exchange rate per unit leads to a 6-7% decrease in NPV, reflecting the high dependence of profitability on price fluctuations and currency instability. Infrastructure projects occupy an intermediate position: their NPV responds to changes in macro parameters in the range of 4-5%, which is associated with capital intensity, but also with the presence of a multiplier effect that compensates for part of the risks. Overall, the results presented show that the cost of capital has the main impact on the sustainability of investment projects, while inflationary and currency factors have a secondary but cumulative effect. This highlights the need for regular adjustments to financial models to take into account macroeconomic volatility, the introduction of scenario calculations and risk-oriented controlling tools to maintain the stability of investment decisions.

Econometric interpretation of the integral model of efficiency

Analysis of the regression relationship between the main parameters of investment analysis showed that the integral efficiency indicator E is formed under the dominant influence of the volume of investment (I) and the cost of capital (r), while the risk factor (σ) has a compensatory but less pronounced effect. The results of the regression analysis are presented in Table 4. As Table 4 shows, the overall effectiveness of investment projects is largely influenced by the amount of investment: a coefficient of $\beta = 0.63$ indicates that even a moderate increase in investment flow provides a noticeable increase in overall performance, which is particularly characteristic of capital-intensive industries. The cost of capital is a limiting factor: the negative coefficient $\beta = -0.27$ indicates that an increase in the discount rate by each percentage point systematically reduces efficiency, narrowing the range of acceptable projects and increasing the requirements for their profitability. The risk factor (σ) also has a noticeable impact ($\beta = -0.18$), with its influence being most pronounced in the agro-industrial sector, where the volatility of macroeconomic parameters and seasonal fluctuations directly affect cash flow. The high

value of the coefficient of determination ($R^2 = 0.76$) confirms that the proposed model has high explanatory power and adequately reflects the relationships between investment, financial and risk parameters. Figure 4 illustrates the comparative contribution of three key factors – investment volume (I), cost of capital (r) and aggregate risk (σ) – to the formation of integral efficiency (E) across the main sectors of the Kyrgyz Republic's economy.

Table 4. Results of regression analysis of the influence of I, r, and σ on integral efficiency E

Indicator	B coefficient	Statistical value (p)	Interpretation
I (investment)	0.63	<0.01	A 1% increase in investment volume raises integral efficiency by 0.63 units.
r (discount rate)	-0.27	<0.05	A 1 percentage point increase in the capital rate reduces efficiency by 0.27 units.
σ (risk)	-0.18	<0.05	Increased volatility reduces the stability of projects, especially in the agricultural sector.
Constant	0.92	<0.01	Basic level of efficiency under average conditions.
R^2	0.76	-	High explanatory power of the model.

Source: compiled by the author based on National Statistical Committee of the Kyrgyz Republic (n.d.a; n.d.b), Ministry of Finance of the Kyrgyz Republic (n.d.), United Nations Development Programme (n.d.), World Bank (n.d.), Kyrgyz Republic country partnership framework 2024-2028 (2023), Organisation for Economic Co-operation and Development (2024)

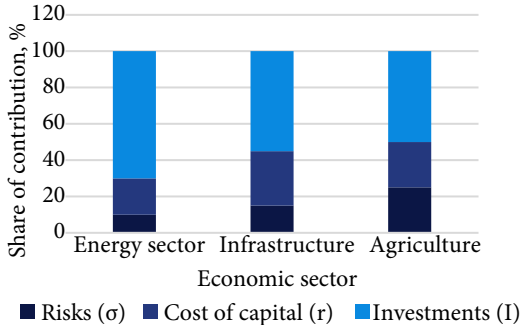

Figure 4. Contribution of factors I, r and σ to integral efficiency E (by sector)

Source: ccompiled by the author based on National Statistical Committee of the Kyrgyz Republic (n.d.b), Ministry of Finance of the Kyrgyz Republic (n.d.), World Bank (n.d.), Kyrgyz Republic country partnership framework 2024-2028 (2023), Organisation for Economic Co-operation and Development (2024)

According to the data presented in Figure 4, the energy sector is characterised by the dominance of the investment factor, which accounts for about 70% of overall efficiency, indicating the high capital intensity and stability of the industry. In infrastructure projects, the contribution structure is more balanced: the impact of capital costs increases to 30%, and risks to 15%, reflecting the long implementation cycle and dependence on credit conditions. In the agricultural sector, the share of the investment factor decreases to 50%, while risk reaches 25%, demonstrating the greatest sensitivity to macroeconomic volatility, seasonality and price fluctuations. Overall, the results of the regression analysis and visualised decomposition confirm that the overall effectiveness of investment activity in Kyrgyzstan is determined not by a single factor, but by their interrelated action. The scale of investment provides the basis for economic growth, the cost of capital sets the limit for financial stability, and the level of risk is an indicator of the adaptability of projects to macroeconomic fluctuations. This structure of interdependencies points to the need to optimise investment policy by balancing investment expansion and risk control, as well as the importance of introducing long-term financial planning and capital source diversification mechanisms as part of a sustainable development strategy.

Comparison of calculated results with national strategic goals and typical controlling errors

A comparison of the calculated efficiency indicators with the target parameters of national policy shows that investment projects in the energy, agricultural and infrastructure sectors are generally in line with the priorities stipulated in the National Development Programme of the Kyrgyz Republic until 2026 (2021) and the strategic documents of the Ministry of Economy and Commerce of the Kyrgyz Republic (n.d.). The average values of integral efficiency ($E \approx 1.15$-1.25) and internal rate of return (IRR = 13-16%) are consistent with the projected targets for productivity growth and investment attractiveness. However, in practice, there is a discrepancy between the modelled and actual results, which is largely due to errors in management control and insufficient verification of input parameters (Table 5).

Table 5. Typical controlling errors in evaluating investment projects and their impact on NPV

Error type	Core	Consequences for NPV and IRR	Comment
Incorrect r rate	Use of the average market rate of capital instead of the industry rate	Overestimation of NPV by 5-10%	Risk premiums and financing structures must be addressed.
Neglect of the σ factor	Lack of analysis of macroeconomic volatility	Underestimation of the NPV decline risk to 15%	Stress analysis and scenario modelling are required.
Errors in CF_t	Incorrect flow forecast due to optimistic assumptions	Distortion of the payback period by 1-2 years	An independent examination of the input data is recommended.

Table 5. Continued

Error type	Core	Consequences for NPV and IRR	Comment
Incomplete accounting for investments I	Exclusion of intangible assets and indirect costs	Decrease in the accuracy of E and IRR calculations	Integration with management accounting is required.
Absence of post-audit	No comparison of forecast and actual results is made	Accumulation of systemic errors	Feedback and model adjustment mechanisms are required.

Source: compiled by the author based on the Ministry of Economy and Commerce of the Kyrgyz Republic (n.d.), National Development Program of the Kyrgyz Republic until 2026 (2021), World Bank (2024), Organisation for Economic Co-operation and Development (2024)

As Table 5 shows, the greatest impact on the distortion of performance indicators is caused by errors related to the incorrect selection of the discount rate r and ignoring the σ factor, which leads to an overstatement of the net present value (NPV) by 5-10% and an underestimation of risks by up to 15%. Errors in cash flow forecasting (CF_t) are caused by overly optimistic assumptions and lead to a 1-2 year shift in the payback period, especially in projects with high capital intensity and seasonal fluctuations. Incomplete reflection of the investment volume (I), including intangible assets and indirect costs, reduces the accuracy of the calculation of integral efficiency (E) and internal rate of return (IRR), creating the illusion of greater profitability. The absence of post-audit increases the accumulation of systemic errors, as there is no feedback between planned and actual results. Together, the identified deviations indicate the need to transition to risk-adjusted models, integrate management and financial accounting, and make post-audits mandatory as a tool for improving the reliability of investment control. The results of comparing the calculated indicators with national strategic guidelines confirm that most of the investment projects studied meet the objectives of state policy to increase the efficiency of capital investments, modernise infrastructure and develop energy-intensive industries. At the same time, the main discrepancy between planned and actual results is not due to shortcomings in the econometric methods used, but rather to errors in management control and the untimely adaptation of financial models to changes in the macroeconomic environment. To achieve sustainable alignment of project decisions with strategic objectives, it is necessary to strengthen the analytical function of controlling, introduce risk-adjusted models (incorporating r and σ), integrate budgeting and management accounting systems, and conduct mandatory post-audits of investment programmes. The implementation of these measures will increase the transparency of assessments, reduce the probability of systemic distortions, and ensure the strategic alignment of the Kyrgyz Republic's investment policy with the principles of effectiveness and sustainable growth.

A summary interpretation of the results of modelling, sensitivity analysis and verification against strategic benchmarks shows that investment projects in the Kyrgyz Republic have a moderate level of integral efficiency ($E \approx 1.15\text{-}1.25$) and demonstrate a positive correlation between investment volume and cash flow sustainability. At the same time, the greatest stability is observed in the energy and infrastructure sectors, while agricultural projects are characterised by increased sensitivity to currency, inflationary and seasonal fluctuations. Financial parameters, primarily the cost of capital (r) and the level of risk (σ), have a systemic impact on net present value and internal rate of return, creating the need for risk-adjusted discounting and stress testing models. Table 6 summarises the impact of macroeconomic, financial and institutional factors on investment performance, highlighting key areas for improvement in controlling and strategic planning.

Table 6. Final comparison of macroeconomic, financial and institutional factors affecting efficiency

Groups of factors	Main parameters	Impact on efficiency	Management recommendations
Macroeconomic	Inflation (π), exchange rate (E)	Moderate, indirect impact on NPV (-3-5%)	Regular updating of forecasts, inclusion of stress scenarios
Finance	Discount rate (r), capital structure, risk (σ)	High, direct impact (up to -0.3 E units with an increase in r by 1 percentage point)	Apply Weighted Average Cost of Capital (WACC) with industry premiums and conduct sensitivity analysis
Investment	Volume and structure of investments (I)	Positive, dominant influence (+0.6 units of E with a 1% increase in I)	Improve the quality of investment planning and post-audit
Institutional	Regulatory framework, transparency, and management control	Indirect influence through risks and deadlines	Strengthen interdepartmental coordination and digitisation of control procedures

Source: compiled by the author based on National Statistical Committee of the Kyrgyz Republic (n.d.b), Ministry of Economy and Commerce of the Kyrgyz Republic (n.d.), Kyrgyz Republic: Country partnership strategy 2023-2027 (2023), World Bank (2024), Organisation for Economic Co-operation and Development (2024)

Following Table 6, financial and investment factors have a decisive influence on the overall effectiveness of investment activities, primarily the discount rate (r), the level of risk (σ) and the volume of capital investment (I). Macroeconomic parameters such as inflation and exchange rates have a predominantly indirect impact through changes in

the cost of capital and cash flows, reducing NPV by an average of 3-5%. Institutional factors, such as regulatory stability, transparency of procedures and quality of management control, have a systemic but less pronounced impact, creating conditions for predictability and reducing the volatility of results. Agricultural sector projects remain the most sensitive to changes in parameters, with the cumulative impact of external factors reaching 25%, while energy and infrastructure demonstrate more stable performance profiles. Thus, the results confirm the need for a comprehensive approach to investment risk management, combining macroeconomic monitoring, financial modelling and institutional measures to increase the transparency of control.

Overall, the results of the analysis confirm the need to move from formal accounting to analytical controlling based on quantitative verification of parameters, comprehensive risk assessment, and constant feedback between the modelling stages and the actual implementation of investment programmes. To improve the accuracy of forecasts and the sustainability of investment policy, it is advisable to introduce dynamic discounted cash flow models adapted to macroeconomic changes, as well as to integrate risk modules (σ) and stress scenarios into standard financial analysis tools. The use of industry-specific WACC rates instead of average values can adequately reflect the specifics of individual sectors and minimise distortions in NPV and IRR calculations. In addition, it is necessary to strengthen independent expertise in source data, systematise post-project evaluation, and develop digital monitoring platforms that ensure transparency and comparability of information. The implementation of these measures will improve the manageability of the investment cycle, reduce the likelihood of systemic errors in controlling, and ensure that investment decisions are consistent with the national sustainable economic development goals of the Kyrgyz Republic.

DISCUSSION

The results obtained demonstrated that the effectiveness of investment programmes in Kyrgyzstan is determined not only by the volume of capital investments but also by the quality of financial modelling and risk management. This is consistent with the findings of J. Fabianová *et al.* (2023), demonstrating that the use of Monte Carlo simulation can correctly estimate the ranges of net present value and internal rate of return, reducing the uncertainty of the final indicators. A similar relationship was observed in a study where the use of probabilistic models confirmed the significant impact of parameter volatility on forecast reliability. The results also correlate with the conclusions of Y. Yang (2024), noting that the assessment of investment risks should include dynamic scenario models. In the analysis of projects in Kyrgyzstan, a similar approach confirmed the significance of adapting discounted cash flows to changing macroeconomic conditions, which improved the accuracy of forecasts. A comparison with the study by C. Nwangele *et al.* (2021) showed that the inclusion of social and environmental indicators in financial models provides a more comprehensive assessment of project sustainability. A similar conclusion was confirmed by the research data, where the integration of non-financial factors into the controlling system made it possible to increase the objectivity of decisions. The results were compared with those of C. Karnavas (2024), proposing coverage of uncertainty through risk-adjusted discount rates. This approach was confirmed by research: the use of industry-specific WACC values reduced systematic NPV distortions and increased the consistency of indicators with market conditions. Research by J. Lin (2023) identified differences in the applicability of NPV and IRR methods for projects with atypical cash flow structures. A comparison with the results of the analysis in Kyrgyzstan showed a similar trend: in long-term infrastructure projects, the internal rate of return should be supplemented with net present value calculations for more reliable conclusions. The conclusions of K. Abdullayev *et al.* (2024) and H. Liang (2025) on the comparison of three key evaluation methods confirmed that the return-on-investment period indicator has limited value for strategic investments. This was consistent with the findings that the payback period criterion was effective only for small projects but did not reflect their long-term profitability.

The results obtained were also consistent with those of H. Dai *et al.* (2022), demonstrating that discrepancies between NPV, IRR, and PP are related to the choice of discount rate and price assumptions. A similar effect was observed in the Kyrgyz examples, where rising inflation and currency risks changed the cash flow structure and reduced the real return on investment. Following the conclusions of L. Vilani *et al.* (2024), the sustainability of agricultural projects depends on coverage of external factors and climate risks. The results of the study confirmed that the instability of the agricultural sector in Kyrgyzstan requires the adaptation of financial models to consider seasonal fluctuations and subsidies. A comparison with J. Cohen (2024) showed that the use of a fixed discount rate of 3% does not reflect the real cost of capital. The study found that the use of a flexible discount range of 3.5 to 8% increases the accuracy of the assessment of socially significant infrastructure projects. Arguments of R. Baerenbold (2023) on "reference class forecasting" confirmed the advisability of calibrating models based on similar completed projects. A similar principle was applied when constructing Kyrgyzstan scenarios, which reduced the probability of systematic error in forecasting timelines and costs. In addition, the results were compared with those of J. Eliasson (2025), estimating that cost overruns and delays in infrastructure projects are statistically stable. These results confirmed the need to include penalty coefficients in the controlling model, which increased the reliability of calculations and correlated with international practices for assessing investment risks.

Additional comparative analysis confirmed that improving the accuracy of investment forecasting in Kyrgyzstan is possible by integrating artificial intelligence models and scenario analysis. The results obtained are consistent with the conclusions of S. Chen *et al.* (2024),

determining that combining the reference class forecasting method with a radial basis function neural network provides a more robust assessment of investment viability and minimises systematic errors. A similar effect was observed in the study: the use of trainable models made it possible to improve the reliability of forecasts in the context of multi-parameter uncertainty. The results correlate with the study by A. Akinsulire *et al.* (2024), demonstrating that strategic planning increases the viability of investment projects in the housing sector, provided that financial analysis and socio-economic factors are integrated. In the context of Kyrgyzstan, similar patterns were observed in construction projects, where the implementation of long-term sustainable housing programmes required the coordination of investment and social priorities. These results confirm the conclusions of S. Shao & A. Sorourkhah (2024), proposing combining robustness analysis with the net present value model. A comparison with national indicators showed that integrating robustness analysis with classical NPV models reduced the dispersion of expected results and increased the reliability of long-term forecasts. J. Zhan & A. Santos-Paulino (2021) demonstrated that mobilising investment for sustainable development is only possible through a combination of public and private capital. A comparison with the conditions in Kyrgyzstan showed that investment efficiency increased when mixed forms of financing were used, including grants and concessional loans from international organisations, which ensured resilience to macroeconomic risks. The results were also consistent with the study by F. Mahmood *et al.* (2024), which confirmed that behavioural biases among investors reduce the rationality of investment decisions. A similar effect was identified in Kyrgyzstan, where insufficient financial literacy and inflated expectations of returns led to errors in determining the discount rate and return on investment period.

A comparison with J. Huang *et al.* (2022) demonstrated that the application of NPV and IRR methods requires accurate identification of cash flow and coordination of time parameters. This conclusion coincided with the results of an analysis of national investment projects, where deviations in calculations on the time scale led to significant discrepancies in the final performance indicators. In turn, C. Magni & J. Martin (2025) highlighted the duality of reinvestment assumptions in NPV and IRR methods, which explains the discrepancies between these criteria. The results of the study confirmed that the use of adjusted models that consider the real possibilities of reinvestment increases the reliability of estimates and reduces the risk of project overvaluation. A comparison with A. Singh & V. Chatterjee (2025) demonstrated that the combined use of NPV and IRR provides the most balanced decision-making in capital budgeting. A similar conclusion was confirmed by the analysis of Kyrgyzstan examples, where the combined use of both criteria eliminated the distortions that arose when IRR was used alone. The results also correlate with M. Bara (2025), who demonstrated that an improved Monte Carlo simulation combining cost analysis and schedule analysis significantly increases the reliability of investment risk assessment. Applying this model in the Kyrgyz context reduced the range of uncertainty and assessed the impact of time shifts on the overall effectiveness of projects. Lastly, the results are consistent with K. Arjunan (2022), proposing a new method for calculating NPV and IRR based on a capital depreciation schedule, which simplifies the processing of financial data. A similar approach has proven effective in processing statistics on investment projects in Kyrgyzstan, ensuring transparency and automation of calculation procedures.

Thus, in comparison with international and regional approaches, the results obtained show that Kyrgyzstan's investment control system is in the process of transitioning from a formal accounting model to an integrated analytical structure based on the principles of risk-adaptive management and quantitative verification of performance parameters. The analysis confirmed that the accuracy of investment decision-making can be improved using probabilistic methods, uncertainty modelling and dynamic discounting, which reflects the real cost of capital in a volatile economy. The study determined that the integration of risk-adjusted models, flexible discount rates and post-audit can minimise systematic errors and increase the sustainability of investment projects. In a broader context, the research results indicate that the effectiveness of Kyrgyzstan's investment policy directly depends on the ability of the national controlling system to combine financial modelling, risk analysis and strategic planning into a single digital platform. Such a transformation creates the conditions for a transition from reactive control to proactive capital investment management, increases transparency, reliability and consistency of investment decisions with the country's sustainable economic development goals.

CONCLUSIONS

The study provided a comprehensive assessment of investment activity dynamics, efficiency and sustainability of capital investments in the economy of the Kyrgyz Republic for 2019-2024. During this period, the total volume of investment in fixed capital increased by approximately 14%, with the highest average annual growth rates recorded in the energy (+5.8%) and infrastructure (+4.4%) sectors, while the agricultural and industrial sectors showed more moderate positive dynamics. The structure of investments shifted towards projects with high capital intensity and long payback periods, which correlates with the priorities of the state strategy for industrial and innovative development and the guidelines of the Ministry of Economy and Commerce. An analysis of performance indicators using DCF, NPV and IRR methods showed that energy projects provide the highest sustainability, NPV = KGS + 8.7 million, IRR = 14.5%, payback period of about 7 years, while agricultural programmes are highly sensitive to currency and inflation risks. Solar generation projects demonstrated the shortest payback period (≈5 years) with long-term profitability, making them promising for small and medium-sized businesses. Scenario and sensitivity analysis showed that a 1

percentage point change in the discount rate reduces NPV by an average of 4-7% depending on the sector: in energy by 4-5%, in agriculture by 6-7%, and in infrastructure projects by 4-5%, with energy remaining the least sensitive to fluctuations in macroeconomic parameters. The regression model $E = f(I, r, \sigma)$ showed that the main contribution to integral efficiency (E) is made by the volume of investment ($\beta = 0.63$), while the growth in the cost of capital (r) and the level of risk (σ) reduces E by 0.27 and 0.18, respectively.

A comparison of the calculated results with national strategic objectives revealed that the project indicators were generally consistent with government policy objectives; however, practical implementation is complicated by typical controlling errors, such as an incorrect discount rate, underestimation of risks, and lack of post-audit, which leads to a 5-10% distortion of NPV and the accumulation of systemic inaccuracies. A summary interpretation of the effectiveness factors showed that financial parameters (r, σ, I) have a decisive impact on investment stability, while macroeconomic and institutional conditions shape the environment of predictability. Overall, the results confirm the need to transition to an analytical type of investment controlling based on quantitative verification, scenario modelling, and risk module integration. To improve the accuracy of forecasts and align investment policy with national strategic goals, it is recommended to implement dynamic DCF models, use industry WACC rates, conduct independent expert reviews of source data, and develop digital monitoring platforms. This approach will minimise systemic distortions, increase the transparency and adaptability of the investment process, and ensure the sustainable development of the Kyrgyz Republic's economy based on a balance between the scale of investment, the cost of capital, and risk management.

The study is limited using aggregated statistical data, which renders micro-level analysis of investment projects considering management decisions impossible, while the time lag in macroeconomic indicators and the lack of a unified post-audit database reduce the accuracy of forecasts and the reliability of NPV and IRR calculations. Promising areas for development include the development of multi-level econometric models, the integration of artificial intelligence technologies into investment controlling, and the creation of a national digital monitoring platform to improve the accuracy, transparency, and comparability of investment decisions.

ACKNOWLEDGEMENTS

None.

FUNDING

None.

CONFLICT OF INTEREST

None.

REFERENCES

[1] Abdullayev, K., Abdullayev, R., Yusifov, E., Babazade, I., & Fataliyeva, G. (2024). Main areas of development of the digital economy in the Republic of Azerbaijan. *Economics of Development*, 23(1), 78-88. doi: 10.57111/econ/1.2024.78.

[2] Akinsulire, A.A., Idemudia, C., Okwandu, A.C., & Iwuanyanwu, O. (2024). Strategic planning and investment analysis for affordable housing: Enhancing viability and growth. *Magna Scientia Advanced Research and Reviews*, 11(2), 119-131. doi: 10.30574/msarr.2024.11.2.0114.

[3] Arjunan, K. (2022). A new method to estimate NPV and IRR from the capital amortization schedule. *Australasian Accounting, Business and Finance Journal*, 16(6), 23-44. doi: 10.14453/aabfj.v16i6.03.

[4] Asizbaev, R., & Djeenbekova, N. (2022). Modern investment policy in the development of the real sector of the economy of the Kyrgyz Republic. *News of Universities of Kyrgyzstan*, 1, 91-95.

[5] Baerenbold, R. (2023). Reducing risks in megaprojects: The potential of reference class forecasting. *Project Leadership and Society*, 4, article number 100103. doi: 10.1016/j.plas.2023.100103.

[6] Bara, M. (2025). Enhanced Monte Carlo simulation for project risk analysis: Integrating cost and schedule impacts with time-shifted risks and dependency modeling. *Applied Operations and Analytics*, 1(1), 1-15. doi: 10.1080/29966892.2025.2552675.

[7] Chen, S., Wang, C., & Yan, K. (2024). Assessing project resilience through reference class forecasting and radial basis function neural network. *Applied Sciences*, 14(22), article number 10433. doi: 10.3390/app142210433.

[8] Cohen, J.T. (2024). It is time to reconsider the 3% discount rate. *Value in Health*, 27(5), 578-584. doi: 10.1016/j.jval.2024.03.001.

[9] Dai, H., Li, N., Wang, Y., & Zhao, X. (2022). The analysis of three main investment criteria: NPV IRR and payback period. In *Proceedings of the 2022 7th international conference on financial innovation and economic development* (pp. 185-189). Dordrecht: Atlantis Press. doi: 10.2991/aebmr.k.220307.028.

[10] Duysen, G.M., Panzabekova, A.Zh., & Daurenbekova, K.S. (2025). Trade and investment cooperation between China and Central Asian countries: Structure, dynamics and strategic significance. *Statistics, Accounting and Audit*, 3(98), 231-248. doi: 10.51579/1563-2415.2025.-3.17.

[11] Eliasson, J. (2025). Cost overruns of infrastructure projects – distributions, causes and remedies. *Transportation Research Part A: Policy and Practice*, 198, article number 104532. doi: 10.1016/j.tra.2025.104532.

[12] Fabianová, J., Janeková, J., Fedorko, G., & Molnár, V. (2023). A comprehensive methodology for investment project assessment based on Monte Carlo simulation. *Applied Sciences*, 13(10), article number 6103. doi: 10.3390/app13106103.

[13] Hassibullah, R., & Ahmad, M.H. (2023). *Analyzing environmental investment differences: A comparative study of fixed asset investments for environmental protection in the Kyrgyz Republic and Afghanistan*. Retrieved from https://elibrary.auca.kg/bitstream/123456789/2779/1/Environmental%20investments.docx.pdf.
[14] Huang, J., Tong, J., Wang, P., & Zheng, X. (2022). Application and comparison of NPV and IRR methods in the company investment decision. In *Proceedings of the 2022 7th international conference on financial innovation and economic development* (pp. 71-78). Dordrecht: Atlantis Press. doi: 10.2991/aebmr.k.220307.012.
[15] International Renewable Energy Agency. (2022). *Renewables readiness assessment: Kyrgyz Republic*. Retrieved from https://www.irena.org/Publications/2022/Dec/RRA-Kyrgyz-Republic.
[16] Investment Portal of the Kyrgyz Republic. (n.d.). *Digital library.* Retrieved from https://invest.gov.kg/sanarip-kitepkana/.
[17] Karlibaeva, R., Kurbonov, K., Bekimbetova, G., & Shaturaev, J. (2022). The effectiveness of investment projects in development of innovative activities of enterprises. *European Business & Management*, 8(3), 62-71.
[18] Karnavas, C. (2024). A new approach of investment project appraisal under risk and uncertainty. *Economics and Business Journal*, 2(3), 217-240. doi: 10.47353/ecbis.v2i3.121.
[19] Kyrgyz Republic country partnership framework 2024-2028. (2023). Retrieved from https://www.worldbank.org/en/country/kyrgyzrepublic/publication/cpf-2024-2028.
[20] Kyrgyz Republic: Country partnership strategy 2023-2027. (2023). Retrieved from https://www.adb.org/documents/kyrgyz-republic-country-partnership-strategy-2023-2027.
[21] Law of the Kyrgyz Republic No. 66 "On Investments in the Kyrgyz Republic". (2003, March). Retrieved from https://cbd.minjust.gov.kg/1190/edition/8226/kg.
[22] Liang, H. (2025). Applying three financial analysis methods in investment: A comparative case study. *Advances in Economics, Management and Political Sciences*, 145, 14-20.
[23] Lin, J. (2023). A comparative study on the application of NPV and IRR in financial market investment decision. *Academic Journal of Business & Management*, 5(4), 51-54. doi: 10.25236/AJBM.2023.050409.
[24] Magni, C.A., & Martin, J.D. (2025). The two sides of the reinvestment assumption fallacy in IRR and NPV. *The Engineering Economist*, 70(3), 122-151. doi: 10.1080/0013791X.2025.2541386.
[25] Mahmood, F., Arshad, R., Khan, S., Afzal, A., & Bashir, M. (2024). Impact of behavioral biases on investment decisions and the moderation effect of financial literacy: Evidence from Pakistan. *Acta Psychologica*, 247, article number 104303. doi: 10.1016/j.actpsy.2024.104303.
[26] Melkher, O., & Ermekova, G. (2023). Foreign investment in the Kyrgyz Republic: Analysis of dynamics and structure. *News of Universities of Kyrgyzstan*, 6, 125-129.
[27] Ministry of Economy and Commerce of the Kyrgyz Republic. (n.d.). Retrieved from https://mineconom.gov.kg/ky/section/document.
[28] Ministry of Finance of the Kyrgyz Republic. (n.d.). Retrieved from https://www.minfin.kg/pages/show/page/dokumenty.
[29] Myrzaibraimova, I. (2023). Investment in real estate as a factor of investment activity. *Science, New Technologies and Innovations of Kyrgyzstan*, 9, 100-103.
[30] Nadirkhanov, U.S. (2024). Risk management in the process of attracting foreign investments. *Economics and Innovative Technologies*, 12(4), 25-40. doi: 10.55439/EIT/vol12_iss4/i4.
[31] National Development Program of the Kyrgyz Republic until 2026. (2021, October). Retrieved from https://cbd.minjust.gov.kg/430700/edition/32967/kg.
[32] National Statistical Committee of the Kyrgyz Republic. (n.d.a). *Publications published by National Statistical Committee.* Retrieved from https://www.stat.gov.kg/en/publications/.
[33] National Statistical Committee of the Kyrgyz Republic. (n.d.b). *Main economic indicators for the industry of the Kyrgyz Republic.* Retrieved from https://stat.gov.kg/en/publications/osnovnye-ekonomicheskie-pokazateli-po-promyshlennosti-kyrgyzskoj-respubliki/.
[34] Nwangele, C.R., Adewuyi, A., Ajuwon, A., & Akintobi, A.O. (2021). Advances in sustainable investment models: Leveraging AI for social impact projects in Africa. *International Journal of Multidisciplinary Research and Growth Evaluation*, 2(2), 307-318. doi: 10.54660/.IJMRGE.2021.2.2.307-318.
[35] Organisation for Economic Co-operation and Development. (2024). *Sustainable infrastructure programme in Asia (SIPA): Activity report 2023-2024*. Retrieved from https://www.oecd.org/content/dam/oecd/en/about/programmes/sustainable-programme-in-asia-sipa/activity-report-sipa-2023-2024.pdf.
[36] Satyvaldieva, B.A. (2024). The Kyrgyz Republic's regional development problems in the conditions of new challenges. *Bulletin of Kemerovo State University Series Political Sociological and Economic Sciences,* 9(1), 142-152. doi: 10.21603/2500-3372-2024-9-1-142-152.
[37] Shao, S., & Sorourkhah, A. (2024). A novel perspective on prioritizing investment projects under future uncertainty: Integrating robustness analysis with the net present value model. *Economics*, 18(1), article number 20220111. doi: 10.1515/econ-2022-0111.

[38] Shaturaev, J. (2023). Efficiency of investment project evaluation in the development of innovative industrial activities. *Asian Journal of Science and Education*, 3(2), 147-162. doi: 10.17509/ajse.v3i2.45675.
[39] Singh, A.D., & Chatterjee, V. (2025). Capital budgeting decisions using net present value and internal rate of return techniques. *Global Perspectives in Management*, 3(1), 48-59.
[40] Tyulebekov, T.B., Serik, E.T., & Yermekbayev, A.A. (2025). The potential of international cooperation within the framework of investments of member countries of the Organization of Economic Cooperation. *Bulletin of Ablai Khan KazUIRandWL Series "International Relations and Regional Studies"*, 59(1), 230-244. doi: 10.48371/ISMO.2025.59.1.015.
[41] United Nations Development Programme. (n.d.). *Small hydropower plants for independent power production (IPP).* Retrieved from https://sdgprivatefinance.undp.org/leveraging-capital/sdg-investor-platform/small-hydropower-plants-independent-power-production-ipp.
[42] Vilani, L., Zanin, A., Lizot, M., Trentin, M.G., Afonso, P., & de Lima, J.D. (2024). A framework for investment and risk assessment of agricultural projects. *Journal of Risk and Financial Management*, 17(9), article number 378. doi: 10.3390/jrfm17090378.
[43] World Bank. (2024). *Kyrgyz Republic economic update spring 2024: Special topic – business support programs: A snapshot for the 2020-2022 period.* Retrieved from https://documents.worldbank.org/en/publication/documents-reports/documentdetail/099070924031041055/p50105713310ba020182d11f3d66d34d17a.
[44] World Bank. (n.d.). *Agriculture productivity and nutrition improvement project.* Retrieved from https://projects.worldbank.org/en/projects-operations/project-detail/P132754.
[45] Yang, Y. (2024). Research on financial investment risk assessment techniques and applications. *Science, Technology and Social Development Proceedings Series*, 2, 117-123. doi: 10.70088/pp8rvk34.
[46] Zhan, J.X., & Santos-Paulino, A.U. (2021). Investing in the sustainable development goals: Mobilization, channeling, and impact. *Journal of International Business Policy*, 4(1), 166-183. doi: 10.1057/s42214-020-00093-3.

Оцінка інвестиційних проектів у Киргизстані: сучасні методи та помилки у практиці контролінгу

Тілек Тойчієв
Студент
Університет Невади
89154, вул. Південний Меріленд-Парквей, 4505, м. Лас-Вегас, Сполучені Штати Америки
https://orcid.org/0009-0005-6196-2208

Анотація. Мета дослідження полягала у вдосконаленні методичних підходів до оцінки ефективності інвестиційних проектів у Киргизькій Республіці. Робота заснована на застосуванні порівняльно-економічного, структурно-динамічного, кореляційно-регресійного та сценарного аналізу, а також методів контент-аналізу нормативних актів та фінансового моделювання, що включає розрахунки дисконтованих грошових потоків, чистої наведеної вартості, внутрішньої норми прибутковості та терміну окупності. Результати показали, що у 2024 році загальний обсяг інвестицій в основний капітал збільшився на 14 % порівняно з 2019 роком, що свідчило про поступове відновлення інвестиційного циклу та перехід до більш активної фази капітальних вкладень. Найбільші темпи зростання фіксувалися в енергетичному (+5,8 %) та інфраструктурному (+4,4 %) секторах, де спостерігалося стале розширення проектного портфеля та посилення ролі довгострокових вкладень. Проведений сценарний аналіз підтвердив високу стабільність енергетичних проектів при коливаннях ключових макроекономічних показників, тоді як аграрні та інфраструктурні ініціативи демонстрували підвищену чутливість до інфляційних та валютних ризиків, що потребувало застосування ризик-скоригованих методів оцінки. Паралельно структура джерел фінансування змістилася у бік приватного та змішаного капіталу, відображаючи зміцнення механізмів державно-приватного партнерства та прискорену цифровізацію інвестиційного процесу, включаючи використання онлайн-платформ для реєстрації та моніторингу проектів. Економетрична модель $E = f(I, r, \sigma)$ показала, що збільшення інвестицій на 1 % підвищило інтегральну ефективність на 0,63 одиниці, тоді як зростання ставки капіталу на 1 п.п. знизило її на 0,27 одиниці, що підкреслило значущість вартості капіталу та структури фінансування для стійкості інвестиційних рішень. Отримані результати можуть використовуватись державними органами, фінансово-аналітичними підрозділами та консалтинговими структурами для вдосконалення процесів оцінки, планування та контролю інвестиційних проектів

Ключові слова: фінансове моделювання; дисконтування; чиста наведена вартість; внутрішня норма доходності; інтегральна ефективність; термін окупності

Економічний вісник університету

Збірник наукових праць
учених та аспірантів

Том 20, № 2, 2025

Заснований у 2006 р. Видається два рази на рік

Відповідальний редактор:
С. Кучеренко

Формат 60x84/8
Підписано до друку 24.12.2025 р.
Умовн. друк. арк. 10,7
Наклад 50 прим.

Адреса видавництва:
Університет Григорія Сковороди в Переяславі
08400, вул. Сухомлинського, 30, м. Переяслав, Україна
Тел.: +38(044)293-11-10
E-mail: mail@ue-bulletin.com.ua
https://ue-bulletin.com.ua/uk

University Economic Bulletin

Collection of scientific articles of Scientists
and Postgraduate Students

Vol. 20, No. 2, 2025

Established in 2006. Issued 2 times a year

Managing editor:
S. Kucherenko

Format 60x84/8
Signed for print 24.12.2025
Conventional printed pages 10.7
Circulation 50 copies.

Publisher's address:
Hryhorii Skovoroda University in Pereiaslav
08400, 30 Sukhomlynsky Str., Pereiaslav, Ukraine
Tel.: +38(044)293-11-10
E-mail: mail@ue-bulletin.com.ua
https://ue-bulletin.com.ua/en