ФІНАНСИ, ОБЛІК ТА ОПОДАТКУВАННЯ

FORECAST OF THE USE OF ARTIFICIAL INTELLIGENCE IN BANKING AND RISK MANAGEMENT

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Methods. This work is based on the application of a number of scientific tools and methods, for example, scenario analysis in identifying examples of employee-artificial intelligence interaction. Induction for building forecasts based on typical stages of introducing new technologies into society; drawing analogies with historical trends in the development of the banking market, for example, automated banking systems of the late 20th – early 21st centuries, the introduction of CRM systems in banking management or the transition to a «digital state» in Ukraine. The above examples have the same stages of implementation from the idea to full acceptance and application by the banking community.

Novelty. The author proposes to divide the implementing artificial intelligence into 4 stages and outlines the main features (technological, methodological and legal) of the application of artificial intelligence, as well as its application according to the selected periodization in management.

Results. The use of artificial intelligence by banks has already begun. Understanding the stages of using artificial intelligence will allow building a further strategy for the development of banking, considering artificial intelligence, changing the policy of personnel management, processes, risks, and bank security. Thus, the first stage (by 2028) involves the completion of the initial stage of artificial intelligence implementation with the mass use of generative tools, online risk and process monitoring, and the first attempts by regulators to establish requirements for artificial intelligence in banking. The second stage (by 2030) involves strengthening regulation and integrating artificial intelligence into most banking processes, including risk management. The third stage – by 2035 – involves the transfer of a significant part of the functions currently performed by a bank employee to artificial intelligence with the subsequent reorganization of the system of banking products and processes. The fourth stage (by 2075) is a complete reformation of banks with the transfer of a significant list of artificial intelligence functions and increased risks associated with the work of artificial intelligence in the bank.

The author also attempted to determine the change in the relationship between the bank employee and artificial intelligence and impose these changes on the proposed stages. The first stage (until 2030) involves the active use of artificial intelligence tools by the bank employee to solve his own tasks, respectively, that is why artificial intelligence is a tool. The second stage (until 2035) artificial intelligence acts as a partner and, accordingly, the employee indicates what exactly should be done and how, and artificial intelligence independently makes decisions on some tasks (typical, technical, etc.), without the participation of the employee. The third stage is a forecast for a period of up to 50 years - artificial intelligence makes decisions itself, and the employee only identifies the need.

Practical value. The results of this study will allow, when implementing strategic planning, to consider artificial intelligence and its potential in one's own activities, including within the framework of risk management.

Keywords: artificial intelligence, banking artificial intelligence, risk management

Statement of problem. In the modern world, AI systems (further in the text – AI) used to solve current production, economic or organizational tasks: from text recognition to the creation of works of art. The trends of expanding the involvement of AI in data processing, information flow management, and assistance in customer service have also spread to banking systems in different countries of the world.

Forecasting the development of new technologies and the possibility of their practical implementation allows organizations to become leaders with a significant increase in benefits and profits in the future. The feasibility of outlining the stages and steps of the potential development of AI, especially in the context of use in the banking sector, determines the relevance of this study.

Analysis of recent papers. The development of this article is relevant specifically for practical cases, as example in the standards and materials of Deloitte (Deloitte, 2023) [1**Ошибка! Источник ссылки не найден.**] or the European Central Bank (European Central Bank, 2024) [2]. In these documents reveals the regulator`s vision of practical tools for controlling and auditing AI in the activities of financial institutions. Massachusetts Institute of Technology (MIT Technology Review) Review, 2023) [3] formed a forecast of the practical development of AI as an element of the state tool for control, governance and management of social tasks until 2050.

As for scientific works, it is worth highlighting the work of Pavlyuchenko D. M. «The Impact of Artificial Intelligence and Machine Learning on Banking Services» (Pavlyuchenko D. M., 2024) [4], which thoroughly and thoroughly reveals some current tools, mechanisms for using AI in the banking sector, and current risks. In addition, worthy of attention is the work of Solodky V. V. and Polishchuk Y. A. (2023) [5], which outlines potential steps for banks to develop AI in their activities. And the contribution of Bezshtanko D. V. (2025) [6], which revealed specific tools, risks, opportunities, and practices for using artificial intelligence in risk management of banks, allows us to verify the presence of thorough approaches to the analysis and assessment of theoretical and practical ways of using AI in the banking sector.

Numerous theses of scientific reports and publications that contain practical recommendations on the development and implementation of AI in the work of banking institutions confirmed relevant of this article. At the same time, the issue of strategic forecasting of the involvement of AI in the work of banking structures, including in the direction of banking risk management, remains insufficiently explored, which determines the relevance of this forecasting study.

Aim of the paper. The purpose of the article is to forecast the use of AI by outlining the main stages of implementing AI in the processes of banking institutions, including risk management, as well as the importance of employee and AI at these stages, taking into account automation, CRM, and changes in the model of customer-bank relationship and interaction.

Materials and methods. Forecasting the development of AI is extremely difficult: it is impossible to take into account all influencing factors, because as the forecast horizon increases, the probability of events occurring decreases. Let us highlight facts that have a high probability of significantly changing the correctness of the forecast:

– Inability to take into account the so-called «black swans» (Taleb N, 2013) [7]: wars, new pandemics, global cyberattacks, etc.

– Limited number of national cases: for example, at the time of analysis, only a few banks in Ukraine are piloting AI solutions at the decision-making level.

– The speed of legislative adaptation in Ukraine may be slower than in the EU/USA, etc.

These factors may partially or completely refute the forecast, or postpone its implementation. That is why the forecast proposed by the author is based on a number of assumptions:

– AI technologies continue to develop exponentially – the so-called Moore's Law. It assumes a doubling of the number of transistors on a chip every 24 months, and therefore the amount of server hardware resources that artificial intelligence requires today to perform its tasks will have the following trend: the physical dimensions of server hardware will change insignificantly, and digital power tends to increase geometrically over time.

– The regulator does not prohibit, but regulates the use of AI, for example, EU Policy, (AI Act, 2024) [2] or Ukrainian orientation towards open data & GDPR (National Bank of Ukraine, 2024) [8].

– The influence of public opinion on the use of AI is extremely important for banks, as there is a potential opportunity to lose not only customers, but also licenses from regulators due to violations of the law, mass appeals from customers to regulators, or critical failures that will complicate/make it impossible for banks to operate for a certain period.

– The focus of banks' operations on cost reduction and scaling: the use of AI assistants or systems with artificial intelligence elements allows for a reduction in operating costs of up to – 40% (Statista, 2024) [9].

– Adaptation of the educational and personnel market in Ukraine and the world, which is already, manifested in 2025 in the form of an increase in courses/certificates in «artificial intelligence for lawyers», «AI risk management», etc.

– The absence of the above significant «black swans».

It should also be noted that the modeling of the phasing of AI implementation in the bank's work and risk management is carried out using, among other things, the method of historical analogy. Thus, the stages of development of automated banking systems and related software in the 1990s-2000s, the displacement of manual processing of client requests and accounting by CRM systems, as well as the process of transforming risk assessment models according to Basel approaches, are taken as a basis.

So, taking into account the assumptions, we will try to predict the development of the Banking System and the risk management system in future periods, and display the results of the forecast in Figure 1.
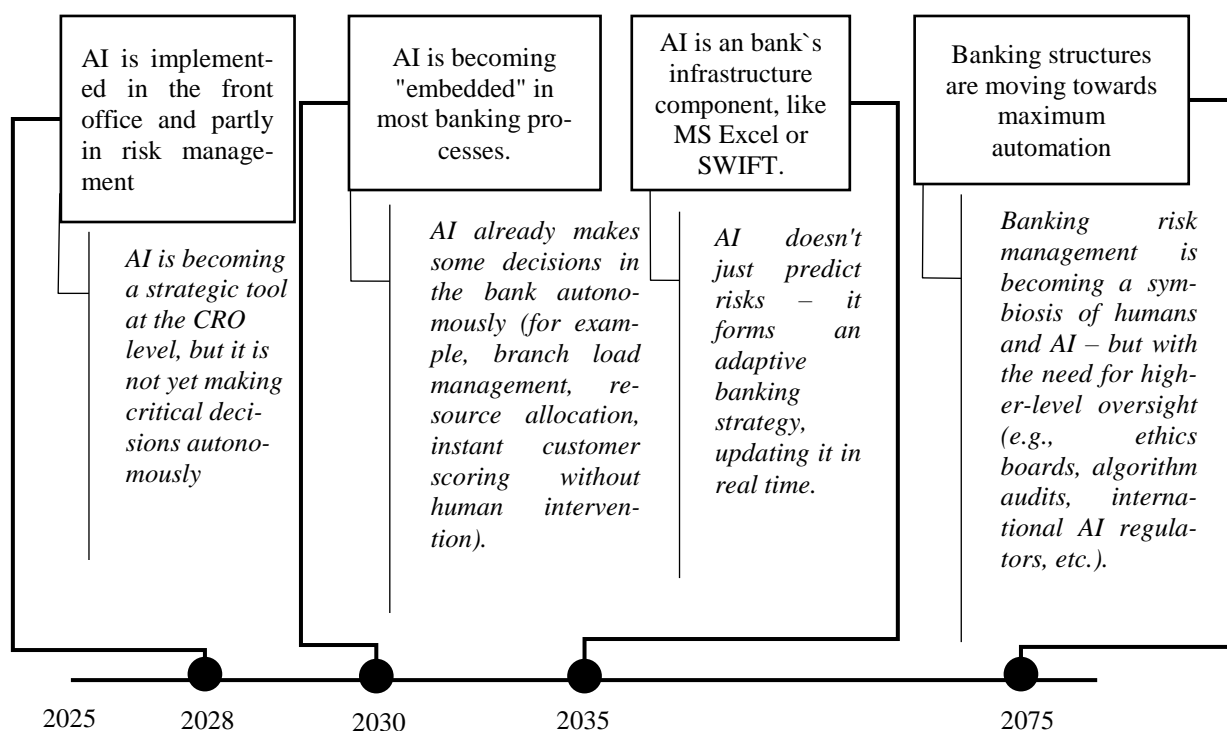

Fig. 1. Predicted stages of AI implementation in bank operations and risk management

The first stage (from today to 2028) involves testing and the beginning of active use of AI in the banking sector, including in risk management. As an example of the practical implementation of artificial intelligence elements in the processes of banks and other financial institutions:

– AI- scoring in Monobank, Revolut, Raiffeisen Bank (Raiffeisen Bank International, 2023) [11].

– Reduced use of lawyers at JPMorgan COIN, saving 360,000 hours of highly paid professionals (JPMorgan Chase & Co., 2023) [12].

– The active use of artificial intelligence in CHATBOT-type systems has significantly reduced the time for processing information and requests from customers, which has allowed an increase in the number of automated (typical) requests by 70% (McKinsey & Company, 2023) [10].

The features of this period of AI implementation in the work of banking institutions also include:

– Mass use of generative AI for customer service, automatic creation of reports, and supporting documents.

– Real-time AI monitoring of operational risks is becoming the norm in medium and large banks.

– Integrating AI into fraud detection and AML systems.

– Financial sector regulators (e.g., National Bank of Ukraine, EBA, BIS) are developing basic approaches to AI management or model validation.

As for risk management identified, for this stage, the following characteristic features: the active use of «Black Boxes» of models (in which risk managers are not provided with a full (or complete) explanation or interpretation of AI decisions). Besides, beginning of ethical dilemmas, especially in the issues of personnel management, automation of transaction rejections, and the transfer of part of the rights in the implementation of operations.

The second stage (2028–2030) is the stage of activating the mass use of AI in most of the Bank's processes. AI already makes some decisions in the bank autonomously (for example, managing branch workload, allocating resources, instant customer scoring without human intervention).

In our opinion, the features of this stage will be:

– Full automation of operational process control (continuous audit, incident forecasting).

– Widespread use of AI for credit and operational risk assessment and forecasting models.

– Merger of AI with RPA → «intelligent automation» (Intelligent Automation).

– In the context of regulatory measures, AI is subject to mandatory certification, «explainable AI» standards are emerging,

and GDPR 2.0, adapted to AI risks (including the right not to be subject to automated decision-making), is being implemented.

Examples of AI applications at this stage may include active use of AI to combat fraud (for example, at HSBC or ING), implementation of automated AML systems in AML/CTF, experimental testing and implementation of RegTech solutions with AI by the regulator of the Ukrainian banking sector (PwC, 2024) [13].

When assessing risks and risk management at this stage, it is worth paying attention to:

– Detected false positives/negatives in automated decisions that during sample audits.

– The growth of cyber fraud, which is disguised as AI activity, including the development of individual AI systems aimed at finding vulnerabilities in individual banks, selecting, and creating malicious code for specific infrastructures.

The third stage characterized in a forecast horizon of 10 years – until 2035 and, in our opinion, this stage as the adoption by banking specialists of AI as one of the structures of the information infrastructure, just as, for example, MS Office, various database management systems, corporate governance systems, etc. were adopted at one time.

The following features of this stage can be identified:

– Either identification of AI risks as a separate material risk by the Basel Committee or as part of operational risk that requires a special approach.

– Bank`s development of their own neural networks (their own, not the adaptation of existing ones) for risks, personnel, capital, or other areas of management systems.

– The merger of banking AI analytics with state registries, e- Health, e- Justice, and tax systems, which is already partially implemented through APIs (2025), and will be developed more actively in the future.

The threats and risks at this stage include the following:

– Banks' dependence on individual AI platforms.

– The formation of a new type of operational risk is an algorithmic failure in a centralized AI network. That is, it is not part of IT risks in the operational risk structure, but a separate type of risk with its own set of controls and

management tools.

– Legal uncertainty of decisions based on errors in AI models.

The fourth stage – a strategic forecast for 50 years, subject to gradual development and taking into account the above assumptions, defines banking risk management as a symbiosis of humans and AI – but with the need for higher-level control (e.g., ethics boards, algorithm audiences, international AI regulators).

In our opinion, the following features can characterize this period:

– Transforming banking structures into web interfaces of individual intelligent finance with significant powers and capabilities of AI assistants.

– Banking regulators themselves are actively using AI to manage their own and systemic risks in real time.

– Abandonment of branches, cash desks, PTKS and ATMs in favor of a complete transition to virtual currency.

At this stage, a significant influence exerted ethics council, which will be established in the bank and will deal with issues related to the problems of interaction between AI, the client and the bank employee. Among the tasks, in our opinion, will be the issues of verification of models, logic, behavior and approval of AI decisions regarding their changes. In addition, taking into account the change in the status of AI, its participation in the work of this committee and other committees of the Bank will have a significant impact on management decisions.

At the same time, we anticipate an increase in certain risks, among which the following are worth highlighting:

– The effect of a model ecosystem, when actively interacting AIs generate unpredictable tools and refine existing models with unobvious consequences.

– Activation of cyberattacks, which are no longer directed at server equipment (such attacks will continue), but at the models and tools operating in banks with the aim of obtaining advantages, financial resources, or destruction/damage to models by attackers or other AIs.

– Other threats are unpredictable given the lack of clear trends at this stage of forecasting.

In conclusion, it is worth noting that the transition to the active use of artificial intelli-gence by banks is an economically beneficial step, since along with reducing personnel costs, their training, social costs and wages, significant flexibility in management, efficiency in solving tasks and a significant reduction in typical human errors, the so-called human factor, are achieved.

That is, along with the growth of the risks listed above, the benefits of implementing the latest systems with elements of artificial intelligence, or using its full-fledged analogue, will become increasingly important over time.

Man and machine. Today, the introduction of artificial intelligence raises a number of concerns, primarily due to the potential loss of control over processes in the Bank. Let us try to evaluate the proposed periodization from the perspective of «human-machine» interaction and project the experience of technology adoption by society, staff and business owners, taking as a basis their perception of social networks, bots and automated banking management systems from the moment of their inception to active and profitable use.

The first period is from 2025 to 2030, and the period we called «he machine as an assistant».

The essence of this period is the active use of artificial intelligence systems by banking specialists to solve typical, similar and systemic tasks within the same process. For example, in the process of managing the legal direction, AI:

– It deals with the interpretation of legislation (based on logic, NLP, updates from the NBU/EU). Such tools are already actively used by regulators and are called RegTech, and it is based on the automated transfer of reporting information (regarding the balance sheet, financial results, regulatory indicators and standards, personnel, risks) to the server capacities of the regulator, including with minimal human participation (for example, current reporting or reporting on prudential standards);

– Generates templates of regulatory documents, checks for compliance with the norms of legislation and the legal field, determines court precedents and enters optimal solutions into documents. Within the framework of RegTech such changes are expected to be implemented by the end of the specified stage (National Bank of Ukraine, 2024) [8];

– It identifies conflicts between differ-

ent norms and suggests using the most optimal ones in terms of banking interests, etc.

An employee of the legal department, either separately or together with the compliance department, performs corrective and monitoring functions:

– They carry out a legal check taking into account the experience of lawyers, the specifics of document flow and judicial law.

– Conduct an ethical assessment (if necessary) to determine whether the rights and freedoms of employees or clients are restricted, whether the proposed regulatory documents comply with the rules and norms of behavior in force in a given country, and whether ethical and social imperatives are met.

– Approve or correct the formed regulatory document.

An example of the process of updating a regulatory document at this stage could be the following scenario:

Having received an update from the regulator regarding card services, the lawyer creates a task for the AI to change its own regulatory documents considering the updates. Having received the new document, the lawyer reviews it, removing nonsense (for example, signing a contract with blood, or using only Face ID to identify the client) and signs the document, submitting it for approval by the bank's Board.

The second period (2030 to 2035) we characterized as a bolder use of AI in banking processes, as banks will implement AI even more actively. This stage we called as «machine as decision» – AI makes the majority of operational and technical decisions, and human involvement is an exception. Thus, in the context of the above scenario, AI actions can be:

– Implementing algorithms and solutions for the purpose of full adaptation to regulatory norms without the involvement of a lawyer, drawing a parallel with today, is low-code / no-code platforms.

– Identifying risks of non-compliance in all areas and making changes to documents to avoid/reduce them.

– Implementing changes to banking policies, rules, limits, etc.

The person's role will be to:

– Monitoring self-updating systems.

– Conducting analysis of not formalized complex cases.

At the end of this period, the scenario of cooperation between AI and a bank employee will look like this: AI discovers that the new EU law on open banking conflicts with Ukrainian norms. It suggests changes to policies and procedures, clarifications to limits. The bank only agrees to the changes at the level of the Management Board or Supervisory Board of the bank.

This stage will actually be a transition to a new banking, where human participation will move from an operator to a controller of the ethics of the rules and logic by which banking AI will work. Each client will receive maximum attention with minimal personnel costs. The significance of this period is like the transition in banking from calculators to computers.

The next, third stage is the period of strategic forecast for 50 years. Given the above trend, this period we called «human is the last reserve». The use of artificial intelligence in banking, having achieved significant integration with similar systems, will be of critical importance, and the employee will perform either controlling functions, or representative, marketing functions.

Thus, in our opinion, AI in the context of the proposed scenario will forge the following functions:

– Automatic application of legal norms through APIs or similar integration systems between banks and regulators, supervisory government bodies or other structures.

– Continuous, systematic and regular updating of control systems, policies, internal regulations or limits

– Self-study based on precedents and regulatory decisions not only at the national but also international level, etc.

The role of a bank employee at this simulated stage will be as follows:

– Check whether the AI has gone beyond the permitted limits

– Resolving conflicts between AI logic and humanistic principles

The scenario for using AI will look like this: AI decides to block all customers with suspicious behavior according to the new rules, but the responsible bank employee imposes a moratorium on some actions due to fears of discrimination against a certain group.

Therefore, the gradual transition from

fears to the transfer of lion's share of AI functionality will lead to a radical rethinking of the role of the employee in a banking institution. In order to make the transition as smooth as possible, in our opinion, the banking system needs to introduce a new vision of AI among its staff:

–   HR reorientation: staff must undergo retraining – from executor to interpreter of AI solutions

–   AI doesn't fire people - AI changes jobs": instead of 10 compliance workers, there will be 3, but their role will become critical

–   Ethics Committee: Permanent structures for evaluating AI actions will appear at supervisory boards

–   Legislative regulation of AI limits: the state will establish that AI cannot decide on its own (for example, deny a loan without human review).

The use of artificial intelligence by banks has a number of significant advantages: along with reducing personnel costs and processing and in, the bank receives maximum loyalty and minimizes one of the biggest risks – the risk of human influence (intentional or unintentional, due to negligence or for causing harm/illegal enrichment). These advantages, along with sound regulatory norms, will allow the banking institution to keep the logic, processes and artificial intelligence itself (used by the bank) under maximum control in the future. In addition, in order to reduce social distrust of the system, an ethics committee, additional controls and reporting to society, including aggregated by the regulator, can be introduced.

Conclusions. As a conclusion, we must point out that a significant number of risks and concerns in the using of AI, being far-fetched and exaggerated, will suspend the introduction of high-tech generative artificial networks into banking activities. At the same time, the gradual activation of the use of AI by society will allow financial institutions to reduce risk and increase the benefits of the transition to relevant digital solutions.

Banks will increasingly use AI to manage their own processes, and the need for personnel will shift from operations specialists to interpreters of AI responses or decisions. This gradual evolution, in our opinion, will have several stages (from AI as an assistant to AI as a system for making operational, constructive, ob-jective and strategic decisions) with minimal risks for banking institutions.

Risks and risk management will also change over time, and more attention will be paid to the problems of cyber protection, building correct logic, AI loyalty, and setting clear limits for new digital solutions. Typical risks will remain, new and unusual risks will appear, but AI tools will be to minimize them.

The possibilities of using AI by banks may change over time, accordingly, this periodization and approaches to AI in the bank will need to be reassessed and re-examined. It is worth noting that the established signs of the stages, the relationship between AI and the Bank's processes, risk management are not exhaustive and may be supplemented in the course of further research.

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ПРОГНОЗ ВИКОРИСТАННЯ ШТУЧНОГО ІНТЕЛЕКТУ В БАНКІВСЬКІЙ СФЕРІ ТА РИЗИК-МЕНЕДЖМЕНТІ

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Методи. Дана робота базується на застосуванні ряду наукових інструментів та методів, наприклад, сценарного аналізу при визначенні прикладів взаємодії працівника та AI; індукції для побудови прогнозів на основі типових етапів впровадження у суспільство нових технологій; проведення аналогій з історичними тенденціями в частині розвитку банківського ринку, наприклад, автоматизовані банківські системи кінця XX – початку XXI століття, впровадження CRM систем в банківський менеджмент чи перехід до «цифрової держави» в Україні. Зазначені приклади мають однакові етапи впровадження від ідеї – до повного прийняття та застосування банківською спільнотою.

Новизна. Автором запропоновано розмежувати етапи впровадження штучного інтелекту на 4 та окреслено основні особливості (технологічно, методологічного та юридичного характеру) застосування штучного інтелекту, а також його застосування за обраною періодизацією в ризик-менеджменті.

Результати. Використання банками штучного інтелекту вже розпочато. Розуміння етапів використання AI дозволить будувати подальшу стратегію розвитку банківської з урахуванням AI, зміною політики управління персоналом, процесами, ризиками, безпекою банків.

Так, перший етап (до 2028 року) передбачає завершення початкового етапі впровадження AI із масовим використання генеративних інструментів, моніторинг ризиків та процесів онлайн, перші спроби регуляторів встановлення вимог до AI у банківській сфері. Другий етап (до 2030) передбачає посилення регулювання та інтеграцію AI в більшість банківських процесів, в тому числі і ризик-менеджмент. Третій етап – до 2035 передбачає передачу значну частину функцій, що наразі виконує працівник Банку AI із подальшою реорганізацією системи банківських продуктів та процесів. Четвертий етап (до 2075) – це повна реформація банків із передачею значного переліку функцій AI і посиленням ризиків пов'язаних із роботою AI в банку.

Також автором здійснено спробу визначити зміну відносин між працівником банку та AI і накласти ці зміни на запропоновані етапи. Перший етап (до 2030) року передбачає активне використання інструментів працівником банку AI для вирішення власних завдань, відповідно AI – інструмент. Другий етап (до 2035 року) AI виступає партнером і відповідно, працівник вказує що саме має бути зроблено і як саме, також AI приймає рішення самостійно по частині завдань (типових, технічних тощо), без участі працівника. Третій етап – прогноз на період до 50 років – AI сам приймає рішення, а працівник лише ідентифікує потребу.

Практична значущість. Результати даного дослідження дозволять при здійсненні стратегічного планування, враховувати AI та його потенціал у власній діяльності, в тому числі і в рамках ризик-менеджменту.

Ключові слова: AI, банківський штучний інтелект, управління ризиками.