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ARTIFICIAL INTELLIGENCE IN RISK HEDGING SYSTEMS: BANKING AND FINTECH INNOVATIONS FOR CUSTOMS CONTROL

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This article investigates how artificial intelligence (AI) can be embedded into risk-hedging systems in banking and fintech with a focus on strengthening customs control in cross-border trade. The research is motivated by the growing exposure of financial and trade ecosystems to fraud, illicit flows, tax evasion, and compliance failures under conditions of rapid digitalization and globalization. The paper systematizes the main directions of AI application: predictive analytics for early identification of risky transactions and shipments; machine-learning and hybrid rule-based models for anomaly and fraud detection; RegTech/SupTech instruments that support supervisory decision-making; and digital customs platforms that accelerate declaration processing, duty collection, and post-clearance audit. A structural framework for selecting strategic priorities in risk management is proposed, including requirements for data quality, interoperability, cybersecurity, transparency, and accountability of algorithms. The study also outlines methodological parameters for implementing AI solutions in line with international standards, emphasizing ethical governance (privacy protection, bias control, explainability) and regulatory harmonization across jurisdictions. The results demonstrate that combining AI-enabled efficiency measures with coordinated institutional reforms can increase productivity and profitability of financial operations while improving resilience indicators such as compliance, auditability, and stability of public revenues. The article argues that Ukraine and similar economies can leverage AI and fintech practices to modernize banking risk-hedging and customs oversight, reduce illicit trade risks, and enhance long-term adaptability of integrated financial-customs systems. Finally, the proposed approach highlights the importance of continuous model validation and data sharing protocols to sustain trustworthy, scalable AI adoption in customs and financial supervision.

Key words: artificial intelligence, risk hedging, banking innovations, fintech, customs control, economic resilience, compliance.

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STATEMENT OF THE PROBLEM IN GENERAL AND ITS RELATIONSHIP WITH IMPORTANT SCIENTIFIC OR PRACTICAL TASKS

The problem of ensuring effective risk-hedging in banking and fintech systems has intensified in recent years due to the combined impact of globalization, digitalization, and the urgent need for secure customs control. Rapid growth of cross-border trade and financial innovation has created vulnerabilities in compliance, fraud detection, and customs duty collection. According to Paleti [1], artificial intelligence plays a critical role in strengthening risk compliance and driving financial innovation in banking. However, the absence of integrated AI-driven frameworks in customs oversight exposes economies to illicit trade, tax evasion, and systemic instability.

From a scientific perspective, the problem is linked to the need for conceptual frameworks that integrate AI technologies with risk-management theory in financial and trade regulation. Ahmed et al. [2] emphasize that AI-driven innovations - from predictive analytics to compliance frameworks - are reshaping modern banking practices. Similarly, Gera et al. [3] highlight the importance of interdisciplinary research combining economics, law, technology, and data science to design effective governance models for financial inclusion and customs modernization. Alqahtani & Hamdan [4] note that fintech applications in customs duty collection improve efficiency and transparency, while Al-Zaqeba et al. [5] demonstrate that AI-driven customs systems reduce illicit trade risks and enhance compliance. Current data from the Junquera-Varela et al. [6] show that digital transformation of tax and customs administrations is essential for stabilizing fiscal systems and ensuring fair trade. Addressing these inefficiencies is critical for reducing corruption, mitigating financial risks, and meeting global integration criteria.

From a practical standpoint, the problem is directly tied to Ukraine's aspiration to strengthen economic resilience and align with international trade standards. The relationship between the general issue and practical tasks is evident: modernizing banking and customs systems through AI is not only a scientific challenge but also an essential step toward economic resilience and international compliance. Specifically, the study seeks to: (1) i**dentify strategic directions** of AI integration into risk-hedging systems in banking and fintech, with emphasis on customs control; (2) a**ssess the role of AI-driven predictive analytics, fraud detection models, and compliance frameworks** in enhancing resilience and transparency; (3) e**xamine the impact of globalization and digitalization** on the stability of financial and customs

systems, including risks of illicit trade and corruption; (4) p**rovide practical recommendations** for aligning national financial and customs policies with international standards of transparency, efficiency, and ethical responsibility.

By evaluating contemporary risk-hedging strategies, the study emphasizes how Ukraine and comparable economies can leverage artificial intelligence and fintech practices to enhance adaptability, efficiency, and long-term stability of their financial and customs control systems.

ANALYSIS OF LATEST RESEARCH AND PUBLICATIONS

Given the rapid diffusion of AI and fintech solutions across banking and cross-border trade, recent scholarship [1-17] increasingly focuses on how data-driven tools reshape risk identification and supervisory practices. At the same time, customs administrations are adopting digital platforms, RegTech/SupTech instruments, and advanced analytics to accelerate clearance while strengthening compliance, transparency, and fraud prevention. To consolidate these strands of literature, Table 1 summarizes key contributions on AI-enabled banking resilience, fintech-driven duty collection, and intelligent customs control, highlighting their combined implications for risk-hedging systems.

Table 1

Synthesis of modern research and studies in the field of AI, fintech, and customs control

№	Author, source	Direction of research	Description of ideas	Impact on risk-hedging and customs systems
1	Paleti, S. (2022) [1]	AI in banking compliance	Examines AI's role in strengthening risk compliance and driving financial innovation.	Highlights AI as a tool for transparency and risk reduction.
2	Ahmed et al. (2025) [2]	AI-driven banking innovations	Analyzes AI models for secure transactions, risk management, and ATM forecasting.	Demonstrates efficiency gains in digital banking and compliance.
3	Gera et al. (2023) [3]	AI and financial inclusion	Provides a bibliometric review of AI and fintech impacts on inclusion.	Shows AI reduces shadow practices and expands access.
4	Alqahtani & Hamdan (2023) [4]	Fintech in customs duties	Studies fintech applications in customs duty collection.	Identifies fintech as a driver of efficiency and transparency.
5	Al-Zaqeba et al. (2025) [5]	AI-driven customs systems	Explores AI's role in customs modernization and illicit trade reduction.	Demonstrates AI's potential for compliance and oversight.
6	Junquera-Varela et al. (2022) [6]	Digital transformation of customs	Reviews the modernization of tax and customs administrations.	Positions digitalization as essential for fiscal stability.
7	Dumanska & Matviiets (2021) [7]	Legal principles of customs security	Analyzes economic-legal foundations of customs security in e-trade.	Frames legal structures as vital for effective customs control.
8	George, A. S. (2024) [8]	Finance 4.0	Discusses the transformation of financial services in the digital age.	Highlights AI's role in reshaping financial models.
9	Harun et al. (2025) [9]	Global AI legal frameworks	Synthesizes international legal approaches to AI in finance.	Stresses the harmonization of regulations for customs efficiency.
10	Hossain, M. A. (2025) [10]	AI-driven financial analytics	Develops models for predicting market risk and investment decisions.	Demonstrates AI's strategic role in risk management.
11	Rajasree & Ragini (2025) [11]	Logistics and international payments	Studies the optimization of logistics and customs payments.	Shows AI enhances efficiency in global trade operations.
12	Agberxonu et al. (2023) [12]	AI in fintech	Examines machine learning in payments, fraud detection, and inclusion.	Positions AI as a driver of innovation and fraud prevention.
13	Okolo et al. (2022) [13]	Intelligent border security	Proposes automated cargo screening technologies.	Shows AI strengthens customs security and border resilience.
14	Kussainov et al. (2023) [14]	Anti-corruption in finance	Studies the EU financial sector security mechanisms.	Identifies AI as a tool for anti-corruption management.
15	Aggarwal & Karwasra (2025) [15]	AI and trade digitalization	Explores AI vs human intelligence in trade.	Highlights AI's role in global trade integration.
16	Igbinenikaro & Adewusi (2024) [16]	AI in trade policy	Provides recommendations for integrating AI into trade agreements.	Positions AI as a strategic factor in global governance.
17	Ridzuan et al. (2024) [17]	Ethics and regulation of AI	Examines the balance between innovation and regulation in finance.	Stresses ethical standards in customs and financial AI use.

Accordingly, the reviewed literature underscores the crucial integration of AI and fintech innovations into banking and customs risk-hedging systems. Evidence suggests that technological innovation, combined with regulatory harmonization and institutional reforms, can significantly improve transparency, resilience, and economic stability. Future research should focus on synthesizing international policy frameworks, deploying AI-driven customs solutions, and balancing innovation with ethical responsibility. As Ukraine and other economies advance toward deeper integration with global trade systems, fostering a culture that prioritizes both technological innovation and regulatory compliance will be imperative for long-term success in financial and customs control.

HIGHLIGHTING THE PREVIOUSLY UNSOLVED PARTS OF THE GENERAL PROBLEM TO WHICH THE ARTICLE IS DEDICATED

Despite significant progress in the digital transformation of banking and customs systems, several critical aspects of the general problem remain unresolved. First, the integration of artificial intelligence into risk-hedging frameworks remains fragmented, with applications concentrated in isolated areas such as fraud detection or transaction monitoring, while customs oversight and cross-border regulation are insufficiently covered. Second, the diversification of fintech applications in customs control is limited, as current solutions focus mainly on payments and duty collection, leaving predictive analytics, automated cargo screening, and intelligent dispute resolution underdeveloped. Third, the deployment of AI-driven customs systems continues to face technical, financial, and regulatory barriers, including infrastructure readiness, investment constraints, and the lack of harmonized international legal frameworks.

These unsolved issues form the core challenges to which this article is dedicated, underscoring the need for comprehensive AI-driven risk-hedging models, expanded fintech applications, and deeper institutional reforms to ensure resilience, transparency, and compliance in banking and customs control.

FORMULATING THE PURPOSE OF THE ARTICLE

The primary purpose of this research article is to critically examine the mechanisms of integrating artificial intelligence into risk-hedging systems in banking and fintech, with a particular emphasis on applications for customs control. This study aims to explore the interplay between AI-driven predictive analytics, compliance frameworks, fraud detection models, and digital customs platforms in the context of strengthening economic resilience and aligning with international trade standards. By addressing both scientific and practical dimensions, the article contributes to the existing body of knowledge on financial innovation, risk management, and customs modernization, while offering policy-relevant insights for enhancing transparency, reducing illicit trade risks, and supporting long-term stability in Ukraine's financial and customs systems.

PRESENTATION OF THE MAIN MATERIAL

Banking and customs systems are undergoing a profound transformation under the dual influence of global digitalization and the requirements of international trade regulation. The rapid expansion of fintech solutions and artificial intelligence has created new opportunities for strengthening resilience, while simultaneously exposing vulnerabilities in compliance, fraud detection, and customs oversight. The urgency of reforms that align Ukraine's financial and customs practices with European Union standards underscores the strategic importance of AI-driven risk-hedging mechanisms. The main material of this study is presented through a synthesis of recent research, comparative analysis, and conceptual modeling, which together highlight both the challenges and opportunities facing the modernization of Ukraine's banking and customs systems.

1. Artificial Intelligence in Banking Risk-Hedging Systems. The modern financial landscape is undergoing a profound transformation as artificial intelligence redefines the parameters of institutional stability. The first part of this study examines the critical role AI plays in strengthening banking resilience by shifting the industry from a reactive posture to a proactive, predictive state [1]. By integrating advanced analytics and automated oversight, these technologies serve as the backbone of contemporary risk-hedging systems, ensuring that banks can withstand the pressures of an increasingly volatile digital economy [8; 10].

Recent research emphasizes that banking institutions now rely on AI-driven models to significantly improve transaction monitoring and enhance transparency across all operational levels [12]. These systems are positioned as essential tools for mitigating risks in an environment where traditional human oversight is no longer sufficient to manage the scale of modern data [15; 17]. The synergy between predictive analytics and real-time processing allows banks to identify and neutralize systemic vulnerabilities before they

escalate into institutional crises, thereby fostering a more robust financial infrastructure [1; 10].

The implementation of AI-driven financial analytics models has revolutionized the way enterprises predict market risk and formulate investment decisions [10]. Unlike conventional statistical methods, AI synthesizes vast arrays of global legal frameworks and market data to forecast volatility, a process often described as a form of «algorithmic alchemy» [9]. This enables banks to hedge against investment risks by identifying subtle patterns in market behavior that precede economic shifts [10]. By refining these predictions, institutions can optimize their capital allocations and maintain stability even during periods of high market turbulence [2].

Beyond market forecasting, the integration of AI extends into the security architecture of modern banking. AI-driven innovations facilitate secure digital transactions and robust ATM forecasting systems, ensuring that physical and digital touchpoints remain resilient against emerging threats [2]. Furthermore, the role of machine learning in fraud detection and financial inclusion provides a dual benefit: it protects the institution from illicit activities while expanding the reach of secure digital payments to underserved populations [3; 12]. This technological integration is supported by evolving compliance frameworks that use AI to navigate the delicate line between innovation, regulation, and ethical responsibility [1; 17].

To effectively understand how these technologies shift from mere operational tools to strategic assets, it is essential to examine the specific domains where AI-driven compliance creates measurable value. The following Table 2 outlines the core focus areas of Regulatory Technology (RegTech), detailing how specific AI applications generate positive impacts for banking resilience and market stability.

Table 2

Strategic Impact of AI on Compliance and Regulatory Frameworks*

Focus Area	AI Application	Impact
Regulatory Alignment	Automated synthesis of global legal frameworks	Reduced legal exposure and streamlined cross-border operations.
Financial Inclusion	AI and Fintech integration for unbanked sectors	Diversification of risk pools and expansion of stable credit markets.
Audit Trails	Blockchain and AI-driven transparency	Enhanced accountability and reduced «information asymmetry».
Fraud Prevention	Real-time transaction monitoring and anomaly detection	Immediate mitigation of illicit financial flows and enhanced asset protection.
Ethical Governance	Algorithmic bias auditing and ethical responsibility frameworks	Improved public trust and reduction of discriminatory financial exclusion.
Trade Compliance	Automated cargo screening and intelligent border security	Optimized logistics and minimized risk in international payment systems.
Systemic Stability	Predictive market risk analytics and ATM forecasting	Strengthened institutional resilience against sudden economic shocks.
Administrative Efficiency	Digital transformation of tax and customs protocols	Increased efficiency in collecting duties and reduced administrative overhead.

* formed by the author based on [2; 3; 5; 6; 9; 10; 12; 13; 16-18]

The resilience of the banking sector is also intrinsically linked to the digital transformation of tax and customs administrations [5]. Strategic frameworks that enhance cargo screening and intelligent border security through automated detection technologies contribute to a more secure global trade environment, which directly impacts trade finance risk [13]. By aligning banking risk systems with the digital practices of common transit and international trade agreements, AI ensures a seamless, transparent flow of capital [16; 19]. This interconnected approach to security and compliance forms a comprehensive landscape that protects the financial sector from external shocks and internal vulnerabilities alike [14; 18].

Thus, the integration of AI into banking transforms risk management from a reactive necessity into a proactive strategic shield by synchronizing predictive analytics with global trade and compliance frameworks. While these systems offer unprecedented resilience, their long-term success depends on balancing high-speed algorithmic efficiency with transparent, ethical oversight to prevent systemic opacity. Central to this integration is the automation of custom control systems, which utilize intelligent screening to secure international corridors and ensure that the cross-border flow of goods remains both commercially efficient and resistant to financial crime.

2. Fintech Innovations and Customs Control. The digital transformation of international trade has necessitated a shift in how customs administrations operate, moving toward a data-driven ecosystem that prioritizes speed without compromising security. The initial wave of fintech in customs primarily focused on enhancing the efficiency of duty collection and electronic payments. Research indicates that digital payment systems have significantly improved the speed of duty collection and the accuracy of charges,

reducing the administrative burden on both traders and the state [4; 6]. These advancements are further complemented by the optimization of logistics and international payment systems, which ensure that financial flows are synchronized with the physical movement of goods [11]. The implementation of the New Computerized Transit System (NCTS) serves as a prime example of how digital practices facilitate common transit and reduce bottlenecks in international trade corridors [19].

While financial payment systems are well-established, broader technological innovations remain underutilized in the field of physical oversight. AI-enabled cargo screening and automated detection technologies represent the next frontier in customs control [13]. These systems utilize machine learning to identify anomalous cargo patterns, effectively mitigating the risks of illicit trade and smuggling [14]. By integrating intelligent border security frameworks, customs administrations can achieve a «security landscape» that protects the financial sector from external shocks related to trade-based money laundering and corruption [18].

The integration of fintech into customs also extends to administrative and legal domains. Emerging AI applications offer pathways for intelligent dispute resolution, allowing for faster and more objective mediation in trade-related conflicts [15]. These tools are essential for supporting sustainable financial development, as they reduce the unpredictability associated with international trade disputes (Fig. 1).

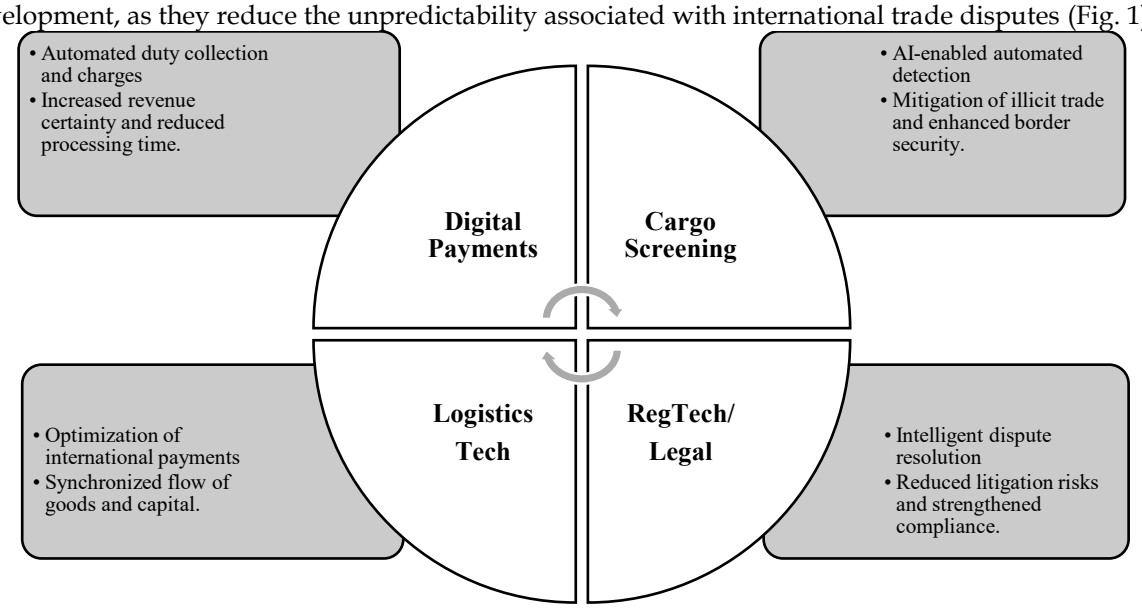

Fig. 1. Strategic Integration of AI and Fintech in Modern Customs Oversight*
* formed by the author based on [1-5, 18-23]

Furthermore, the relationship between digitalization and international trade, driven by the competition between artificial and human intelligence, continues to push customs toward more efficient and ethically responsible regulatory frameworks [17]. The evolution of fintech within customs control suggests that the sector is moving toward a more holistic integration of financial and physical security. While early innovations focused on the «Fin» (financial) aspects - such as duty collection-modern applications are increasingly focused on the «Tech» (technological) aspects, particularly in the realm of automated oversight and intelligent screening [4; 13]. This shift is crucial for strengthening the overall security of the economic system, as it allows for a more granular approach to risk assessment.

However, the transition to AI-driven customs control is not without its challenges. The successful implementation of these systems depends on the performance of the Customs Union and the differentiated policy implementation across various regions [18]. For these innovations to reach their full potential, policy recommendations must be integrated into global trade agreements, ensuring that AI is used responsibly and ethically across international borders [16]. Ultimately, the synergy between fintech and customs oversight creates a more resilient trade environment that supports global economic stability [5; 14].

So, the reviewed literature underscores the crucial integration of AI and fintech innovations into banking and customs risk-hedging systems. This technological synergy shifts the industry from a reactive posture to a proactive strategic shield by synchronizing predictive analytics with global compliance frameworks. By automating custom control through intelligent screening, these systems secure international trade corridors and ensure that cross-border capital flows remain both efficient and resilient against systemic vulnerabilities. Ultimately, the success of these advancements depends on balancing high-

speed algorithmic efficiency with transparent, ethical oversight to prevent systemic opacity in the digital age.

3. Barriers and Alignment with International Standards. The deployment of Artificial Intelligence and Fintech innovations in customs and banking systems is not without significant hurdles. While the theoretical benefits of these technologies are well-established, their practical implementation faces a complex web of technical, financial, and regulatory barriers that vary across jurisdictions and institutional frameworks.

A primary obstacle to the scalability of AI-driven systems is the presence of infrastructure limitations and significant investment constraints [12]. High-fidelity AI models for predictive analytics and automated cargo screening require substantial computational power and high-quality, standardized data sets, which many transitioning economies lack. Furthermore, the high cost of acquiring and maintaining these technologies creates a digital divide, where only the most well-capitalized institutions can afford the «algorithmic alchemy» required for modern risk hedging [9-10].

Beyond technical issues, fragmented legal frameworks continue to restrict the seamless integration of AI into global trade [5]. The lack of unified standards for data privacy, algorithmic accountability, and cross-border digital payments creates a landscape of «differentiated policy implementation» [18]. For nations like Ukraine, the path toward integration involves aligning national systems with European Union digital transit frameworks and Customs Union efficiency standards [7]. Currently, while initiatives like the New Computerized Transit System (NCTS) have been introduced as an implementation of European digital practice, full harmonization remains a work in progress [19].

The theoretical framework of AI-driven risk hedging is best illustrated through real-world applications that demonstrate the transition from manual oversight to automated precision.

Case Study A: HSBC's AML Transformation. HSBC transitioned from traditional rules-based transaction monitoring to an AI-driven solution developed in partnership with Google Cloud. Outcome: The «AML AI» system identified 2 to 4 times more suspicious activity while simultaneously reducing false-positive alerts by 60%. Result: Processing time for suspicious account detection dropped to just 8 days, significantly enhancing the bank's ability to dismantle criminal networks and manage systemic risk [2].

Case Study B: Ukraine's NCTS Phase 5 Implementation. As of April 2024, Ukraine successfully launched NCTS Phase 5, a critical step in aligning with the European Union's Common Transit Convention [19]. Data Point: Tens of thousands of transit declarations were processed under the Phase 5 system in its first year, marking 80% harmonization of Ukrainian customs legislation with EU rules. Impact: The implementation allows for real-time data exchange and unified transit guarantees, directly reducing the «information asymmetry» previously cited as a barrier to EU integration [7].

The data and case studies presented confirm that artificial intelligence is no longer a speculative "future" instrument but has become an active, high-ROI component of contemporary risk-hedging, as evidenced in Table 3.

Table 3

Summary of AI-Driven Performance Metrics (2024-2025)

Metric	Traditional System	AI-Enhanced System	Institutional Impact
Fraud Detection	High False Positives	60% Alert Reduction	Higher investigator efficiency [2]
Compliance Speed	Manual/Rules-based	4x Faster Detection	Reduced legal & systemic risk [10]
Customs Accuracy	60-70% Manual	Automated Validation	Higher duty collection certainty [4]
Ukraine-EU Transit	Phase 4 (Legacy)	Phase 5 (Active)	Full data compatibility with EU [19]

The HSBC case demonstrates that «algorithmic alchemy» [9] can solve the long-standing problem of false positives in banking, allowing institutions to focus resources on genuine threats. Simultaneously, Ukraine's progress with NCTS Phase 5 shows that technical and regulatory barriers [5] can be overcome through strategic digitalization and international partnership, providing a blueprint for other nations seeking EU alignment.

However, a «Predictive Paradox» remains: while a majority of firms see revenue growth from AI, a significant portion of AI projects still struggle to meet ROI expectations due to implementation delays and talent scarcity. This highlights that for banks and customs to remain resilient, they must invest not just in the technology, but in the domain-specific talent required to manage these complex systems [10].

Furthermore, the integration of custom control systems through intelligent screening ensures that international trade corridors remain secure, reinforcing the role of AI as a proactive strategic shield.

In conclusion, the reviewed literature and real-world data underscore the crucial integration of AI and fintech innovations into banking and customs risk-hedging systems. This technological synergy shifts the industry from a reactive posture to a proactive strategic shield by synchronizing predictive analytics with global compliance frameworks. By automating custom control through intelligent screening - as seen in the Ukrainian NCTS transition - these systems secure international trade corridors and ensure that cross-border capital flows remain both efficient and resilient against systemic vulnerabilities. Ultimately, the success of these advancements depends on balancing high-speed algorithmic efficiency with transparent, ethical oversight to prevent systemic opacity in the digital age.

CONCLUSIONS FROM THIS RESEARCH AND PROSPECTS FOR FURTHER RESEARCH IN THIS DIRECTION

This research demonstrates that the integration of artificial intelligence into risk-hedging systems, combined with fintech innovations, can substantially strengthen the resilience, transparency, and efficiency of banking operations and customs control. The synthesis of recent research, comparative reasoning, and conceptual modeling confirms that AI-driven predictive analytics, real-time transaction monitoring, and anomaly detection improve the quality of risk identification and reduce the costs of compliance. At the same time, the findings show that the modernization of customs procedures increasingly depends on data-driven instruments, including digital payment solutions for duty collection, automated validation of declarations, and intelligent cargo screening, which together reduce «information asymmetry» and limit opportunities for illicit trade. The study also confirms that the value of these innovations becomes highest when technological deployment is paired with regulatory harmonization and ethical governance (privacy protection, bias auditing, accountability of models), especially in cross-border contexts. Finally, the Ukrainian case of NCTS implementation illustrates that alignment with EU digital practices can serve as a practical pathway for institutional modernization, but the persistence of infrastructure, investment, and talent constraints requires coordinated long-term strategies rather than fragmented, isolated projects.

Prospects for further research in this direction include:

1. Development of integrated AI-based risk-hedging architectures that connect banking compliance (AML/CFT, fraud detection, credit risk) with customs risk management (targeting, screening, post-clearance audit) through shared data models and interoperable platforms.

2. Quantitative evaluation of effectiveness and ROI of AI solutions in financial and customs settings (false-positive reduction, processing time, duty collection accuracy, investigator productivity), including robust methodologies for causal impact assessment.

3. Regulatory and legal harmonization studies focused on cross-border data exchange, model accountability, privacy protection, and the compatibility of AI-enabled RegTech/SupTech tools with EU standards and international trade agreements.

4. Advancement of AI-enabled customs technologies beyond e-payments: automated cargo screening, intelligent anomaly detection in declarations, and decision-support systems for dispute resolution, with attention to operational risks and cybersecurity.

5. Human capital and organizational readiness research, including skill needs, change-management models, and mechanisms to reduce the «predictive paradox» where AI projects underperform due to talent scarcity, poor data quality, or implementation delays.

6. Ethical and societal implications of AI deployment in finance and customs: bias risks, transparency requirements, auditability of decisions, and public trust, including the design of governance frameworks that ensure responsible use without slowing innovation.

Overall, the conclusions of this research confirm that strengthening risk-hedging capacity in banking and customs control requires a systemic approach in which AI and fintech tools are embedded into coherent regulatory frameworks and supported by institutional reforms. Further interdisciplinary research that combines economics, data science, law, and public administration will be essential for designing scalable solutions, ensuring compliance with international standards, and translating digital innovations into measurable gains in economic resilience, trade security, and integrity of public revenues.

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ШТУЧНИЙ ІНТЕЛЕКТ У СИСТЕМАХ ХЕДЖУВАННЯ РИЗИКІВ: БАНКІВСЬКІ ТА FINTECH-ІННОВАЦІЇ ДЛЯ МИТНОГО КОНТРОЛЮ

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У цій статті досліджується, як штучний інтелект (ШІ) може бути впроваджений у системи хеджування ризиків у банківництві та фінтех-сфері з акцентом на посилення митного контролю в транскордонній торгівлі. Дослідження мотивоване зростаючою вразливістю фінансових та торговельних екосистем до шахрайства, незаконних потоків, ухилення від сплати податків і порушень у дотриманні нормативних вимог в умовах швидкої цифровізації та глобалізації. У статті систематизовано основні напрямки застосування ШІ: прогнозна аналітика для раннього виявлення ризикованих транзакцій та відправлень; машинне навчання та гібридні моделі на основі правил для виявлення аномалій та шахрайства; інструменти RegTech/SupTech, що підтримують прийняття наглядових рішень; та цифрові митні платформи, що прискорюють обробку декларацій, стягнення мит та пост-митний аудит. Запропоновано структурну основу для вибору стратегічних пріоритетів в управлінні ризиками, включаючи вимоги до якості даних, сумісності, кібербезпеки, прозорості та підзвітності алгоритмів. У дослідженні також окреслено методологічні параметри для

впровадження рішень ШІ відповідно до міжнародних стандартів, з акцентом на етичне управління (захист конфіденційності, контроль упередженості, пояснюваність) та гармонізацію нормативних актів у різних юрисдикціях. Результати демонструють, що поєднання заходів ефективності на основі ШІ з узгодженими інституційними реформами може підвищити продуктивність та прибутковість фінансових операцій, одночасно покращуючи показники стійкості, такі як дотримання вимог, аудитна достовірність і стабільність державних доходів. У статті стверджується, що Україна та подібні економіки можуть використовувати практики штучного інтелекту та фінтехнологій для модернізації хеджування банківських ризиків та митного нагляду, зменшення ризиків незаконної торгівлі та підвищення довгострокової адаптивності інтегрованих фінансових митних систем. Нарешті, запропонований підхід підкреслює важливість безперервної валідації моделей і протоколів обміну даними для підтримки надійного та масштабованого впровадження штучного інтелекту в митному та фінансовому нагляді.

Ключові слова: штучний інтелект, хеджування ризиків, банківські інновації, фінтех, митний контроль, економічна стійкість, комплаєнс.