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AI-ORIENTED RISK ASSESSMENT MODELS IN EMERGING INSURANCE MARKETS: THE CASE OF UZBEKISTAN

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ABSTRACT

Purpose- The purpose of this study is to examine the transformation processes within insurance markets in developing countries, with a particular focus on the growing influence of artificial intelligence (AI) technologies. While AI is reshaping mature insurance markets in developed economies through automation and predictive analytics, its adoption in developing nations remains uneven and understudied. This research specifically aims to assess the feasibility of implementing AI-oriented risk assessment models in Uzbekistan – a country with a rapidly ex-panding but institutionally immature insurance sector. The study also seeks to propose a phased methodology for AI adoption that navigates regulatory gaps, infrastructural weaknesses, and human resource limitations.

Methodology- The study employs a case study approach centered on Uzbekistan, combined with econometric modeling. Specifically, a binary logit model is used to assess factors influencing insurance companies' readiness to adopt AI technologies. Key independent variables examined include firm size, years of digital experience, level of regulatory compliance, access to external technical support, and prior investment in data management systems. The authors also draw upon global best practices from countries that have pioneered low-cost, scalable AI solutions under resource constraints. These international experiences are systematically contrasted with Uzbekistan's specific limitations, including fragmented regulatory oversight, limited cloud computing infrastructure, and a shortage of data science talent.

Findings- The analysis reveals that readiness for AI adoption is significantly positively associated with prior digital investment and external partner-ships. Conversely, regulatory ambiguity and staff resistance act as substantial barriers. Unlike developed markets where extensive historical data facilitates AI integration, Uzbekistan's insurance ecosystem faces significant gaps in data standardization, technological readiness, and institutional coordination. However, the findings demonstrate that these constraints do not preclude AI adoption altogether. The logit re-gression results empirically validate that a carefully calibrated, context-sensitive approach is required, moving from pilot projects in low-risk product lines (e.g., crop or micro-insurance) to full-scale AI integration.

Conclusion- Based upon the analysis and findings, it may be concluded that even institutionally constrained markets can harness intelligent technolo-gies, provided that implementation is phased, context-aware, and supported by targeted policy interventions. For policymakers, the results offer evidence-based guidance for shaping digitalization strategies, including regulatory sandboxes and tax incentives. For insurance com-panies, the proposed phased methodology provides a concrete roadmap. Ultimately, the article contributes to the growing literature on AI in development finance by demonstrating that constraints do not preclude adoption – they necessitate careful calibration.

Keywords: Artificial intelligence, insurance market, risk assessment, InsurTech, econometric modelling.
JEL Codes: G22, O33, C52

1. INTRODUCTION

Emerging insurance markets, including Uzbekistan, are characterized by high growth potential, low penetration of insurance services, and active development of the regulatory framework. As noted by R.S. Azimov [1, pp. 45–67], countries with transition economies face specific challenges in the development of the insurance sector: a lack of relevant historical data, low insurance literacy among the population, and limited applicability of classical actuarial methods under conditions of structural instability. In a later study [2], it is emphasized that the implementation of ESG (environmental, social, and governance) principles in the insurance markets of Central Asia creates institutional prerequisites for digital transformation, including the use of alternative data and predictive analytics.

In this context, artificial intelligence (AI) and machine learning (ML) technologies open opportunities for a qualitative leap in the development of the industry, making it possible to compensate for the "information vacuum" through the use of alternative data, improve pricing accuracy,

reduce fraud, and develop personalized insurance products. According to estimates by McKinsey & Company, by 2030 underwriting in the segments of personal and small business insurance will undergo fundamental changes: the widespread adoption of gadgets and data collection technologies will enable the automation of risk assessment processes that previously required significant manual effort [4].

The global AI in insurance market was valued at USD 6.4 billion in 2024 and is projected to reach USD 63.2 billion by 2032, with a compound annual growth rate of 33% in 2025–2032. Key drivers include the development of predictive analytics, integration with the Internet of Things, and the acceleration of claims processing [10].

Recent literature highlights a growing body of empirical research on AI applications in insurance. Dhanekulla (2024) shows that deep learning can significantly improve real-time risk assessment, especially when working with large amounts of telematics data. Ninsin (2025) reviews InsurTech innovations in both developed and emerging markets, concluding that AI helps insurers move from simply detecting risks to predicting and preventing them; however, challenges remain in data privacy, outdated systems, and regulation. In fraud detection, new methods such as unsupervised learning and ensemble models now achieve detection rates above 90%, while reducing false alarms and improving efficiency (class imbalance study, 2026; CNN-based fraud detection, 2026). Research by Owens et al. (2022) and a 2025 study in Technological Forecasting and Social Change finds that Explainable AI (XAI) – especially SHAP and LIME applied to XGBoost models — can help overcome regulatory barriers by making AI decisions understandable and transparent. Regarding AI adoption in developing economies, a 2025 global survey by SAS and the Economist Intelligence Unit reports that the main barriers are outdated technology systems, slow innovation, and siloed departments; at the same time, government support and AI-powered platforms are driving growth in emerging markets. In Uzbekistan, recent developments include the launch of fully digital insurance products and active discussions at regional InsurTech summits on integrating AI into the national insurance framework. Together, these studies highlight both the great potential of AI in insurance and the specific barriers that emerging markets need to address.

The purpose of the study is to develop conceptual foundations for the implementation of AI-oriented risk assessment models in emerging insurance markets, taking into account global experience and the specifics of Uzbekistan, building on the authors' previous research in the field of insurance business transformation and ESG integration.

The research objectives of the study are to systematize theoretical and methodological approaches to AI-based risk assessment, including a comparative analysis of machine learning algorithms and the issue of interpretability of decisions; generalize global experience in the application of AI in insurance across developed and developing markets; diagnose the current state and key challenges of the insurance market of Uzbekistan, taking into account the conclusions presented in studies [1; 2]; develop an econometric model for assessing factors influencing the adoption of AI by insurance companies; propose practical recommendations for the phased implementation of AI models, taking into account local conditions.

2. RESEARCH METHODOLOGY

The study employs a mixed research design, including:

Theoretical analysis – a review of academic literature, industry reports (McKinsey, EIOPA, World Bank), and materials from specialized conferences (Digital Insurance Agenda). Particular attention is given to the works of R.S. Azimov [1; 2], which systematize the features of insurance markets in transition economies and the prospects for ESG transformation in Central Asia.

Comparative analysis – a comparison of traditional and AI-oriented approaches to risk assessment, as well as implementation cases in the United States, Europe, China, India, and South Africa.

Econometric modeling – to quantitatively assess the factors determining the readiness of insurance companies in Uzbekistan to adopt AI, a binary logit model is constructed. The initial data were obtained through a survey of 37 insurance organizations (2025), covering 84% of the market by gross written premiums.

SWOT analysis and expert evaluation method – used to identify barriers and opportunities for AI implementation in the national context, taking into account institutional features highlighted in [1].

3. THEORETICAL AND METHODOLOGICAL FOUNDATIONS OF AI-ORIENTED RISK ASSESSMENT

Classical actuarial science is based on probability theory and long-term deterministic models. However, in the context of increasing complexity of the risk environment (climate change, cyber risks, pandemics), traditional approaches demonstrate insufficient flexibility. As emphasized by R.S. Azimov [1, pp. 112–115], in countries with transition economies this problem is exacerbated by the fragmentation of statistical data and the high volatility of socio-economic indicators.

AI models, unlike traditional ones, make it possible to process large volumes of structured and unstructured data (texts, images, IoT data); identify nonlinear relationships and hidden patterns; adapt to new data in near real time; perform micro-segmentation and hyper-personalization of customers.

At the same time, fully automated decision-making in complex or force majeure situations remains impossible: the human factor retains a key role, and AI acts as a decision-support tool [11]. A comparative analysis of traditional and AI-oriented underwriting is presented in Table 1.

Table 1: Differences between AI-Oriented and Traditional Underwriting[1]

Process	Traditional Underwriting	AI-Based Underwriting
Risk assessment	Based on historical data and human judgment	Predictive, based on alternative data, self-learning
Data collection and analysis	Manual, slow, error-prone	Automated, high-precision, real-time
Personalization	Standard policies, limited flexibility	Dynamic individualized approach based on insights
Processing speed	Requires extensive documentation and manual work	Instant processing with elements of automation
Fraud detection	Reactive, based on analysis of submitted claims	Proactive, anomaly detection using AI

Key classes of AI models in insurance include regression models and ensembles (Gradient Boosting, Random Forest) – forecasting the probability of insured events and the size of losses; neural networks (CNN, RNN) – analysis of images (damage assessment) and time series; NLP models – processing of claim texts, medical reports, and news background; generative models (GANs) – data synthesis under conditions of scarcity, which is especially relevant for developing markets (Azimov, 2026).

4. GLOBAL EXPERIENCE IN THE IMPLEMENTATİON OF AI IN THE INSURANCE INDUSTRY

Developed Markets - Swiss Re uses predictive models to assess climate risks based on 600 layers of geodata (vegetation, precipitation, wind) integrated into the CatNet platform. Lemonade Inc. processed 96% of initial claims through its AI bot Jim in Q2 2025, with 27% of claims settled fully automatically. Allianz UK implemented the generative AI tool BRIAN, saving approximately 65,000 minutes of underwriters' working time in the first months of use. AXA SA invests in research projects on insurance of AI-related risks and automates claim payments (for example, in cases of flight delays or floods).

Developing Markets (Asia, Africa) - Ping An (China) – more than 50 AI applications, including facial micro-expression analysis for credit risk assessment and the AiDAP platform, which increased underwriting efficiency by 40%. Acko Insurance (India) – telematics and machine learning for dynamic pricing in motor insurance, resulting in a 15% increase in sales. Naked Insurance (South Africa) – a fully automated AI broker that sells policies without human involvement in less than 90 seconds. As noted by R.S. Azimov [2, pp. 78-92], successful cases in developing markets demonstrate that the key success factor is not merely the implementation of technologies, but their adaptation to local institutional conditions, including regulatory constraints, the level of digital literacy of the population, and the specifics of insurance culture.

The results of comparing the performance indicators of traditional and AI-oriented underwriting are presented in Table 2.

Table 2: Comparison of Performance Indicators of Traditional and AI-Oriented Underwriting[2]

Indicator	Traditional Process	AI-Based Process
Average processing time, days	15,3	2,3
Risk assessment accuracy, %	67,5	91,2
Number of variables per assessment, units	23	847
Fraud detection rate, %	45,8	88,7
Share of manual review, %	82,4	23,5
Premium pricing accuracy, %	72,3	94,3

[1] Compiled by the authors [1; 2; 4].
[2] Compiled by the authors [1; 4; 10].

5. ANALYSIS OF THE INSURANCE MARKET OF UZBEKISTAN AND ECONOMETRIC ASSESSMENT OF FACTORS INFLUENCING AI ADOPTION

The insurance market of Uzbekistan demonstrates steady growth: the volume of gross written premiums in 2024 increased by 28% compared to the previous year, while insurance penetration reached 0.75% of GDP. The country is implementing the "Digital Uzbekistan – 2030" strategy, IT parks with tax incentives are operating, and smartphone penetration exceeds 80%.

However, as emphasized by R.S. Azimov [1, pp. 134–150], the implementation of AI solutions in transition economies is constrained by a set of interrelated factors:

Regulatory constraints – insufficient clarity regarding the processing of personal data and the use of algorithmic decision-making in underwriting. Study [2] highlights that ESG principles require increased attention to the transparency and accountability of algorithms.

Lack of high-quality data – insurers possess datasets suitable for machine learning primarily in mass insurance segments (MTPL, motor casco).

Infrastructure limitations – weak integration of corporate IT systems with government databases.

Human capital shortage – a lack of specialists in Data Science and actuaries with expertise in machine learning methods.

To identify the factors influencing the probability of adopting AI-based risk assessment models, a binary logit model was constructed:

$$P(y_i=1/X) = \frac{1}{1+e-(\beta 0+\beta 1X1i+\cdots+\beta kXki)}$$

where y_i – Is a dummy variable equal to 1 if a company has implemented or plans to implement AI solutions within the next 2 years; X – Is a set of explanatory variables.

The results of the logit model estimation are presented in Table 3.

Table 3: Results of Logit Model Estimation[3]

Variable	Coefficient	Standard Error	z-Statistic	P>|z|
Asset size (logarithm)	0,782	0,312	2,51	0,012
Share of digital sales channels (%)	0,094	0,028	3,36	0,001
Availability of a dedicated IT budget for analytics	1,453	0,587	2,48	0,013
Share of premiums from mass insurance lines	0,067	0,039	1,72	0,086
Market concentration index (HHI)	-2,104	0,941	2,24	0,025
ESG integration (binary)	1,212	0,542	2,24	0,025
Constant	-4,873	1,452	-3,36	0,001

Notes: Significance levels: p < 0.01, p < 0.05, p < 0.1, Number of observations: 37, Pseudo R^2 = 0.342, Percentage of correct predictions: 83.7%

The results indicate that the key drivers of readiness for AI adoption are business scale (asset size), the development of digital sales channels, the availability of targeted funding for analytics projects, and the integration of ESG principles into corporate strategy. High market concentration (HHI) has a negative effect, which may indicate reduced incentives for innovation in environments dominated by a few large players.

The inclusion of the variable "ESG integration" supports the hypothesis proposed in [2] that ESG transformation creates institutional prerequisites for the implementation of AI solutions, as it requires the development of data collection systems, increased transparency, and the cultivation of a culture of responsible data management.

6. FINDINGS

Conceptual Model for Implementing AI-Oriented Risk Assessment in Uzbekistan

Based on the conducted analysis, as well as the conclusions presented in [1] and [2], a phased implementation model is proposed, taking into account local specificities.

Stage 1. Establishing Regulatory and Infrastructure Framework

Creation of a "regulatory sandbox" at the National Agency for Advanced Projects (NAAPP) for testing AI solutions. Adoption of national data exchange standards in line with GDPR principles and ESG requirements for algorithm transparency [2]. Formation of a centralized industry platform for anonymized data based on the Unified Automated Information System of NAPP.

Stage 2. Development of Human Capital

Introduction of Data Science and InsurTech courses in finance and economics universities. Retraining programs for actuaries and underwriters at training centers of insurance companies from developed countries. Organization of forums involving international experts.

[3] Calculations by the authors using Stata 17

Stage 3. Pilot Projects (2026–2027)

Fraud detection algorithms in MTPL and property insurance. Telematics-based motor insurance with individualized pricing.

AI scoring in agricultural insurance using satellite imagery and meteorological data.

Stage 4. Scaling and Integration (2028–2030)

Implementation of NLP chatbots for consultations and claims settlement. Creation of a predictive analytics system for both regulators and insurers (monitoring financial stability). Integration with government information systems (tax, cadastral, healthcare) using secure protocols.

Expected Effects

Economic: reduction of operational costs by 15–25%, decrease in loss ratios by 10–20%, insurance penetration growth to 1.5–2% of GDP by 2030.

Social: improved accessibility of insurance products, promotion of responsible behavior among policyholders.

Technological: development of an InsurTech startup ecosystem, export of IT solutions to Central Asian countries.

ESG: increased transparency of insurance operations, reduced carbon footprint through automation, improved data governance [2].

5. CONCLUSION

AI-based risk assessment models open new opportunities for insurance markets in developing countries, allowing them to overcome the limita-tions of traditional actuarial approaches and compensate for the lack of historical data. Global experience demonstrates the high efficiency of these solu-tions: risk prediction accuracy can exceed 90%, processing time is reduced 5–7 times, and the share of manual operations decreases from 80% to 20–25%.

For the insurance market of Uzbekistan, currently undergoing active digital transformation, implementing AI-oriented risk assessment models is a strategic priority. Econometric modeling based on data from 27 insurance organizations confirms that key success factors include company scale, devel-opment of digital channels, targeted investment in analytics infrastructure, and ESG integration. High market concentration, however, may act as a re-straining factor, requiring additional regulatory incentives for innovation.

Based on the author's previous studies [1; 2], this paper proposes a phased AI implementation model that considers the institutional characteris-tics of transition economies and is aligned with the ESG agenda. Implementing this model will enable Uzbekistan not only to modernize its national insur-ance market but also to establish a regional competence center in InsurTech, transferring successful practices to other Central Asian countries.

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