

RISKS AND EFFICIENCY OF INVESTMENT PROCESSES: THEORY, METHODOLOGY AND PRACTICAL ASPECTS

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Abstract

This article examines the theoretical and applied aspects of risk assessment and efficiency of investment processes in modern market conditions. Based on systematic analysis of international approaches and methodological developments, a comprehensive model for investment risk management is substantiated. Special attention is paid to the classification of investment risks, methods of their quantitative and qualitative assessment, and tools for improving the efficiency of investment activities. The investment climate in the Republic of Uzbekistan is analyzed, and the main trends and development prospects are identified.

Keywords

investment process, investment risk, investment efficiency, risk management, ROI, NPV, IRR, investment climate, Uzbekistan.

Investment processes constitute the foundation of sustainable economic development for any state. In the context of economic globalization and intensifying competition for capital attraction, the challenge of effectively managing investments and their associated risks acquires particular scientific and practical significance. The Republic of Uzbekistan, which is implementing large-scale economic reforms under the Development Strategy 'Uzbekistan – 2030', has faced an objective necessity to form a modern system of investment risk management. According to data from the Ministry of Investment, Industry and Trade of the Republic of Uzbekistan, the volume of foreign direct investment (FDI) in 2023 amounted to 9.8 billion US dollars, testifying to the growing investment attractiveness of the country (MIOT, 2024).

At the same time, the growing uncertainty of the global economic environment, geopolitical shifts, technological transformations, and climate challenges significantly complicate investment planning and implementation. According to World Bank estimates (2023), more than 60% of investment projects in

developing economies are completed with budget overruns or schedule delays, directly indicating insufficient attention to risk management. The relevance of this study is determined by the need to develop a comprehensive, scientifically grounded methodology for assessing the risks and efficiency of investment processes, adapted to the conditions of Uzbekistan's transitional economy.

The aim of this article is to systematize theoretical approaches to the classification of investment risks, analyze modern methods for evaluating investment efficiency, and propose practical recommendations for optimizing investment processes.

There is no single universally accepted definition of the concept of 'investment risk' in the scientific literature. Analysis of domestic and foreign sources reveals several conceptual approaches to its interpretation. The classical theory of risk, developed in the works of F. Knight (Knight, 1921), distinguishes between 'risk' and 'uncertainty': risk is measurable and can be quantitatively assessed, whereas uncertainty cannot be expressed in probabilistic terms. This approach retains its methodological value in the analysis of investment processes.

Portfolio theory by H. Markowitz (Markowitz, 1952) defines investment risk through the variance or standard deviation of returns, formalizing the relationship between risk and expected return. Under this approach, risk is treated as a measurable characteristic of an investment portfolio subject to optimization. Contemporary institutional approaches (Arrow, 1963; Williamson, 1985) emphasize transaction costs and information asymmetry as key sources of investment risk, which is particularly relevant for developing markets. In the context of this study, investment risk is understood as the probability that the actual results of investment activities will deviate from expected values under the influence of a combination of internal and external uncertainty factors.

The systematization of investment risks is a necessary precondition for their effective management. Based on an analysis of contemporary scientific sources and risk management standards (ISO 31000:2018; PMBOK, 2021), an expanded classification is proposed in Table 1.

Table 1.

Classification of investment risks

Risk Type	Characteristics	Management Methods
Systematic (Market)	Risks caused by macroeconomic factors	Diversification, hedging
Unsystematic (Specific)	Risks related to a specific project or company	Insurance, reserves
Political	Changes in government policy, regulatory environment	Political insurance, negotiations

Currency	Fluctuations in exchange rates	Forwards, options, swap contracts
Interest Rate	Changes in interest rates	Interest rate swaps, hedging
Operational	Disruptions in operational processes	Internal control, audit
Environmental	Climate and ecological factors	ESG standards, insurance
Inflationary	Rise in the general price level	Indexation, real assets

Source: compiled by the author based on ISO 31000:2018, PMBOK (2021)

Static methods of evaluating investment efficiency do not account for the time value of money and are applied primarily for preliminary analysis of investment projects. The key indicator is the Return on Investment (ROI):

$$\text{ROI} = (\text{Net Profit} / \text{Investment Volume}) \times 100\% \quad (1)$$

The Simple Payback Period (PBP) determines the time required for the full recovery of initial investments through the generated cash flows. Despite the simplicity of calculation, this indicator does not reflect project profitability after the payback point is reached.

Dynamic methods are based on the concept of discounted cash flows and are recognized as the most scientifically rigorous for evaluating long-term investments. Net Present Value (NPV) is the central indicator of this group:

$$\text{NPV} = \sum [\text{Cft} / (1 + r)^t] - \text{IC} \quad (2)$$

where Cft is the cash flow in period t; r is the discount rate; IC is the initial investment. A project is considered economically viable when $\text{NPV} > 0$.

The Internal Rate of Return (IRR) is the discount rate at which the NPV of an investment project equals zero. The decision criterion: a project is accepted if IRR exceeds the minimum acceptable rate of return (hurdle rate).

The Modified Internal Rate of Return (MIRR) eliminates several theoretical shortcomings of the traditional IRR by assuming that cash flows are reinvested at the company's cost of capital rather than at the IRR rate, providing a more realistic assessment of project profitability (Brigham & Houston, 2019).

The Profitability Index (PI) reflects the relative efficiency of investments and is calculated as the ratio of discounted cash inflows to initial investments. This indicator is especially useful for ranking projects under capital budget constraints.

Table 2.

Comparative analysis of investment efficiency evaluation methods

Method	Acceptance Criterion	Advantages	Disadvantages
NPV	$\text{NPV} > 0$	Accounts for time value of money; absolute indicator	Requires accurate cash flow forecasts
IRR	$\text{IRR} > r$	Independent of the	Multiple solutions

	hurdle rate)	discount rate	with alternating-sign cash flows
MIRR	MIRR > r	Eliminates shortcomings of IRR	More complex calculation
PI	PI > 1	Useful for ranking projects	Does not show absolute effect
PBP	PBP < formative	Simplicity; liquidity assessment	Ignores cash flows after payback
ROI	ROI > 0%	Simplicity; comparability	Does not account for time value

Source: compiled by the author based on Brigham & Houston (2019), Damodaran (2022)

Quantitative assessment of investment risks involves the use of mathematical and statistical methods to formalize uncertainty. Sensitivity analysis enables evaluation of how changes in key project variables (selling price, sales volume, operating costs) affect the resulting performance indicators. The scenario analysis method involves developing several alternative scenarios – optimistic, base, and pessimistic – with a probability assigned to each. The expected NPV value is calculated as the weighted average across all scenarios.

The Monte Carlo method provides the most comprehensive risk analysis through repeated simulation (typically 10,000–100,000 iterations) with random variation of input parameters within specified ranges, taking into account their probability distributions. The result is an NPV distribution function that allows estimation of the probability of achieving target performance indicators. Value at Risk (VaR) is a widely used tool in the financial sector that assesses the maximum potential loss at a given confidence level (typically 95% or 99%) over a specified time horizon. The Conditional VaR (CVaR) method supplements VaR by estimating expected losses in the tail of the distribution, i.e., in the most adverse scenarios.

Diversification is a fundamental method for reducing unsystematic risks, involving the distribution of investments among various assets, industries, and geographic markets. According to modern portfolio theory, a properly diversified portfolio can significantly reduce risk without a proportional reduction in expected return. Hedging using derivative financial instruments – futures, options, swaps – allows for the neutralization of currency, interest rate, and commodity risks. Hedging strategies must be carefully calibrated by weighing the cost of hedging against the potential benefits of risk reduction.

Insurance of investment risks is gaining increasing importance in international practice. The Multilateral Investment Guarantee Agency (MIGA) of the World Bank provides guarantees against political risks for foreign direct investment in developing countries, including Uzbekistan. Contractual risk management

mechanisms include the formation of reserves, staged financing (venture approach), milestone-based payment structures, and the inclusion of special provisions in investment agreements (force majeure, MAC clauses).

Investment climate reforms initiated in Uzbekistan from 2017, under the Action Strategy for Five Priority Areas of Development (2017–2021) and subsequently the 'Uzbekistan – 2030' Strategy, have fundamentally transformed the conditions for investment activity in the country. Key reforms include: liberalization of the currency market (2017); simplification of registration procedures for enterprises with foreign investment; introduction of a tax incentive system for priority economic sectors; establishment of free economic zones (FEZs) and small industrial zones (SIZs); and digitalization of administrative processes (e-Gov, e-Licenses).

According to the World Bank's Doing Business report and A.T. Kearney's FDI Confidence Index, Uzbekistan significantly improved its rankings in 2022–2023, as confirmed by growing FDI volumes. The FDI structure is dominated by investments from China, Russia, South Korea, Germany, and Gulf states, primarily directed towards energy, mining, transport and logistics, and tourism and hospitality.

Table 3.

Key investment activity indicators in Uzbekistan (2020–2024)

Indicator	2020	2021	2022	2023	2024
FDI, billion USD	3.0	1.6	4.1	7.5	9.8
Capital investment volume, % of GDP	35.2	32.8	36.1	37.4	38.6
Number of new foreign enterprises, thousands	3.8	2.1	4.5	5.9	7.2
Investment Climate Index (1–10)	5.2	5.4	5.7	6.1	6.5

Source: Ministry of Investment, Industry and Trade of the Republic of Uzbekistan; State Committee on Statistics of the Republic of Uzbekistan (2025)

Uzbekistan's investment environment has a number of specific characteristics shaped by the features of a transitional economy. The key risks relevant to this market include:

Regulatory risk is associated with a dynamically evolving legal framework. Despite the general trend towards liberalization, frequent legislative changes create a degree of uncertainty for long-term investors. It should be noted that the Investment Code of the Republic of Uzbekistan, adopted in 2022, significantly systematized the legal regulation of investment activities.

Infrastructure risk is determined by the uneven development of transport, logistics, and energy infrastructure across the country's regions. The

implementation of large-scale infrastructure projects under the Belt and Road Initiative partially mitigates this risk, though the issue remains relevant for a number of regions.

Human capital risk stems from a shortage of qualified specialists in certain sectors, particularly in the high-technology sector and the services industry. State professional training programs and international academic cooperation are aimed at alleviating this risk over the long term.

Based on the theoretical analysis conducted and a study of investment risk management practices, the authors have developed a comprehensive model comprising five interrelated components: risk identification; quantitative and qualitative assessment; development of response strategies; monitoring and control; and organizational support for risk management.

The key principle of the proposed model is the integration of risk management into the overall investment process – from the project initiation stage through to the completion of implementation and post-investment results evaluation. This ensures a proactive rather than reactive approach to risk management.

The second fundamental element of the model is an orientation towards value creation, rather than mere risk minimization. Risk management should be viewed as a strategic resource that enables exploitation of favorable opportunities alongside protection against threats.

The practical implementation tool of the proposed model is a risk-efficiency matrix, which allows visualization of the relationship between expected return and the risk level for each investment project or asset. The matrix is constructed in a two-dimensional space: the X-axis represents the probability/risk level (from low to high); the Y-axis represents the expected investment efficiency.

This tool allows each investment object to be assigned to one of four zones: 'Priority Investments' (high efficiency / low risk); 'Managed Investments' (high efficiency / high risk); 'Depressed Assets' (low efficiency / low risk); and 'Undesirable Investments' (low efficiency / high risk).

The practical application of the risk-efficiency matrix, combined with scenario analysis and the Monte Carlo method, supports informed investment decision-making based on scientifically verifiable data – which is especially important in conditions of high uncertainty in developing markets.

Based on this research, a number of practical recommendations are proposed for improving the investment risk management system at various levels of the economy.

At the macro level (state regulation): further improvement of the regulatory framework for investment activities is needed to ensure stability and predictability

of the regulatory environment; development of instruments for state guarantees and investment insurance, including under international agreements; and creation of specialized development institutions focused on financing high-risk innovative projects.

At the meso level (industry, region): formation of industry clusters and technology platforms that facilitate risk diversification; development of regional investment maps with mandatory risk assessment for each zone; introduction of ESG standards as a tool for reducing the environmental and social risks of investment projects.

At the micro level (enterprise, project): mandatory integration of risk management into project management at all stages of the investment cycle; application of a set of quantitative evaluation methods (NPV, IRR, MIRR, sensitivity analysis, Monte Carlo method) to substantiate investment decisions; establishment of an investment committee with risk management specialists; regular review of investment strategies in line with changes in the external environment.

The study conducted allows the following key conclusions to be drawn. Investment risk is a multidimensional phenomenon requiring a systematic approach to classification, assessment, and management. The classification of investment risks proposed by the authors, encompassing eight major categories, provides a methodological basis for the practical work of risk managers.

Effective evaluation of investment projects requires the application of a set of methods, including both traditional indicators (NPV, IRR, ROI) and probabilistic analysis methods (scenario analysis, Monte Carlo method, VaR/CVaR). No single method provides an exhaustive assessment; only their systematic combination creates an adequate picture of risks and efficiency.

Uzbekistan's investment climate demonstrates sustained positive momentum, driven by consistent regulatory reforms. At the same time, specific risks of a transitional economy – regulatory, infrastructure, and human capital – persist and require dedicated management mechanisms.

The proposed comprehensive investment risk management model, based on the principles of proactive risk management and value creation orientation, can serve as a methodological foundation for improving investment activities both at the level of public administration and at the level of individual economic entities.

Further research in this area may focus on developing specialized methods for assessing climate and ESG risks of investment projects, as well as advancing risk management instruments through the application of artificial intelligence and machine learning technologies.

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