

UNDERSTANDING INVESTMENT RISK UNDER UNCERTAINTY: A THEORETICAL EXPLORATION IN THE CONTEXT OF ROMANIA AND THE REPUBLIC OF MOLDOVA

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Abstract: *This article explores the concept of uncertainty as a defining dimension of investment risk in Romania and the Republic of Moldova. The study was motivated by the increasing limitations of traditional financial theories that primarily interpret investment risk through measurable statistical indicators, despite the growing complexity of contemporary economic and geopolitical environments. Emerging and transition economies are increasingly exposed to structural instability, institutional fragility, geopolitical tensions, technological transformation, and behavioral volatility, which generate forms of uncertainty that cannot be fully captured through conventional probabilistic models. The paper adopts an interdisciplinary theoretical approach integrating perspectives from financial economics, institutional theory, behavioral finance, complexity economics, and cybernetics. The analysis focuses on conceptualizing uncertainty and examining its principal dimensions within Romania and the Republic of Moldova, including macroeconomic, institutional, geopolitical, behavioral, and technological uncertainty. Attention is given to the structural characteristics of Eastern European transition economies and the ways in which uncertainty influences investor behavior, financial stability, and economic resilience. The findings suggest that uncertainty should be understood not as a temporary disturbance, but as a permanent structural feature of contemporary financial systems. In both Romania and the Republic of Moldova, investment environments are shaped by interconnected economic, political, institutional, and geopolitical factors that alter expectations and market dynamics. The study highlights that adaptive and cybernetic approaches provide more suitable theoretical frameworks for understanding modern financial systems than static equilibrium-based models. Ultimately, the article argues that resilience, adaptability, and institutional flexibility are becoming increasingly important for investment decision-making under conditions of persistent uncertainty.*

Key words: *uncertainty; investment risk; emerging markets; geopolitical instability; adaptive systems; Romania and Republic of Moldova.*

JEL: D81, D84, G11, G32, O16, P52

Introduction

Uncertainty has become one of the defining characteristics of contemporary economic and financial systems. While classical financial theory traditionally focuses on measurable risk, modern economic realities increasingly demonstrate that investors operate in environments where future events cannot be fully predicted, quantified, or modeled through stable probabilistic distributions. This distinction is particularly relevant in emerging and transition economies, where institutional instability,

geopolitical tensions, structural vulnerabilities, and asymmetric information significantly shape investment behavior and market dynamics.

Romania and the Republic of Moldova represent two interconnected yet structurally different economic spaces in Eastern Europe, both characterized by varying degrees of uncertainty. Romania, as a member of the European Union and an emerging financial market, has undergone significant institutional and economic transformation during the past decades. Nevertheless, the Romanian economy remains exposed to inflationary fluctuations, fiscal instability, external dependency, labor migration, political polarization, and global financial volatility. In contrast, the Republic of Moldova faces deeper structural uncertainty generated by institutional fragility, geopolitical pressure, energy dependency, limited financial market development, and high economic sensitivity to external shocks. In this context, uncertainty should not be understood merely as a temporary disturbance affecting investment decisions. Rather, uncertainty constitutes a structural characteristic of economic and financial systems in transition economies. Unlike measurable risk, uncertainty reflects situations in which future outcomes, probabilities, or causal relationships remain fundamentally incomplete, ambiguous, or unstable. Knight [1] distinguished between risk, where probabilities are known, and uncertainty, where future events cannot be objectively quantified. This distinction remains highly relevant for understanding investment environments in Romania and the Republic of Moldova.

The increasing complexity of global financial systems further amplifies uncertainty. Economic crises, pandemics, geopolitical conflicts, technological disruption, climate-related challenges, and energy market instability continuously reshape investor expectations and financial behavior. Under such conditions, deterministic models based solely on historical data become insufficient for explaining financial dynamics. Instead, uncertainty emerges as a multidimensional phenomenon involving economic, political, institutional, behavioral, technological, and geopolitical dimensions.

Theoretical approaches to uncertainty have evolved considerably within economics and finance. Keynes [2] emphasized the instability of expectations and the impossibility of fully predicting future economic conditions. More recent perspectives derived from behavioral economics, institutional economics, complexity theory, and cybernetics suggest that financial systems should be interpreted as adaptive and evolving structures characterized by feedback mechanisms, non-linearity, and imperfect information.

For Romania and the Republic of Moldova, uncertainty has both internal and external determinants. Internally, uncertainty is influenced by institutional quality, governance effectiveness, macroeconomic consistency, financial market maturity, and social trust. Externally, uncertainty is amplified by regional geopolitical instability, global economic integration, energy dependency, and international capital market fluctuations. Consequently, investment risk in these economies cannot be analyzed exclusively through conventional statistical indicators such as volatility or variance. Instead, uncertainty itself becomes a central analytical category.

This article aims to develop a theoretical understanding of uncertainty in the context of investment risk within Romania and the Republic of Moldova. The study focuses primarily on conceptualizing uncertainty, identifying its main dimensions, and examining its implications for investment behavior and financial decision-making in emerging and transition economies. The paper adopts an interdisciplinary perspective integrating financial theory, institutional analysis, behavioral economics, and adaptive systems thinking. The article is structured into three sections. Following the introduction, the second section examines the theoretical foundations of uncertainty, its manifestations within Romania and the Republic of Moldova, and the relationship between uncertainty and investment behavior. The final section presents the conclusions and discusses the broader implications of uncertainty-oriented approaches for financial research and economic policy.

Basic content

Defining Uncertainty in Financial and Economic Theory

The concept of uncertainty occupies a central position in economic thought. Although frequently associated with risk, uncertainty represents a distinct theoretical category. In financial theory, risk generally refers to measurable variability associated with future outcomes, often expressed through probabilistic distributions, volatility indicators, or statistical models [3]. Uncertainty, however, describes situations where future outcomes cannot be fully predicted, probabilities remain unknown, or causal relationships are unstable and incomplete.

$$\sigma = \sqrt{\frac{1}{N} \sum_{i=1}^N (x_i - \mu)^2} \quad (1)$$

The standard deviation formula above illustrates how traditional finance measures measurable risk through dispersion around an expected mean. However, uncertainty extends beyond measurable dispersion because future structures themselves may change unpredictably. Frank Knight [1] introduced one of the most influential distinctions between risk and uncertainty. According to Knight, risk refers to situations in which probabilities can be estimated, whereas uncertainty involves fundamentally unknown outcomes that cannot be statistically calculated. In emerging economies, uncertainty often dominates because institutional and macroeconomic environments evolve continuously and unpredictably. Keynes [2] further expanded this perspective by emphasizing the fragility of expectations. Economic actors make decisions under incomplete knowledge about the future, relying not only on rational calculations but also on conventions, subjective beliefs, and confidence. Under uncertainty, investment decisions become highly sensitive to changing perceptions and emotional reactions.

Within Romania and the Republic of Moldova, uncertainty should therefore be understood as a structural condition rather than an exceptional event. Financial and economic systems in both countries are influenced by ongoing institutional adaptation, external dependencies, and geopolitical transformations that reduce predictability and increase informational instability. Uncertainty in these economies can be theoretically classified into several interconnected dimensions: macroeconomic uncertainty; institutional uncertainty; geopolitical uncertainty; financial market uncertainty; technological uncertainty; behavioural uncertainty; regulatory uncertainty. These dimensions interact dynamically and collectively shape investment environments.

Macroeconomic Uncertainty in Romania and the Republic of Moldova

Macroeconomic uncertainty refers to instability associated with inflation, interest rates, exchange rates, fiscal policies, economic growth, and labor market conditions. In emerging economies, macroeconomic fluctuations are generally more pronounced due to weaker institutional stabilization mechanisms and higher exposure to external shocks [4].

Romania has experienced substantial economic growth following European integration; however, its economy remains vulnerable to inflationary pressures, fiscal imbalances, and external market fluctuations. Periods of high inflation and monetary tightening increase uncertainty regarding future consumption, borrowing costs, and investment profitability. Exchange-rate fluctuations further complicate investment decisions, particularly for foreign investors and internationally exposed sectors. The Republic of Moldova experiences even higher levels of macroeconomic uncertainty. Economic dependency on remittances, imported energy, and agricultural production increases vulnerability to external disturbances. Energy crises and geopolitical instability in Eastern Europe significantly affect inflation dynamics, currency stability, and economic expectations [5].

Under such conditions, investment decisions cannot rely exclusively on historical market performance because future macroeconomic trajectories remain uncertain. Investors operating in Romania and Moldova must continuously adapt to changing economic environments characterized by incomplete information and structural instability.

Institutional Uncertainty and Governance Fragility

Institutional uncertainty represents one of the defining characteristics of transition economies. Institutions reduce uncertainty by establishing stable rules, predictable regulations, legal protections, and governance structures [6]. When institutional quality is weak or inconsistent, investors face difficulties in estimating future conditions and assessing long-term investment security.

Romania has achieved important institutional improvements through European integration and regulatory harmonization. Nevertheless, investors continue to perceive uncertainty associated with political instability, bureaucratic inefficiency, fiscal unpredictability, and governance inconsistencies [7]. Frequent legislative modifications and political tensions contribute to reduced predictability in economic decision-making. In the Republic of Moldova, institutional uncertainty is more pronounced. Weak governance structures, corruption perceptions, lower regulatory capacity, and political instability generate significant uncertainty premiums for investors [8]. Consequently, long-term investment projects face higher perceived risks due to uncertain institutional continuity and policy implementation.

Institutional uncertainty influences not only foreign investment flows but also domestic entrepreneurial behavior. When economic actors lack confidence in institutional stability, investment horizons shorten, speculative behavior increases, and long-term economic planning becomes more difficult. From a theoretical perspective, institutional fragility amplifies other forms of uncertainty by weakening society's capacity to absorb shocks and coordinate expectations. Consequently, institutional resilience becomes essential for reducing uncertainty within emerging financial systems.

Geopolitical Uncertainty and Regional Instability

Geopolitical uncertainty has become one of the most influential determinants of economic and financial instability within Eastern Europe. Unlike conventional macroeconomic fluctuations, geopolitical uncertainty originates from political conflicts, strategic rivalries, military tensions, diplomatic fragmentation, sanctions regimes, territorial disputes, and energy-security vulnerabilities. Such forms of uncertainty are particularly difficult to quantify because they evolve rapidly, involve multiple actors, and frequently generate unpredictable economic consequences across interconnected financial systems [9,10]. For emerging and transition economies, geopolitical instability creates structural uncertainty that extends beyond temporary market reactions. Investors operating within uncertain geopolitical environments must evaluate not only economic indicators, but also political alignments, regional security dynamics, international strategic interests, and the possibility of sudden institutional or regulatory change. Consequently, geopolitical uncertainty transforms investment decision-making into a multidimensional process in which financial calculations are inseparable from broader political and strategic considerations [11,12].

Romania occupies a strategically important geopolitical position at the eastern border of the European Union and NATO. This position simultaneously generates opportunities and vulnerabilities. On one hand, Romania benefits from security guarantees, institutional integration, access to European markets, and increased credibility among international investors due to its membership within Western political and economic structures. These factors contribute to institutional stability and strengthen long-term investment confidence. On the other hand, Romania's geographical proximity to regional conflicts and geopolitical tensions exposes the country to indirect economic risks associated with military instability, migration pressures, energy insecurity, and fluctuations in regional investor sentiment [9,13]. The geopolitical significance of the Black Sea region further amplifies uncertainty within Romania's investment environment. The Black Sea has increasingly become a strategic space characterized by competition over energy resources, transport corridors, military influence, and regional security architecture. Any instability affecting this region may influence investor confidence, international trade routes, infrastructure projects, and financial market expectations. Under such conditions, geopolitical developments become economically relevant even when direct economic damage remains limited [14].

For the Republic of Moldova, geopolitical uncertainty represents an even more fundamental structural condition. Moldova's geopolitical position between the European Union and the post-Soviet sphere of influence creates continuous strategic ambiguity regarding economic orientation, institutional development, and long-term political stability. This ambiguity contributes to uncertainty concerning future regulatory frameworks, international partnerships, and economic integration processes [15]. Moldova's dependence on imported energy resources further intensifies geopolitical vulnerability. Energy dependency transforms geopolitical tensions into direct economic risks capable of affecting inflation, industrial production, household consumption, fiscal stability, and overall investor confidence. Under conditions of geopolitical instability, energy prices may fluctuate rapidly, creating uncertainty regarding production costs, economic growth prospects, and financial sustainability [16]. Moreover, geopolitical uncertainty influences investor behavior not only through objective economic consequences, but also through subjective perceptions of regional instability. Investors frequently respond to anticipated risks rather than exclusively to realized events. Consequently, geopolitical narratives, diplomatic tensions, military rhetoric, and media representations may significantly influence financial expectations and capital allocation decisions even before measurable economic impacts emerge [17]. In emerging economies such as Romania and the Republic of Moldova, geopolitical uncertainty also interacts with institutional fragility and market vulnerability. Financial markets characterized by lower liquidity and reduced depth tend to react more strongly to external shocks and changes in international sentiment. As a result, geopolitical events may generate disproportionate market volatility, exchange-rate fluctuations, and capital outflows relative to the scale of the initial disturbance [18]. Geopolitical instability additionally affects foreign direct investment decisions. Long-term investors generally prioritize predictability, institutional continuity, and strategic stability when evaluating investment destinations. Persistent geopolitical uncertainty increases perceived country risk and may discourage investments requiring long planning horizons, substantial infrastructure commitments, or exposure to regional supply chains. In this context, uncertainty itself becomes economically costly because it reduces strategic confidence and weakens long-term development perspectives [11,19].

Another important dimension of geopolitical uncertainty concerns the fragmentation of globalization and the increasing regionalization of economic systems. Contemporary geopolitical tensions have accelerated the restructuring of supply chains, energy partnerships, technological cooperation, and strategic industries. Such transformations create new forms of uncertainty for emerging economies integrated into international markets. Romania and Moldova must therefore continuously adapt to changing geopolitical and economic configurations that reshape trade flows, investment priorities, and strategic partnerships [20]. The psychological dimension of geopolitical uncertainty should also be emphasized. In periods characterized by regional instability, collective perceptions of insecurity tend to intensify risk aversion among both investors and consumers. Financial decision-making becomes increasingly influenced by precautionary behavior, defensive strategies, and expectations of future instability. Consequently, geopolitical uncertainty may contribute to reduced investment activity, lower entrepreneurial confidence, and increased financial conservatism even in the absence of immediate economic deterioration [21,22]. From a theoretical perspective, geopolitical uncertainty demonstrates that financial systems cannot be analyzed independently from broader political and strategic structures. Economic systems are deeply embedded within geopolitical environments that continuously shape institutional development, investor expectations, and financial stability. In emerging and transition economies, where institutional resilience remains comparatively weaker, geopolitical instability often amplifies existing economic vulnerabilities and generates complex forms of interconnected uncertainty [23,24].

Behavioural Uncertainty and Investor Psychology

Behavioral economics highlights the importance of psychological and emotional factors in financial decision-making under uncertainty. Investors do not behave as perfectly rational actors; instead, they

rely on heuristics, subjective perceptions, and emotional reactions [25]. Under uncertain conditions, cognitive biases become increasingly influential. Loss aversion, herding behavior, overconfidence, and panic reactions significantly shape market dynamics, particularly within emerging economies characterized by lower informational transparency and higher volatility.

$$U(x) = \begin{cases} x^\alpha, & x \geq 0 \\ -\lambda(-x)^\beta, & x < 0 \end{cases} \quad (2)$$

The Prospect Theory value function above illustrates how investors perceive losses more intensely than equivalent gains, reinforcing risk aversion during uncertain periods. In Romania and the Republic of Moldova, behavioral uncertainty is amplified by historical experiences of economic instability, inflationary episodes, and institutional distrust. Investor expectations are therefore shaped not only by objective indicators but also by collective memory, political narratives, and social perceptions. Media influence and digital communication further intensify uncertainty. Information spreads rapidly across digital platforms, often amplifying emotional reactions and speculative behavior. Under uncertain conditions, market sentiment may become as influential as economic fundamentals themselves [26]. Behavioral uncertainty demonstrates that financial instability is not purely objective. Rather, uncertainty is socially and psychologically constructed through expectations, narratives, and collective perceptions.

Adaptive Systems and the Cybernetic Perspective of Uncertainty

Traditional financial models frequently assume equilibrium, rational expectations, and relatively stable relationships among economic variables. Classical financial theories are generally constructed upon the premise that markets tend toward efficiency and that future outcomes can be estimated through historical data and probabilistic reasoning. However, contemporary economic and financial environments increasingly challenge these assumptions. Global financial crises, geopolitical instability, pandemics, technological disruptions, and energy shocks demonstrate that financial systems often behave in non-linear and unpredictable ways. Under such conditions, uncertainty cannot be treated merely as a temporary anomaly affecting otherwise stable systems. Instead, uncertainty becomes a structural characteristic of modern economic environments [23,24]. Within this context, adaptive and cybernetic approaches provide important theoretical alternatives for understanding financial systems operating under uncertainty. Cybernetic theory focuses on communication, feedback mechanisms, learning processes, adaptation, and self-regulation within complex systems [24]. Unlike static equilibrium-based models, cybernetic approaches interpret economic systems as continuously evolving structures capable of responding dynamically to internal and external disturbances.

In financial contexts, cybernetic principles can be applied to investment behavior and market dynamics. Investors continuously observe new information, estimate uncertainty, formulate expectations, make decisions, evaluate outcomes, and subsequently modify future strategies. This process creates adaptive feedback loops in which learning and adjustment become essential components of financial decision-making. Consequently, financial markets function not as perfectly balanced equilibrium systems, but rather as evolving adaptive networks characterized by interaction, feedback, and continuous transformation [23,27]. Adaptive systems theory further suggests that economic systems possess emergent properties that cannot be fully explained through isolated variables or linear causal relationships. Small disturbances may generate disproportionately large consequences due to interconnectedness and feedback amplification mechanisms. This perspective became particularly relevant following the global financial crisis of 2008, which demonstrated how interconnected financial systems can rapidly transmit instability across international markets [28].

Romania and the Republic of Moldova can both be interpreted as adaptive economic systems exposed to continuous structural transformation. Romania's integration into the European Union, financial modernization, digitalization processes, demographic changes, and institutional reforms have continuously reshaped the country's economic structure during recent decades. Simultaneously,

Romania remains exposed to inflationary pressures, fiscal instability, labor migration, and regional geopolitical tensions, all of which contribute to persistent uncertainty within financial and investment environments. The Republic of Moldova experiences even more pronounced adaptive pressures due to its geopolitical positioning, institutional fragility, energy dependency, and economic vulnerability. Moldova's economic and financial systems must constantly adjust to changing external conditions, including regional conflicts, fluctuating energy markets, migration dynamics, and evolving international partnerships. Consequently, adaptation itself becomes a central characteristic of economic survival and financial resilience. Adaptive approaches emphasize resilience rather than deterministic prediction. Traditional financial models frequently attempt to reduce uncertainty by improving forecasting precision and statistical estimation. However, adaptive theories argue that complete prediction is impossible in highly complex and evolving systems [29]. Instead of assuming full control over future outcomes, adaptive systems seek flexibility, responsiveness, learning capacity, and resilience under changing conditions.

This perspective is increasingly relevant because uncertainty within global financial systems has become continuous rather than episodic. Contemporary economies are affected simultaneously by multiple interconnected risks, including geopolitical instability, technological disruption, climate-related pressures, cybersecurity threats, and global financial contagion. Under such conditions, economic systems must continuously adapt to evolving environments rather than merely return to previous equilibrium states. The increasing use of artificial intelligence and machine learning in financial analysis reflects this transition toward adaptive decision systems [30]. Machine learning models are capable of identifying hidden patterns, processing large quantities of information, and adjusting predictions dynamically as new data emerge. Such technologies are increasingly utilized in portfolio optimization, algorithmic trading, risk management, fraud detection, and macroeconomic forecasting. From a theoretical perspective, artificial intelligence represents an attempt to enhance adaptability within financial systems. Unlike traditional econometric models based on fixed assumptions and linear relationships, machine learning approaches may continuously update internal structures in response to changing data environments. This adaptive capacity makes artificial intelligence particularly attractive for financial environments characterized by uncertainty and non-stationarity [31]. Technological sophistication cannot eliminate uncertainty entirely. Machine learning systems remain dependent on data quality, historical information, and algorithmic assumptions. Structural breaks, unprecedented events, geopolitical crises, and sudden institutional changes may significantly reduce predictive accuracy. Financial crises frequently emerge precisely because historical relationships become unstable or because unexpected events fundamentally alter economic behavior [32].

Moreover, artificial intelligence itself may introduce additional forms of uncertainty into financial systems. Algorithmic trading, automated investment strategies, and interconnected digital financial infrastructures may increase systemic complexity and amplify market instability during periods of stress. Highly interconnected computational systems can accelerate contagion effects, informational cascades, and rapid market reactions [33]. Behavioral uncertainty further limits the capacity of adaptive technologies to fully predict financial outcomes. Investor psychology, collective expectations, emotional reactions, and political perceptions cannot always be adequately captured through quantitative models. Human decision-making under uncertainty frequently deviates from rational or statistically predictable behavior, particularly during periods of crisis or instability [21,22]. Another important dimension of adaptive systems concerns institutional learning. Economic resilience depends not only on technological adaptation, but also on institutional flexibility and governance capacity. Romania and the Republic of Moldova continuously face the challenge of adapting regulatory frameworks, financial institutions, and economic policies to rapidly changing international environments. Institutional rigidity may amplify uncertainty, whereas adaptive governance structures may improve resilience and reduce systemic vulnerability [25,34]. Adaptive

and cybernetic perspectives therefore provide a broader understanding of uncertainty within modern financial systems. Rather than treating uncertainty as a deviation from equilibrium, these approaches recognize uncertainty as an intrinsic and permanent feature of evolving economic environments. Financial systems are not static mechanisms governed exclusively by predictable laws, but dynamic structures shaped by feedback, interaction, learning, institutional transformation, and behavioral complexity. Consequently, investment decision-making within Romania and the Republic of Moldova increasingly requires adaptive frameworks capable of integrating economic, geopolitical, institutional, technological, and behavioral dimensions of uncertainty. Under contemporary conditions, resilience, flexibility, and continuous learning may become more important than deterministic forecasting accuracy itself.

Conclusions

This article examined uncertainty as a central concept for understanding investment risk in Romania and the Republic of Moldova. Unlike traditional approaches focused exclusively on measurable risk, the study emphasized that uncertainty represents a broader and more complex phenomenon involving incomplete information, institutional instability, behavioral dynamics, and geopolitical unpredictability.

In the context of Romania and the Republic of Moldova, uncertainty should be understood as a structural characteristic of economic and financial systems rather than a temporary disturbance. Both countries operate within environments shaped by macroeconomic volatility, institutional transformation, external dependency, and regional geopolitical instability. Consequently, investment decisions are strongly influenced by factors that cannot be fully captured through conventional probabilistic models. The analysis highlighted multiple dimensions of uncertainty, including macroeconomic, institutional, geopolitical, behavioral, and technological uncertainty. These dimensions interact continuously and collectively influence investor expectations, market confidence, and financial stability.

Behavioral and institutional perspectives demonstrated that uncertainty is not purely objective. Investor psychology, social perceptions, institutional trust, and political narratives significantly shape financial behavior and market outcomes [35]. Similarly, geopolitical developments increasingly influence investment dynamics within Eastern Europe. The article also emphasized the relevance of adaptive and cybernetic perspectives for understanding uncertainty in modern financial systems. Contemporary economies function as complex adaptive systems characterized by feedback loops, non-linearity, and continuous transformation. Under such conditions, resilience, flexibility, and learning become more important than deterministic prediction.

Ultimately, uncertainty should not be treated merely as an obstacle to financial analysis, but as a defining structural feature of contemporary investment environments. Future research concerning Romania and the Republic of Moldova should continue developing interdisciplinary approaches capable of integrating economic, institutional, behavioral, technological, and geopolitical dimensions of uncertainty.

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