ENTERPRISE MANAGEMENT UNDER ECONOMIC INSTABILITY: THEORY, MANAGERIAL APPROACHES, AND EMPIRICAL EVIDENCE

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Abstract. Economic instability has become an increasingly critical and multifaceted challenge for enterprises worldwide, arising from global market volatility, geopolitical conflicts, financial crises, inflationary pressures, supply chain disruptions, and rapid technological transformation, with particularly severe consequences for crisis-affected and transitional economies such as Ukraine, where firms must navigate heightened uncertainty, resource constraints, and systemic risks while striving to maintain operational continuity and long-term strategic development. *Purpose.* The study examines enterprise management under economic instability, aiming to integrate theoretical perspectives, managerial strategies, and empirical evidence into a unified framework. It addresses the gap in research on enterprise-level responses to complex economic conditions, with particular relevance to emerging and crisis-affected economies, including Ukraine, where enterprises face heightened operational and strategic risks. *Methodology.* The research employs a combination of theoretical analysis, synthesis, induction and deduction, observation, and abstraction to systematize existing knowledge. It reviews literature on economic instability at the household, macroeconomic, and enterprise levels, classifies managerial response strategies, analyzes enterprise behavior through systems, contingency, dynamic capabilities, and resilience theories, and evaluates methodological approaches, including econometric models, machine learning, composite indices, and multi-criteria decision analysis. An empirical case study, complemented by expert evaluation, illustrates practical managerial responses, scenario-based stress

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testing, and the interplay between strategy and risk mitigation. *Results.* The study identifies core dimensions of economic instability, categorizes managerial responses from reactive to transformational, and demonstrates the effectiveness of adaptive, proactive, and risk-mitigating strategies. The case study highlights strengths in technological adaptability, operational flexibility, and risk management, while revealing vulnerabilities in leverage management, decision-making efficiency, and exposure to compounded stressors. *Practical implications.* The integrated framework equips managers with guidance to design strategies that enhance resilience, sustain operational continuity, and support informed decision-making under volatile economic conditions. An empirical case study analyzing a company in the renewable energy sector demonstrates how adaptive and risk-mitigating strategies can be applied in practice, highlighting lessons for strategic management in high-uncertainty contexts. These insights are particularly relevant for Ukraine, where the renewable energy sector plays a critical role in economic recovery, energy security, and sustainable development amid ongoing instability. *Value/originality.* This study bridges theoretical and practical knowledge on enterprise management under economic instability by combining multi-level conceptual analysis, methodological review, and empirical evaluation. It advances understanding of how enterprises can sustain performance, adapt strategically, and manage systemic risks in highly uncertain and dynamic environments.

1. Introduction

Economic instability has become a defining feature of the global business environment, driven by financial, geopolitical, technological, climatic, and policy-related shocks. These dynamics intensify uncertainty and volatility, making enterprise management under instability a critical scholarly and practical concern, particularly for firms highly exposed to external risks. Enterprise resilience increasingly depends on the ability to anticipate, absorb, and adapt to such conditions.

The relevance is particularly acute in Ukraine, where full-scale war has generated a prolonged, systemic form of economic instability. Enterprises face compounded pressures from infrastructure disruption, labor displacement, energy insecurity, cost escalation, limited access to capital, and security risks. These conditions exceed conventional cyclical

instability, rendering traditional management approaches insufficient and underscoring the need for adaptive strategies to ensure continuity, financial stability, and recovery.

Building on key contributions to economic instability and enterprise management (Hill et al.; Montiel and Servén; Loayza and Raddatz; Morrissey et al.; Lyulyov et al.; Zapukhliak et al.) and on advances in dynamic capabilities, contingency, and resilience theories, this study addresses a major research gap. While economic instability is well explored at macroeconomic and household levels, enterprise-level management responses remain fragmented, and the managerial relevance of advanced analytical tools has not been sufficiently systematized.

The main aim of this paper is to conceptualize economic instability as a systemic phenomenon and to analyze enterprise management responses under conditions of uncertainty, combining theoretical insights with empirical evidence. To achieve this aim, the study pursues the following objectives:

1) to systematize and conceptualize economic instability by synthesizing its definitions, dimensions, and theoretical foundations across household, macroeconomic, and enterprise levels;

2) to analyze and classify enterprise management responses to economic instability, integrating managerial strategies with theoretical explanations of enterprise behavior under unstable conditions;

3) to review and evaluate methodological approaches for assessing economic instability and its impact on enterprise performance, highlighting their applicability for managerial decision-making;

4) to empirically evaluate managerial responses to economic instability through a case study analysis.

The methodological foundation of the research is based on general scientific and special research methods. Methods of analysis and synthesis, induction and deduction, abstraction and generalization are applied to systematize theoretical and empirical findings in the literature. Comparative analysis is used to examine different conceptual and methodological approaches to economic instability. Scenario analysis, expert evaluation, and weighted scoring techniques support the empirical assessment of managerial responses in the case study. These methods collectively ensure analytical rigor and allow for a comprehensive examination of enterprise management under unstable economic conditions.

2. Conceptualizing Economic Instability in Enterprises

Economic instability in economic and management research is generally defined as adverse and unpredictable fluctuations in key economic parameters, characterized by volatility, uncertainty, and deviations from expected macroeconomic or microeconomic trajectories [4; 34].

At the enterprise level, instability represents a systemic condition manifesting across global, national, sectoral, and organizational contexts [46; 47]. It is analytically distinct from volatility, which reflects short-term fluctuations, and uncertainty, which denotes limited predictability [13; 34]. The literature identifies macroeconomic, financial, political, and enterprise-specific instability, each associated with different causes and consequences [4; 13; 48]. Enterprise-oriented classifications further emphasize risk types, including operational, financial, managerial, technological, and reputational risks [1; 4].

Measurement approaches vary by domain: macroeconomic instability is captured through GDP growth, inflation, and unemployment volatility [34; 48]; financial instability through exchange-rate fluctuations, financial stress indices, and credit risk indicators [24]; political instability through measures of political violence and regime change [13]; and micro-level instability through income and employment volatility and exposure to external shocks [1]. Composite indicators, such as the Macroeconomic Instability Index or Financial Stress Index, provide aggregated assessments drawing on multiple variables [24; 34; 48].

Overall, economic instability can be defined as an unpredictable deviation from equilibrium conditions with significant managerial implications. Its assessment combines conceptual frameworks and quantitative indicators, supporting enterprise resilience and decision-making under uncertainty [1; 4; 24; 48]. This synthesis underpins the identification of key dimensions of economic instability and their relevance for enterprise management (Table 1).

Economic instability refers to deviations of economic variables from expected or sustainable trajectories, generating uncertainty and adverse effects across different levels of analysis. At the household level, it manifests as unpredictable changes in income, employment, or financial well-being, with direct implications for welfare and resilience [10; 26].

Table 1

Key definitions of economic instability across different levels and contexts

№	Definition	Author(s)
1	2	3
1	Economic instability is defined as repeated changes over time in employment, income, or financial well-being of households – changes that are typically not intentional, predictable, or indicative of upward mobility. This captures instability in income/employment over time (temporal dimension), unpredictability, and potential adverse impact on welfare.	H. D. Hill et al. [10]
2	Macroeconomic instability refers to circumstances in which key macroeconomic variables become volatile or behave in an unsustainable manner, undermining predictability of the overall economic environment. This includes volatility (fluctuations), unsustainability (structural imbalance), and unpredictability (reduced forecasting power) – capturing "type" (volatility/imbalance), "predictability", "scope" (macro level), and "impact level" (system-wide).	P. J. Montiel and L. Servén [25]
3	In the context of enterprises, "operating environment instability" (or external economic environment instability) is defined as conditions under which the probability of deterioration in an enterprise's financial condition increases, due to external volatility – reflecting "origin" (external environment), "impact level" (enterprise-level), and "predictability/controllability" (risks become harder to manage).	I. Pasinovych, V. Hutak and L. Peretiatko [31]
4	Macroeconomic instability (or economic instability broadly) results from high variability of macroeconomic aggregates due to fundamental shocks – implying "origin" (shocks, internal or external), "type" (volatility of aggregates), "scope" (macro level), "impact level" (system-wide), and "duration" (as shocks may have lasting effects).	N. V. Loayza and S. Raddatz [19]
5	Family (household) economic instability conceptualized more broadly as instability in income and employment, with measurement through changes over time (percentage changes, variance, volatility).	T. W. Morrissey et al. [26]
6	Macroeconomic instability defined as a state in which leading macroeconomic variables become volatile or behave in an unsustainable manner, eroding predictability of the overall environment.	O. Lyulyov et al. [21]

(End of Table 1)

7	Instability of the external environment of an enterprise: a set of changing external conditions (economic, political, technological, demographic, etc.), which increase the probability of adverse outcomes for enterprise performance and reduce controllability.	I. Zapukhliak et al [45]
8	Economic instability described in a business context as the condition that requires firms to adapt to cyclical or structural fluctuations in the world economy – implying ongoing uncertainty and the necessity for adaptive strategies.	O. Zadorozhnyi and H. Zhaldak [44]
9	Economic instability as a systemic phenomenon at the national/global level, arising under conditions of globalization, crises, or global shocks, which affect both macroeconomic and microeconomic systems and alter the overall economic policy environment.	A. Mazaraki and Y. Umantsiv [23]

Source: summarized by the author based on [10; 19; 21; 23; 25; 26; 31; 44; 45]

At the macroeconomic level, instability involves fluctuations or unsustainable dynamics in key aggregates, such as GDP growth, inflation, and employment, reducing predictability for economic agents and producing system-wide effects driven by both internal shocks and external crises [19; 21; 25].

In enterprise contexts, instability reflects variability in the external operating environment, increasing financial risk and complicating managerial decision-making in response to economic, political, technological, and demographic changes [31; 44; 45]. Some approaches integrate internal and external factors, emphasizing the interaction between firm-level risks and broader macroeconomic dynamics [19; 23; 44].

Despite differing analytical emphases, the literature consistently identifies variability over time, outcome uncertainty, and multi-level consequences as core features of economic instability, ranging from household welfare to enterprise performance and systemic outcomes [10; 19; 23; 25; 26; 31; 44; 45]. This integrated understanding provides a coherent basis for analyzing enterprise management strategies under conditions of uncertainty.

In summary, economic instability can be understood as the propensity of economic systems – whether households, enterprises, or national economies – to experience deviations from expected or stable trajectories, with measurable implications for predictability, control, and overall

economic outcomes. This definition integrates the temporal, structural, and systemic dimensions highlighted across the literature, providing a coherent basis for examining enterprise management strategies under conditions of uncertainty.

Enterprise management under economic instability is increasingly conceptualized through frameworks emphasizing adaptability, crisis preparedness, sustainability, and risk management. These approaches view management as a dynamic, multi-level process integrating strategic, operational, and security functions to sustain resilience and long-term performance.

Adaptive management focuses on continuous adjustment to unpredictable external conditions, combining long-term strategic planning with short-term operational decisions to enhance flexibility and competitiveness [26]. Evidence from crisis contexts indicates that adaptive leadership practices, including stakeholder engagement and timely organizational responses, strengthen resilience under prolonged uncertainty [15].

Crisis management models frame enterprise management as a cycle of anticipation, detection, response, and recovery, supported by early warning systems, scenario modeling, and predictive tools that mitigate the impact of economic shocks and ensure operational and financial continuity [33].

Sustainability-oriented frameworks integrate economic stability, growth, and security by coordinating financial, technological, and organizational subsystems and monitoring internal and external risks through quantitative and qualitative indicators [29].

Risk management approaches conceptualize management as a systematic process of risk identification, assessment, and mitigation, with maturity models guiding capability development and continuous improvement over time [28].

Overall, contemporary frameworks (Table 2) converge on the need for dynamic, multi-level strategies that enable enterprises to anticipate, absorb, and adapt to economic instability.

Adaptive and strategic approaches emphasize flexibility and scenario planning [26], crisis management models prioritize early detection and rapid response [33], sustainability and economic security frameworks focus on long-term stability [29], and risk management models provide structured mechanisms for continuous improvement [27]. Together, these

approaches form an integrated foundation for enterprise management under economic instability, supporting both short-term resilience and long-term development.

Table 2

Conceptual frameworks for enterprise management under economic instability

Framework	Essence	Core functions	Key features
Adaptive and strategic management [26]	Continuous adaptation to rapid external changes	Scenario planning, resource allocation, real-time decisions	Integration of strategic and operational perspectives; balance of stability and growth
Crisis and anti-crisis management [33]	Anticipation and management of crises	Crisis monitoring, scenario modeling, anti-crisis measures	Predictive modeling; dedicated anti-crisis component
Sustainable development and economic security [29]	Long-term viability of operations	Risk monitoring, subsystem integration, strategic planning	Quantitative and qualitative indicators; integrity and continuity principles
Risk management and maturity models [28]	Structured identification and mitigation of risks	Risk assessment, mitigation strategy, process improvement	Maturity-guided evolution of risk practices

Source: summarized by the author based on [26; 28; 29; 33]

Enterprise behavior in unstable economic conditions can be explained through complementary theoretical frameworks, including systems theory, contingency theory, dynamic capabilities theory, and resilience theory. Each framework highlights distinct mechanisms of enterprise response, ranging from structural interdependencies to adaptive and recovery capacities.

Systems theory views the enterprise as an interconnected set of subsystems whose interactions and feedback loops determine stability and adaptability, enabling the identification of vulnerabilities and recovery pathways [27]. Contingency theory rejects universal management solutions, arguing that effectiveness depends on aligning organizational structures and strategies with specific environmental conditions, particularly economic volatility [5].

Dynamic capabilities theory focuses on an enterprise's ability to sense, seize, and reconfigure resources in response to environmental change, with innovation, learning, and business model adaptation sustaining competitiveness during instability [6; 11]. Resilience theory emphasizes the capacity to absorb shocks, recover, and adapt, integrating short-term operational responses with long-term strategic renewal supported by leadership, resource buffers, and organizational learning [9; 30].

Collectively, these theories (Fig. 1) provide a comprehensive framework for analyzing enterprise behavior under conditions of economic instability.

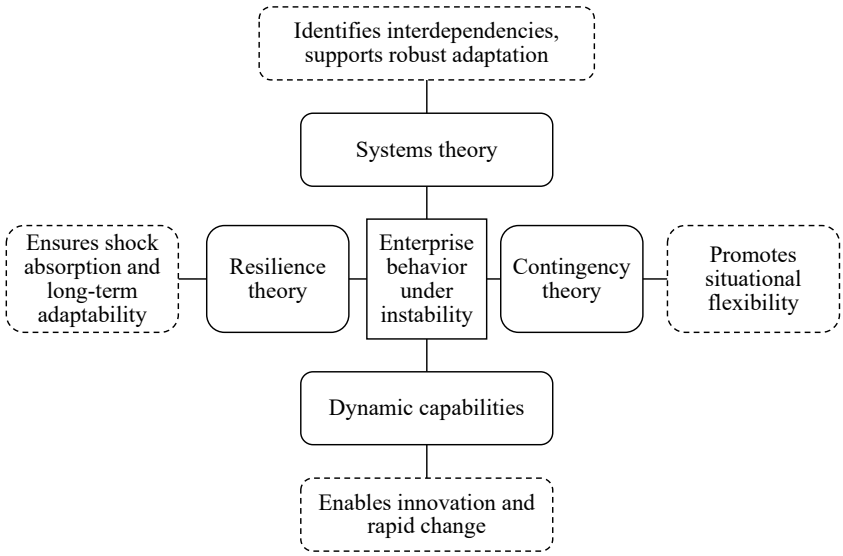

Figure 1. Enterprise behavior theories under economic instability

Source: summarized and adapted by the author based on [5; 6; 9; 27]

Integrating these perspectives enables a comprehensive understanding of enterprise responses to economic instability: systems theory explains structural interdependencies, contingency theory emphasizes alignment with environmental conditions, dynamic capabilities highlight adaptive mechanisms, and resilience theory focuses on recovery and long-term survival. Together, they constitute a multidimensional framework for

anticipating, withstanding, and leveraging instability to sustain performance and growth.

Economic instability is thus defined as the propensity of economic systems to deviate unpredictably from stable trajectories, marked by volatility, uncertainty, and reduced controllability at household, macroeconomic, and enterprise levels. Morphological analysis indicates that the central managerial challenge lies in addressing the temporal, structural, and systemic risks arising from these deviations. Accordingly, enterprise management under instability is conceptualized as a dynamic, multi-level process integrating adaptive strategies, crisis preparedness, sustainability objectives, and structured risk mitigation to ensure operational continuity, long-term viability, and sustained growth.

3. Managerial Approaches to Economic Instability

At the enterprise level, managers respond to economic instability by implementing targeted strategies to preserve operational resilience and competitive advantage. These responses include cost restructuring, revenue diversification, supply chain reconfiguration, and flexible decision-making aimed at maintaining liquidity and optimizing resource allocation under uncertainty. Managerial focus also shifts toward strengthening internal capabilities, such as workforce adaptability and process efficiency, enabling rapid organizational responses to changing market conditions. Empirical evidence indicates that enterprises combining proactive monitoring of economic indicators with adaptive planning are better positioned to absorb volatility while protecting strategic objectives.

The literature commonly classifies managerial responses to economic instability into reactive, adaptive, proactive, and transformational strategies (Table 3), which differ in timing, intent, and the extent of organizational change.

Reactive strategies address acute crises through immediate recovery and damage control [16], while adaptive strategies emphasize learning and incremental adjustment to enhance flexibility without altering core structures [12]. Proactive strategies focus on anticipation and prevention, often linked to dynamic capabilities and innovation, enabling firms to exploit emerging opportunities [35]. Transformational strategies involve profound structural, cultural, or business model changes, typically in response to

severe or prolonged instability [39]. Empirical evidence indicates that firms combining proactive monitoring with adaptive mechanisms demonstrate higher resilience and sustained performance during volatile periods [16; 39].

Table 3

Key managerial response strategies to economic instability

Strategy type	Key characteristics	Typical actions
Reactive	Short-term, immediate responses to shocks; focus on mitigation	Cost-cutting, crisis communication, operational adjustments
Adaptive	Incremental adjustments to maintain operations	Process improvements, resource reallocation, minor business model tweaks
Proactive	Anticipation of future risks and opportunities	Innovation, new product development, market expansion
Transformational	Fundamental organizational change; long-term focus	Digital transformation, business model innovation, restructuring

Source: summarized by the author based on [12; 16; 35; 39]

These managerial responses form a continuum from reactive to transformational, with strategy choice shaped by shock severity, organizational capabilities, and environmental conditions. An integrated view of these typologies supports the design of tailored responses that balance short-term stability and long-term adaptation.

Assessing economic instability and its impact on enterprise performance requires methods capable of capturing multidimensional risk. The literature identifies four main methodological approaches: econometric and statistical models, machine learning and ensemble methods, composite indices, and multi-criteria decision analysis (MCDA).

Econometric models (e.g., PVAR, logistic regression, OLS, hazard models) remain foundational due to their interpretability and capacity for causal inference, though their accuracy may be limited by linear assumptions, sensitivity to outliers, and data quality constraints [8]. Machine learning methods, including neural networks, SVM, random forests, gradient boosting, and ensemble models, achieve superior predictive accuracy by capturing non-linearities and high-dimensional patterns but face limitations related to interpretability and data requirements [20].

Composite indices aggregate financial, macroeconomic, and sentiment indicators using weighting techniques (e.g., entropy, AHP), providing holistic and comparable measures of enterprise vulnerability, albeit with potential subjectivity in indicator selection and weighting [14]. MCDA methods (e.g., PROMETHEE, VIKOR, DEMATEL, ISM) support risk prioritization and strategic decision-making under uncertainty [48]. Hybrid approaches combining econometric, machine learning, and MCDA techniques, reinforced by advances in explainable artificial intelligence, seek to balance predictive power and transparency [18].

Overall, while the methodological landscape increasingly favors machine learning and ensemble models for prediction, interpretability remains critical for managerial and policy applications, sustaining the relevance of composite indices and MCDA for strategic analysis (Table 4).

Hybrid and explainable models offer an effective balance between predictive accuracy and transparency; therefore, methodological choice should reflect research objectives, data availability, and interpretability requirements. Effective enterprise management under uncertainty increasingly relies on data-driven and algorithmic approaches, notably neural networks, ensemble machine learning models, multi-criteria decision-making (MCDM) techniques, and robust optimization frameworks, complemented by organizational practices focused on resilience, management innovation, and digital transformation.

Artificial neural networks and ensemble models (e.g., optimized BP, MLP-ANN, attention-based fuzzy networks, XGBoost, LightGBM, random forest) are central to financial risk prediction and early warning systems, consistently outperforming traditional statistical methods with classification accuracy exceeding 80% and reaching above 99% in some studies [3]. Their strength lies in capturing nonlinear relationships, processing high-dimensional data, and adapting to volatile economic environments.

MCDM methods, including GRA, AHP, PROMETHEE, TOPSIS, and hybrid fuzzy–grey models, provide structured evaluation under uncertainty, with GRA particularly valued for handling incomplete information and supporting sensitivity analysis in strategic prioritization and scenario assessment [41]. Robust and stochastic optimization approaches (e.g., two-stage stochastic programming, distributionally robust optimization, and mixed-integer models) demonstrate superior performance

in resource allocation, logistics, and supply chain design under disruption, improving efficiency, response speed, and equity relative to deterministic models [42; 43].

Table 4

Methodological approaches to assessing economic instability and its effects on enterprises

Methodological approach	Strengths	Limitations	Typical applications
Econometric and Statistical Models	High interpretability; suitable for causal analysis	Limited accuracy under non-linearity; depend on strong assumptions	Impact assessment, policy evaluation
Machine Learning and Ensemble Models	High predictive accuracy; effective for complex, high-dimensional data	Low transparency; require large datasets	Financial distress prediction, instability forecasting
Composite Indices	Multidimensional view; transparent components; useful for comparison	Subjective weighting; may mask internal variability	Vulnerability assessment, monitoring
MCDA and Hybrid Approaches	Integrate qualitative and quantitative criteria; strong for strategic decisions	Complexity of modelling; subjectivity in criteria selection	Resilience assessment, prioritization
Explainable AI (XAI)	Balance of accuracy and interpretability	Still emerging; methodological standardization limited	Managerial decision support, regulatory analysis

Source: summarized by the author based on [8; 14; 18; 20]

Expert-based approaches, including Delphi studies, group decision support systems, and consensus optimization models (e.g., DRO-MECM), enhance collective risk assessment and strategic alignment under information constraints [41]. Resilience frameworks further emphasize adaptive, cognitive, and behavioral capacities, with empirical evidence linking situation awareness and adaptive capacity to more effective proactive and reactive crisis management [22].

Management innovation, digital transformation, and flexible organizational structures significantly strengthen crisis response, particularly

in SMEs, by improving information flows, enabling remote operations, and accelerating decision cycles [17]. Enterprises with robust internal control and risk management systems exhibit higher resilience, more efficient resource allocation, and stronger innovative capacity during disruptions, as observed during the COVID-19 pandemic [47].

Empirical findings confirm that combining proactive risk anticipation with rapid reactive adaptation enhances crisis management performance, supported by social capital and internal resilience capacities [22]. While AI-based models enable earlier and more precise interventions through superior predictive accuracy (up to 99.4%) [46] and optimization techniques improve operational reliability [43], persistent challenges remain regarding model interpretability, data quality, and contextual applicability across diverse enterprise settings [40].

In summary, managerial responses to economic instability involve a dynamic interplay of strategies and analytical tools that allow enterprises to anticipate, adapt to, and recover from uncertain conditions. Strategies range from reactive and adaptive measures addressing immediate disruptions to proactive and transformational approaches that foster long-term resilience and competitiveness. Complementing these strategies, methodological tools support informed decision-making, risk assessment, and performance monitoring. Evidence from empirical studies demonstrates that organizations combining adaptive strategies with robust analytical methods, resilience-building practices, and digital innovations are better equipped to maintain operational continuity and capitalize on emerging opportunities. Overall, effective management of economic instability requires a multi-level, integrated approach that aligns strategic planning, organizational capabilities, and data-driven insights to navigate uncertainty successfully.

4. Management Response to Economic Instability: A Case Study of Goldwind Science & Technology Co., Ltd.

Goldwind Science & Technology Co., Ltd. (hereafter – Goldwind) is a leading global developer, manufacturer, and operator in the wind-power industry, headquartered in Beijing, China, with over 10 000 employees worldwide. Its core activities include R&D, manufacturing and sales of wind turbine generator (WTG) sets, as well as wind-farm development,

operation, and related energy services. The company's portfolio spans onshore permanent-magnet direct-drive turbines and large offshore models, reflecting a diversified domestic and international strategy. In 2024, Goldwind reported revenue of RMB 56,5 billion, up 12,5% year-on-year, while gross profit increased by more than 21%, indicating efficiency gains and an improved product mix [7]. Despite rising operating expenses, effective tax management and continued vertical integration supported net profitability, underscoring structural resilience in a capital-intensive and cyclical sector.

Goldwind was selected for this case study because it operates in a highly dynamic and policy-sensitive industry characterized by volatility in global demand, subsidy regimes, raw material prices, and supply chains. With a globally distributed R&D network, intelligent manufacturing, and a vertically integrated value chain, the company exemplifies a modern enterprise capable of sustaining growth under uncertainty. Accordingly, the following analysis examines Goldwind's managerial responses to economic and policy-related fluctuations, focusing on adaptive, proactive, and transformative measures to maintain operational resilience and competitive advantage.

In 2024, global wind turbine manufacturers delivered a record approximately 127 GW of new capacity, led by Chinese OEMs including Goldwind, indicating continued industry expansion despite macroeconomic pressures and supply-chain challenges [7]. However, this growth masks significant regional disparities and persistent demand volatility outside China, where installations remain uneven and policy uncertainty constrains investment [36; 37]. While China's domestic market continued to expand and accounted for a disproportionate share of OEM installations, demand in many international markets was less stable [7; 2]. Permitting delays, grid constraints, and policy instability in key regions further increase uncertainty, exposing Goldwind to the risk of shrinking order backlogs and weaker future revenue streams if foreign markets deteriorate [7; 36].

Goldwind's operations depend on large volumes of raw materials, components, and global logistics, making it vulnerable to ongoing supply-chain bottlenecks, material shortages, and cost pressures in the wind industry [38]. For capital-intensive manufacturers, rising input costs threaten margin

compression, particularly in highly competitive markets with persistent pricing pressure [7; 38]. At the same time, the sector's inherently high capital intensity implies substantial upfront investment in turbines, project development, grid connections, and financing. In an environment of higher interest rates and tighter credit conditions, increased financing costs may slow investment cycles and delay project implementation, while uncertainty regarding policy support and electricity demand may further suppress orders [36; 37; 38].

Competitive pressures have also intensified. In 2024, Chinese manufacturers, including Goldwind, Envision, and MingYang, captured leading positions in new installations and market share [2]. The combination of potential global oversupply and aggressive pricing strategies heightens the risk of downward pressure on selling prices. Under conditions of economic instability, customers may increasingly prioritize cost minimization, forcing OEMs to accept thinner margins and potentially undermining project viability when costs or financing conditions worsen [7; 2].

Finally, Goldwind's expanding international footprint exposes it to exchange rate and currency volatility, which can distort cost structures, affect profitability, and complicate long-term investment planning [7]. Depreciation of the yuan or instability in local project-market currencies, combined with inflationary pressures and higher interest rates, can amplify financial risks over extended financing horizons [7; 38]. These challenges are reinforced by regulatory and policy uncertainty, including shifting subsidies, permitting backlogs, and evolving energy frameworks, which can delay projects, weaken demand, and increase operational risk [36; 37]. For Goldwind, reliance on both domestic and international markets translates these uncertainties into pipeline volatility, cash-flow timing risks, and potential valuation or receivables impairments [7; 36]. The key external instability factors and their potential impacts are summarized in Table 5.

Goldwind operates in an external environment characterized by interlocking sources of economic instability, including demand fluctuations, input-cost volatility, financing risk, competitive pricing pressure, exchange-rate exposure, and regulatory uncertainty. These factors pose material risks to profitability, cash-flow stability, and long-term project viability [7; 37].

Table 5

Key factors of external environment economic instability for Goldwind

External factor	Description	Potential impact on Goldwind
Global demand fluctuations	Variability in domestic and international orders due to economic cycles, policy changes, and market delays	Uncertain revenue streams; reduced project pipeline; delayed deliveries
Input costs and inflation	Volatility in prices of steel, rare-earth magnets, and other turbine components	Margin compression; higher production costs; pressure on profitability
Financing costs and capital expenditure	Rising interest rates and cost of borrowing for capital-intensive projects	Increased project costs; slower investment; reduced competitiveness
Competitive pressure and pricing	Intense competition from domestic and international turbine manufacturers	Lower selling prices; margin erosion; pressure to maintain market share
Exchange-rate volatility	Fluctuations in yuan and foreign currencies impacting international contracts	Revenue uncertainty; cost distortions; financial risk in export markets
Regulatory and policy uncertainty	Delays in permitting, subsidies, or renewable-energy policy changes	Project postponement or cancellation; cash-flow volatility; increased operational risk
Supply-chain fragility	Potential logistical bottlenecks, shipping delays, or component shortages	Production delays; higher costs; disruption in project timelines

Source: Compiled by the author based on company disclosures and industry reports [2; 7; 36–38]

In response, the company has implemented managerial practices focused on financial prudence, operational flexibility, risk hedging, and strategic diversification [7]:

1. Financial and operational flexibility is supported by a strong equity base (RMB 40.4 billion in 2024) and substantial liquidity, enabling the absorption of temporary revenue shortfalls or cost increases [7]. Although leverage remains high (debt-to-equity ratio 2.83), it is managed through project prioritization and selective debt financing [7]. Operational diversification of manufacturing sites and strategic inventory policies partially mitigate supply-chain disruptions and input-cost volatility [7; 37].

2. Risk management and hedging involve the use of financial instruments to manage interest-rate and currency exposure, particularly in international

projects, as well as long-term supplier contracts and cost pass-through clauses to limit raw-material price risk [7; 37]. These measures stabilize project margins and reduce uncertainty, although residual exposure to market shocks persists [7; 36].

3. Strategic diversification across domestic and international markets helps offset regional demand and policy fluctuations [24; 36], while sustained investment in R&D enhances turbine efficiency and technological competitiveness, providing a buffer against competitive pricing pressure [24].

To assess the robustness of these practices, scenario-based stress tests were applied to Goldwind's project pipeline and balance sheet (Table 6).

Table 6

Scenario-based stress tests of Goldwind

Scenario	Impact on project margins	Estimated net profit (RMB billion)	Balance sheet effects / liquidity	Mitigation measures
High Interest Rates	-2–3 pp	1,5–1,6	Increased interest expenses; slight reduction in current ratio (0.95 → 0.90)	Hedging interest exposure; prioritizing low-leverage projects
Raw-Material Price Spike	-3–5 pp	1,4–1,5	Higher project costs; accounts payable increase; inventory revaluation	Long-term supplier contracts; cost pass-through clauses
Currency Depreciation	-1–2 pp	1,5–1,6	FX losses on international projects; import costs rise	Currency hedging; project diversification by region
Combined Stress (Interest + Input + FX)	-7–10 pp	1,0–1,1	Tight cash flow; higher leverage impact; delayed CAPEX	Integrated risk management; dynamic project prioritization; hedging

Source: Compiled by the author based on company disclosures and industry reports [2; 7; 36–38]

The analysis considered three individual shocks and one combined scenario:

1) high interest rates, assuming a 200–250 basis point increase over 2024 levels and higher debt servicing costs [38];

2) raw-material price spike, modeling a 20% increase in key inputs such as steel and rare-earth components [7; 37];

3) currency depreciation, simulating a 10% depreciation of the Chinese yuan against major currencies [7; 37];

4) combined stress, capturing the simultaneous impact of these factors to evaluate cumulative financial and operational pressure [7; 37; 38].

The stress tests indicate that Goldwind's financial buffer and operational flexibility provide moderate resilience under individual stressors. Hedging and strategic diversification partially mitigate currency, interest-rate, and input-cost risks, supporting project continuity, while technological investment sustains competitiveness and margins [7; 37]. However, high leverage increases sensitivity to interest-rate changes, and significant exposure to raw-material prices and exchange-rate volatility persists [7]. Under combined stress, scenario results suggest potential net profit declines of up to 40% and cash-flow constraints that may delay project execution or technology upgrades. Moreover, instruments such as supplier contracts and hedging provide limited protection against abrupt regulatory shifts or simultaneous global shocks, while the need to coordinate multiple risk-management measures across domestic and international units may reduce managerial efficiency [2; 7].

Overall, Goldwind exhibits a proactive and structured approach to managing economic instability, reflected in diversified production and project portfolios, targeted financial and currency hedging, and continuous technological innovation. Nevertheless, high leverage, residual exposure to cost and currency risks, and decision-making frictions indicate areas for further optimization [7; 37].

Building on this assessment, an expert evaluation was conducted to examine the effectiveness of Goldwind's financial, operational, strategic, and risk-monitoring practices under external stressors, including interest-rate volatility, raw-material price shocks, currency fluctuations, regulatory uncertainty, and supply-chain disruptions [32].

The evaluation focuses on the following five dimensions:

1. Financial management effectiveness – adequacy of liquidity, leverage management, and financial hedging.

2. Operational flexibility – capacity to manage supply-chain disruptions, production diversification, and inventory policies.

3. Strategic and technological adaptability – R&D investment, innovation, and project prioritization.

4. Risk-monitoring and decision-making efficiency – speed and accuracy of managerial responses.

5. Resilience under stress scenarios – ability to maintain profitability and project execution under combined stress.

The number of experts (n) required for reliable assessment was determined using the standard formula for mean estimation under a desired confidence level:

$$n = \frac{4 \cdot \sigma^2 \cdot t^2}{E^2} \quad (1)$$

where: σ is estimated standard deviation of expert responses (assumed 0,8 based on similar evaluations);

t is Student's t-value for 95% confidence (2,776 for small sample);

E is permissible error (0,7).

Substituting these values yields:

$$n = \frac{4 \cdot 0,8^2 \cdot 2,776^2}{0,7^2} \approx 5.$$

Thus, five experts were considered sufficient for a reliable assessment. Experts were selected (Table 7) based on their relevance to economic risk management and operational decision-making, with all participants possessing over ten years of experience in their respective fields.

Table 7

Expert selection

Expert	Position	Relevance to research
Expert 1	CFO	Financial risk management, project financing
Expert 2	Head of Supply Chain	Procurement, inventory management, supplier relations
Expert 3	R&D Director	Technological innovation, turbine efficiency
Expert 4	Project Portfolio Manager	Project prioritization, international contracts
Expert 5	Risk & Compliance Director	Risk monitoring, regulatory engagement

Source: Compiled by the author

To ensure that expert opinions were appropriately weighted, each expert self-rated their competence for each evaluation factor on a five-point scale. These scores were used to calculate the competence coefficient K_i for weighted scoring (Table 8).

Table 8

Experts' competence verification

Expert	Financial management	Operational flexibility	Strategic/ tech adaptability	Risk-monitoring and decision-making	Stress-resilience	Average (K_i)
Expert 1	5	3	3	4	4	3,8
Expert 2	3	5	3	3	3	3,4
Expert 3	3	3	5	4	4	3,8
Expert 4	4	4	4	4	4	4,0
Expert 5	4	3	3	5	4	3,8

Source: Compiled by the author

All selected experts had an average competence ≥3,4, ensuring reliability.

Each expert was asked to score Goldwind's management on each factor using a 5-point Likert scale (1 = very ineffective, 5 = highly effective). A separate weight coefficient (K_i) reflecting the expert's competence in the factor was applied to adjust the score. Questions were:

1. How effective is Goldwind in managing leverage, liquidity, and financial hedging to withstand economic stress?

2. How capable is Goldwind in adapting production processes and mitigating supply-chain disruptions under adverse conditions?

3. How effectively does Goldwind leverage innovation, R&D, and project prioritization to maintain competitiveness under economic uncertainty?

4. How timely and accurate are Goldwind's managerial responses to emerging economic threats?

5. How well does Goldwind maintain profitability and ensure project delivery when facing combined stress conditions (e.g., cost spikes, interest-rate volatility, currency fluctuations)?

6. How effectively does Goldwind manage risks associated with currency fluctuations, foreign policies, and international project contracts?

7. How proactive and effective is Goldwind in anticipating, monitoring, and responding to regulatory and policy changes?

8. How well does Goldwind ensure operational continuity when confronted with supplier or logistics disruptions?

Expert responses are summarized in Table 9.

Table 9

Expert responses

Question	Expert 1		Expert 2		Expert 3		Expert 4		Expert 5	
	Points	Ki	Points	Ki	Points	Ki	Points	Ki	Points	Ki
1	5	0,95	3	0,68	3	0,75	4	0,80	4	0,85
2	4	0,95	5	0,95	3	0,75	4	0,80	4	0,85
3	4	0,95	3	0,68	5	0,95	4	0,80	4	0,85
4	4	0,95	3	0,68	4	0,75	4	0,80	5	0,85
5	4	0,95	3	0,68	4	0,75	4	0,80	4	0,85
6	4	0,95	3	0,68	4	0,75	4	0,80	4	0,85
7	4	0,95	3	0,68	4	0,75	4	0,80	4	0,85
8	4	0,95	5	0,95	3	0,75	4	0,80	4	0,85

Source: Compiled by the author

Agreement among experts was verified using Kendall's coefficient of concordance W:

$$W = \frac{12\sum_{j=1}^{m}(R_j - \bar{R})^2}{k^2\left(n^3 - n\right)} \quad (2)$$

where: n is number of items being ranked (questions);

k is number of experts;

R_j is sum of ranks for item j across all experts;

$\bar{R}$ is average of the sum of ranks across all items.

Taking the responses above, W ≈ 0,82, indicating high agreement among experts, and supporting the validity of the evaluation.

Weighted scores for each factor S_f are calculated as:

$$S_f = \frac{\sum K_i \cdot s_{i,f}}{\sum K_i} \quad (3)$$

The calculated weighted scores are presented in Table 10.

Table 10

Weighted scores of Goldwind's management response

Factor	Weighted score	Assessment
Financial management effectiveness	3,8	Moderately effective; liquidity is adequate, but leverage management and hedging show some vulnerability under stress
Operational flexibility	3,9	Moderately effective; production diversification helps, but supply-chain disruptions are not fully mitigated
Strategic and technological adaptability	4,0	Effective; R&D and innovation are strong, though project prioritization could improve under financial constraints
Risk-monitoring and decision-making	3,5	Only partially effective; decisions are sometimes delayed or inconsistent across units
Stress resilience	3,8	Moderately effective; the company maintains projects and profitability under single stressors, but combined stress moderately affects outcomes
International project risk management	3,7	Moderately effective; some exposure to currency and contract risks remains
Regulatory and policy engagement	3,8	Moderately effective; policy monitoring is proactive, but adaptation speed can be improved
Supply-chain risk adaptation	3,9	Moderately effective; multiple suppliers and strategic inventory mitigate disruptions, but partial vulnerabilities remain

Source: Compiled by the author

The overall weighted score indicates that Goldwind's management demonstrates a moderately effective response to economic instability. Strengths are evident in technological adaptability, operational flexibility, and supply-chain risk mitigation, which support project delivery and innovation under stress. However, decision-making efficiency remains a relative weakness, as coordination delays across organizational units constrain timely responses to emerging threats. Financial management, particularly leverage control and hedging, also shows vulnerabilities under combined stress scenarios, implying that resilience may be weakened when adverse factors coincide.

The case study confirm that Goldwind exhibits a structured and largely effective managerial approach consistent with the conditions of the global wind-energy sector. Resilience is primarily supported by technological adaptability, operational diversification, and proactive risk-management instruments, enabling the company to sustain execution and innovation amid market and policy volatility. At the same time, structural weaknesses persist, notably high leverage, residual exposure to input-cost and currency risks, and limited decision-making speed under compounded shocks. Overall, while Goldwind has established a solid foundation for coping with external pressures, further strengthening of financial risk management and internal coordination is required to enhance long-term stability and responsiveness, offering broader insights for capital-intensive enterprises in the renewable-energy industry.

5. Conclusions

This paper examined economic instability as a systemic phenomenon and analyzed enterprise management responses under conditions of uncertainty. By integrating theoretical perspectives, methodological approaches, and an in-depth case study of Goldwind Science & Technology Co., Ltd., the work demonstrates that economic instability is characterized by volatility, uncertainty, and reduced controllability across macroeconomic and enterprise levels. The findings confirm that effective enterprise management in unstable environments requires dynamic, multi-level strategies that combine adaptability, risk mitigation, technological innovation, and informed decision-making. The case evidence shows that while structured management practices can substantially enhance resilience, residual vulnerabilities persist, particularly when multiple external shocks occur simultaneously.

The key conclusions derived from the study can be summarized as follows:

1. Economic instability represents a complex deviation from stable economic trajectories, affecting enterprises through demand volatility, cost fluctuations, financing constraints, regulatory uncertainty, and supply-chain disruptions.

2. Enterprise resilience under instability depends on the integration of adaptive, proactive, and transformational management strategies rather than reliance on short-term reactive measures alone.

3. Systems theory, contingency theory, dynamic capabilities, and resilience theory provide a complementary theoretical foundation for explaining enterprise behavior in unstable economic environments.

4. Advanced analytical tools, including machine learning, composite indices, and MCDA methods, enhance the assessment of economic instability, though interpretability remains essential for managerial application.

5. The case study confirms that technological adaptability and operational diversification significantly strengthen resilience, while high leverage and decision-making delays increase vulnerability under combined stress scenarios.

Future research may extend this study by adopting a comparative perspective that examines managerial responses to economic instability across different industries, firm sizes, and institutional contexts. Particular attention could be given to cross-country analyses that capture the role of regulatory regimes, financial systems, and policy support in shaping enterprise resilience. In addition, further empirical work could integrate longitudinal data to assess how managerial strategies and adaptive capabilities evolve over time in response to repeated or prolonged instability. Expanding the use of hybrid methodological approaches that combine econometric analysis, machine learning, and expert-based decision models would also enhance the robustness and practical relevance of future findings, especially in the context of increasing digitalization and data-driven management.

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