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# ECONOMETRIC MODELING OF ECONOMIC SECURITY IN INDUSTRIAL ENTERPRISES

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**Abstract**

The economic security of industrial enterprises is an important aspect of sustainable economic development. The article discusses the scientific, theoretical and practical foundations, hypotheses, patterns and development trends, emphasizing the importance and relevance of econometric modeling in ensuring the economic security of enterprises, as well as an econometric model of the economic security of an industrial enterprise.



In the dynamic landscape of the modern business environment, industrial enterprises require economic security, comprehensive understanding of it and an active approach to it. Dynamic volatility of the business environment the activities of enterprises are faced with many problems in the formation of flexibility capacity. With the growing interdependence of the world economy, the weakness of industrial enterprises under the influence of various internal and external factors poses a serious threat to their stability and growth. In response to these complications, the use of econometric modeling emerges as a powerful tool for analyzing and strengthening economic security in industrial ecosystems.

This article explores specific aspects of econometric modeling as an integral methodology for assessing and predicting economic security in the context of industrial enterprises. The integration of econometrics with economic security not only provides a solid analytical framework, but also assists decision makers with valuable recommendations to manage uncertainties, make conscious strategic choices, and protect the financial well-being of their organizations.

In the article, during the study, we will consider the main components of econometric modeling related to economic security, such as risk assessment, financial stability and the impact of macro and microeconomic variables on industrial enterprises. By considering the complex relationships between these elements, recommendations are made to contribute to a deeper understanding of the active measures necessary to strengthen economic security in enterprises, increase stability and promote sustainable growth in the constantly developing landscape of industrial enterprises.

When studying the literature on economic security in industrial enterprises, its econometric modeling, we can increasingly understand the need to use advanced analytical tools to solve modern business problems. Both scientists and practitioners are increasingly focusing on the synergy between econometrics and economic security to address the complexities inherent in industrial ecosystems. In

the course of the research, we studied several modern case studies on the topic. We cite a few of them: Y.Karanina, N. Maksimova and b. the research work on the topic “technology for monitoring industrial enterprises on the level of Economic Security” discusses the technology for monitoring industrial enterprises on the level of economic security [3]. In modern reality, an industrial enterprise is considered as a complex economic system, within which various processes are controlled, among which innovative development occupies an important place. In the Monitoring process, it is necessary to pay enough attention to the choice of target orientation and assessment indicators. It is argued that it is advisable to use economic and statistical methods for monitoring light industrial enterprises by the level of economic security, as well as methodological approaches to determining the economic security of an industrial enterprise through analytical modeling, expert survey are presented, clarification of the basic concepts, factors and indicators classification is developed and the main indicators related to the strategy [6].

E.Bidziura's research work on” theoretical-methodological approach to determining the security of the economy of industrial enterprises “defined the economic security of an industrial enterprise as follows"... it is to keep an industrial enterprise within normal limits by creating a single, stable, relatively independent dynamic system aimed at the legitimate implementation of socio-economic interests at a real and economically acceptable risk” [1]. The author interpreted”economic security " as ensuring the functioning of an industrial enterprise within normal limits by creating a stable, relatively independent dynamic system aimed at the legitimate implementation of socio-economic interests in the face of economically real and potential threats.

O.Onyshchenko and b.in his research work on the topic” the impact of external threats on the economic security of business", he describes the economic security management system of the enterprise as consisting in preventing crisis situations and minimizing the impact of external conditions on economic security of negative factors [4]. It also focuses on the main tasks of creating a business economic security system, taking into account the impact of external threats.

S.Shynkar's scientific study on the topic” economics security assessment of enterprises: theoretical-methodological aspects " offers a methodological approach that ensures the determination of the level of security at three levels. taking into account" operational indicators, functional components, -financial indicators", it insists that reliable information can be obtained about the economic security of the oil and Gas, Mechanical Engineering and food industry [7]. The practical relevance of the research work contributes to the development of a new methodological approach to assessing the economic security of industrial enterprises, combining qualitative and quantitative indicators into functional groups and changing the existing organizational and economic mechanism, taking into account the specifics of economic activity and calculating the index level of integration.

S.Sotskova and I.In the article of Kalashnikova on the comprehensive assessment of the economic security system of an enterprise in the conditions of a digital economy, a model for a comprehensive assessment of the level of economic security of an enterprise is proposed [6]. The scientific article proposes a method aimed at studying methodological views on economic security, developing a model for assessing the level of economic security of an enterprise, and assessing both the current state of economic security and the development trend.

A.Toxirov and N.In the scientific article “indicators of management efficiency indicator (criterion) in the management of corporate enterprises” by mukhammadiyev, the indicators of management efficiency indicator (criterion) in the management of corporate enterprises were taken as an effective indicator in ensuring economic security [10].

A.Toxirov and N.The scientific article “improving the efficiency of processes in the management of enterprises” by mukhammadiyev proposed a methodology for ensuring the efficiency of processes in the management of enterprises. perceived as an effective indicator [11].

Mazkur maqolada iqtisodiy xavfsizlikning mohiyati, iqtisodiy xavfsizlikni ekonometrik modellashtirish uslubiyoti va uning korxonalar faoliyatida ahamiyati existing theories on have been studied. The trends, development factors and possibilities of econometric modeling of economic security were analyzed. In systematic analysis, foreign and domestic source data was widely used. Within the framework of the research topic, methodological methods such as theoretical observation, analysis and synthesis, grouping, induction and deduction, systematic analysis, general scientific research methods and SWOT analysis were used in order to develop a comprehensive analysis of the problem, scientifically based conclusions and recommendations.

The economic security of an enterprise is understood as general financial stability, resistance to internal and external changes and the ability to withstand various economic difficulties and uncertainties. It includes a set of conditions and measures that ensure the ability of the enterprise to maintain and improve its economic well-being over time. Economic security is essential for the sustainable growth, competitiveness and viability of an enterprise in a dynamic and often unpredictable business environment.

The main components of the economic security of the enterprise are as follows:

1. Financial Stability( Financial Stability): a financially secure enterprise will have a solid and healthy financial foundation. It implies having sufficient liquidity to maintain an optimal balance between assets and liabilities, effectively manage debt levels, and meet short-term liabilities.
2. Risk Management( Risk Management): economic security involves identifying, evaluating and managing the risks an enterprise may face. This includes financial risks, operational risks, market risks and external factors that can affect the activities of the enterprise.
3. Market competitiveness (Market Competitiveness): an economically secure enterprise is competitive in its market. This involves adapting to market trends, understanding customer needs, and constantly updating products or services to maintain or improve market share.
4. Supply Chain Resilience (): economic security requires a robust supply chain. Businesses must diversify suppliers, implement emergency plans, and ensure that they adapt to changes in the global market to minimize disruptions.
5. Technological adaptation (Technological Adaptation): economically safe enterprises easily implement technological achievements into their activities. This includes the use of innovative technologies to improve efficiency, reduce costs and maintain competitiveness in the industry.
6. Compliance with government Policies and Regulations (): Economic Security also includes compliance with and compliance with government policies and regulations. This includes understanding and complying with tax structures, trade policies, and industry-specific laws.
7. Environmental, social and governance (Environmental, Social, and Governance (ESG): modern considerations of economic security often involve adherence to ESG principles. Demonstrating environmental sustainability, social responsibility and strong management practices will contribute to the long-term economic security of the enterprise.
8. Crisis Management and Business Continuity (): economic security requires effective crisis management and business continuity planning. Businesses should be prepared to respond to surprises such as natural disasters, economic downturns, or global crises.
9. Data-Driven Decision Making (): enterprise managers enhance economic security by making informed decisions based on data analysis. It involves the use of data to assess risks, identify changes, and make strategic decisions that have a positive impact on the activities of the enterprise.
10. Global economic considerations (): the economic security of an enterprise is affected by current global economic changes. Managers must understand the interdependence of the world economy,

adapt to the dynamics of the international market and manage risks associated with global economic changes.

Taking into account the above, we have developed a table that combines the main components of the economic security of industrial enterprises, some of their indicators and formulas.

**Table 1. The main components of the economic security of industrial enterprises, some of their indicators and formulas**

| The main components of ensuring the economic security of industrial enterprises | Indecators | Formulas |
|---|---|---|
| 1. Financial stability | - Current liquidity ratio | Current liquidity ratio = working assets / short-term liabilities |
| | - The ratio of debt to equity | Debt to equity ratio = total debt / shareholder capital |
| | - Cash reserves | Monetary reserves ratio = monetary and monetary equivalents / total assets |
| 2. Risk management | - Risk assessment reports | Risk assessment score = weighted sum of identified risks |
| | - Emergency plans for major risks | Compliance with the emergency plan = number of plans implemented / Total plans |
| | - Market volatility indices | Volatility Index = standard deviation of Return |
| 3. Supply chain strength | -Supplier Diversity Index | Supplier Diversity Index = number of different suppliers / total suppliers |
| | - Supply chain interruption response time | Response time = recovery time / breakdown time |
| 4. Technological adaptation | - The level of adoption of new technologies | Adoption rate = (number of adopters / total population) * 100 |
| | - Performance improvement indicators | Efficiency increase = (new efficiency - old efficiency) / old efficiency |
| | - Growth in market share | Market share growth = (current market share - previous market share) / previous market share |
| 5. Government policies and regulations | - compliance with regulatory standards | Compatibility ratio = number of corresponding actions / Total Actions |
| | - tax burden and incentive analysis | Tax efficiency = (paid tax / net income) * 100 |
| 6. ESG factors | - Community engagement initiatives | Community participation score = (number of these appearances / total opportunities) * 100 |
| | - Compliance with management ratings and ethical standards | Control rating = weighted sum of control indicators |
| 7. Global economic trends | - Growth of international market share | International market share growth = (current international market share - previous international market share) / |

| | | |
|---|---|---|
| | | previous international market share |
| | - Currency risk management strategies | Currency risk = (foreign currency assets - foreign currency liabilities) / total assets |
| | - Trade balance trends | Savdo balansi = Jami eksport - Jami import |
| 8. Crisis management and business continuity | - Recovery time after disorders | Recovery time = time it takes to return to normal activities after the crisis |
| | - The presence of a comprehensive plan of business continuity | Plan availability = 1 (If plan is available) / 0 (if plan is not available |
| | - Use of data analysis tools | Data Analytics acceptance rate = (number of users / total users) * 100 |
| 9. Data-driven decision-making | - Use of data analysis tools | Data Analytics acceptance rate = (number of users / total users) * 100 |
| | - Accuracy of predictive models | Accuracy = (true positives + true negatives) / total predictions |
| | - Implementation of data-based strategies | Implementation success rate = (number of successful implementations / total implementations) * 100 |
| 10. Bozor raqobatbardoshligi | - Market share trends | Market share growth rate = (current market share - previous market share) / previous market share |
| | - Customer satisfaction indicators | Customer Satisfaction Index = (sum of satisfaction points / number of responses |
| | - ahsulot/level of innovation in services | Innovation rate = number of innovations / total products or services |

Taking into account the current ones, we developed an econometric model of economic frustration for industrial enterprises, in which we used the theoretical laws, laws and methods of economic security and econometrics.

We cite the econometric model developed to assess and ensure the economic security of industrial enterprises in the form of an equation. We cite the main variables to be included in the model and their descriptors [9]. The results are presented in an understandable format with an emphasis on the practical consequences of the model aimed at improving economic security.

1. Model specification: the proposed econometric model combines basic economic indicators to assess and ensure the economic security of industrial enterprises. The Model is designed to adapt to various industrial contexts and provides a comprehensive framework for decision making.
2. Variables:

A. Financial stability (FS): assessment of the financial condition of the enterprise using liquidity ratios, debt levels and profitability indicators.

B. Market competitiveness (MC): assessment of the company's position in the market by differentiating market share, price strategy and product.

V. External impact resistance (RES): measures the ability of a business to withstand external economic difficulties such as market fluctuations or geopolitical phenomena.

3. Equation :

"Economic security" =β0 + β1 * FS+ β2 *MC+ β3 * RES+ϵ

Here:

- "Economic security" - the general economic security of the enterprise. *β0,ß1FS,ß2MC,β3 * RES are coefficients representing financial stability, market competitiveness and external impact resistance weights.
- ϵ-error in the case when taking into account unobservable factors.

We will briefly analyze the equation of the econometric model of economic security of an industrial enterprise using the method “SWOT analysis”.

Strings (s) - strengths:

- Integrated approach: the Model takes into account several dimensions, ensuring a holistic view of economic security.
- ✓ Flexibility: can be adapted to different industrial environments, taking into account changes in the composition and dynamics of the industry.
- ✓ Quantitative assessment: the Model facilitates precise communication and comparative analysis, allowing economic security to be expressed in numerical values.

Weaknesses (W) - Disadvantages:

- Data requirements: the Model relies on accurate and timely data, and the lack of reliable data can affect its performance.
- Simplification: although simplicity has helped to understand, it can simplify complex economic interactions in business.

Opportunities:

Continuous improvement: the Model can be improved and expanded based on new economic theories and advances in econometrics.

AI integration: the use of artificial intelligence can increase forecasting capabilities, allowing real-time corrections.

T-Threats:

- External factors: economic models do not take into account unexpected external factors such as global economic crises or geopolitical events, which can lead to the emergence of uncertainty in relation to the external environment.
- Misinterpretation of the model: misinterpretation or misapplication of the model by the clock can lead to misjudgments affecting economic security.

**Conclusion.** In conclusion, econometric modeling of the economic security of industrial enterprises plays a decisive role in understanding and strengthening the foundations of economic stability. These models facilitate subtle analysis by quantifying the relationships between different economic variables, and allow for a more accurate and evidence-based understanding of complex dynamics. The positivity inherent in this approach provides its decision makers, policy makers and managers with the tools necessary to make conscious choices, to act with confidence in the economic landscape.

Through the use of econometric models, stakeholders can identify potential risks, anticipate challenges, and develop strategies to increase the economic security of industrial enterprises.

However, it is necessary to recognize specific problems associated with econometric modeling, such as data deficits and model assumptions. In maintaining a positive outlook, these problems should be

recognized not as insurmountable obstacles, but as opportunities for continuous improvement. The positive side of econometric modeling lies in its flexibility and the presence of the potential for improvement through the integration of new data and methodologies.

It emphasizes the optimistic potential for conscious decision-making, Risk Reduction and continuous improvement, while supporting a positive view of the efforts to protect the economic well-being of industrial enterprises.

It can be said that the econometric model is a valuable tool for assessing and ensuring the economic security of industrial enterprises, but its successful application requires a close examination of its strengths, weaknesses, capabilities and threats.

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