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Effective management strategies development based on modern information and analytical technologies

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Abstract: This research addresses the critical challenge of strategy implementation in Ukrainian enterprises facing market volatility and international competition. The methodological foundation of the research object incorporates several established management theories and approaches. The study develops an integrated methodology combining the Japanese Hoshin Kanri method with Vector Autoregressive (VAR) models to enhance strategic management effectiveness and enterprise competitiveness. The main contribution is a comprehensive three-stage framework: formation of enterprise performance indicator space, construction and analysis of VAR models for development dynamics, and selection of development priorities. The Hoshin Kanri method provides systematic approach to managing change through strategic planning (hoshin) and operational control (kanri) levels, while VAR models enable dynamic relationship analysis between current and lagged values of key indicators. Empirical validation using Anheuser-Busch InBev Ukrainian division demonstrates the methodology's effectiveness [2]. VAR models constructed for Current Assets indicators (Reserves, Accounts Receivable, Fixed Assets, Goods in Process) show strong explanatory power with R-squared values ranging from 0.9146 to 0.9904. The analysis reveals interconnection degrees among current asset components and identifies endogenous/exogenous variable relationships. The proposed integrated approach enables detection and prediction of non-linear cyclic processes, improves current assets management policy, and provides evidence-based recommendations for enhancing enterprise efficiency. This methodology offers practical solutions for strategic management implementation in volatile business environments.

Keywords: Strategic management, Hoshin Kanri, VAR-models, enterprise development, current assets, performance indicators, competitiveness, market volatility.

1. Introduction

In the context of constant changes in the external environment as well as market variability, the management of enterprises is faced with the need to apply effective strategic planning to increase its competitiveness.

Fast development of the modern domestic market increases need for strategic planning development of companies' activity.

Decrease in competitive potential of Ukrainian products, distribution of foreign goods in the domestic market, the international competition - all these problems make strategic planning one of the most important managerial problems, the solution will allow enterprises to develop and receive economic profit [15].

For effective functioning its the entity creation of strategies - one of the ways to ensure effective work in a competitive environment.

In order to avoid a decline in activity and promote its growth, it is necessary to create a strategic management system, based on strategy development by means of which the company achieves effective objectives. For effective management of the company at all levels attention is paid to ability to make optimal decisions which influence the future and compare the current activities with strategic objectives. The main objectives of strategic planning is optimum development set for strategy of long-term development and determination of the purposes [16]. Strategic planning capabilities enable a company to align itself with its long-term development. In today's economic conditions, the strategic role in planning is constantly increasing, since its application enables monitoring the future situation, which is the basis for planning the future development of the enterprise.

The development of industrial Ukraine enterprises occurs in conditions of uncertainty and instability for the external environment., as well as the weakened internal environment of the business entities themselves due to the use of obsolete technologies, methods and models of management in general. Despite a wide range of scientific papers dedicated to this subject, It remains important to solve the problems of assessing and analyzing the processes of enterprise development and making adequate management decisions on the development and implementation of development strategies in the unsteady state of the external and internal environment of the enterprise. The aim of the study is to build a set of models for studying the dynamics of enterprise under process of strategic development.

The purpose of the article is to justify the need for the development and application strategic management in enterprises using the method of Hoshin Kanri and dynamic models based on the study of an integrated approach of long-term and short-term processes.

2. Object and subject of research

The object of this research encompasses Ukrainian industrial enterprises operating under conditions of external environment uncertainty and market instability, characterized by weakened internal business environments due to obsolete technologies and ineffective management models. These enterprises face decreased competitive potential in domestic markets, intensified foreign competition, and significant gaps between strategic planning formulation and effective implementation. The research subject focuses on an integrated strategic management system that combines Hoshin Kanri methodology with dynamic Vector Autoregressive modeling approaches for comprehensive enterprise development analysis and strategic implementation effectiveness assessment.

The methodological framework operates through a dual-level approach incorporating strategic planning dimensions (Hoshin) and operational control mechanisms (Kanri), building upon established Management by Objectives principles, Total Quality Management concepts, and strategic deployment methodologies. However, several critical shortcomings characterize the existing operational conditions, including persistent implementation gaps, information management

deficiencies, communication barriers across organizational levels, imbalanced focus on planning versus execution, environmental instability effects, and inadequate resource management practices particularly in current assets formation and financial allocation.

3. Target of research

The primary research goal is to develop and validate a comprehensive integrated strategic management framework that effectively combines Hoshin Kanri methodology with dynamic Vector Autoregressive modeling techniques to enhance strategic implementation effectiveness and improve enterprise competitiveness among Ukrainian industrial organizations operating under uncertain economic conditions. This goal addresses the fundamental challenge of bridging the gap between theoretical strategic planning concepts and practical operational execution through systematic procedures for cascading strategic objectives while providing quantitative analytical tools for monitoring and adjusting strategic initiatives.

To achieve this overarching goal, the research establishes three primary objectives: formulating a comprehensive theoretical model that integrates Hoshin Kanri principles with quantitative dynamic analysis capabilities, implementing and validating Vector Autoregressive models for analyzing enterprise development dynamics and performance indicator interconnections, and conducting empirical validation through real enterprise case studies including systematic measurement of strategic implementation effectiveness. The research addresses critical improvement areas including methodological enhancement to bridge theory-practice gaps, decision-making optimization through systematic algorithms and causality assessment mechanisms, system integration combining qualitative and quantitative approaches with feedback mechanisms, and practical application framework development with detailed implementation guidelines specifically designed for Ukrainian enterprises operating in volatile economic environments.

4. Literature analysis

In the domain of enterprise strategy formulation, numerous approaches exist, necessitating careful justification and rigorous analysis. Foundational contributions by Peter Drucker [4], Joseph Juran [6], Yoji Akao [1], and Phillip W. Marksberry [11] have significantly shaped modern strategic planning theory. Drucker’s work on Management by Objectives (MBO) and Juran’s Strategic Quality Planning laid the foundation for aligning organizational goals and deploying policies across hierarchical levels. Akao later developed and formalized Hoshin Kanri—a strategic deployment methodology integrating MBO with Total Quality Management (TQM)—which emphasizes cascading goals vertically and horizontally through mechanisms like catchball and PDCA cycles [3, 20]. Marksberry quantitatively investigated Toyota's implementation of Hoshin Kanri, demonstrating its blend of emergent and deliberate strategy and its reliance on resource- and knowledge-based theories [11]. While each scholar advanced strategic planning, a single universal strategic management mechanism has yet to emerge.

5. Research methods

Most enterprises can not implement the developed strategy and this is one of the main problems faced by the modern business. The proper implementation in the strategy is so important that it was recognized by investors as the most important non-financial measure for the company's assessment. [18].

Success in the field of strategic management is achieved by those companies that skillfully implement the chosen strategy. The effectiveness of a strategy depends on many factors that impede or facilitate the implementation of the strategy. These factors are presented in Table 1.

Table 1. Factors that affect the process of implementing a strategy

Factors that interfere	Factors contributing
not specific goals; deviation from the goals; inappropriate information; adverse changes in resource allocation; energy dissipation; duration of decision-making; the destruction of trust between the leader and subordinates.	clear strategy; light organizational structure; image of the company's path through the system of processes; common values. clear strategy; light organizational structure; image of the company's path through the system of processes; common values.

You need to use different tools to implement the strategy: tactical and operational plans, communication systems, or simple ways to inform employees about the importance of the strategy. One of the most effective tools for monitoring and implementing a strategy is the use of the Hoshin Kanri method. Hoshin Kanri - this is a Japanese method of planning and quality management. Hoshin Kanri is a systematic approach to managing change in critical business processes [18].

Hoshin Kanri consists of two different levels. The first level of strategic planning (hozin) and the second level - operational control (kanri). Applying this method is not just a process for senior management to create vision or long-term plans, as well as a process for mid-level managers to effectively apply a cycle of processes within the company.

The undisputed advantage of companies that use the strategic indicator system is the impact of this system on the company's intellectual capital development. Hoshin Kanri requires the use of high-level skills and knowledge that will have a decisive influence on the implementation of the strategy. This method, as a management tool, allows to evaluate and modify the hypotheses that underlie a business strategy.

The effectiveness of Hoshin Kanri depends on the availability of a clear strategy developed jointly by management and staff [5]. Therefore, it makes no sense to use this method for companies that do not develop formalized strategies. For the best effect, when using Hoshin Kanri companies need:

Focus on strategy;

Develop effective management tools;

Regularly collect strategic information;

Develop employees in accordance with the company needs.

The introduction of Hoshin Kanri allows the organization to change the strategic course of its activities at will, since conditions are now created that allow you to influence what happens when new information is received [17].

Despite the fact that Hoshin Kanri can be one of the main tools for implementing the strategy, its use should be maintained through a management tool, such as budget, forecasting and other monitoring systems.

Hoshin Kanri is an effective management tool, but with its implementation as well as using other tools, there may be problems [19]. Often, company executives pay too much attention to planning and long-term strategic activities, which means that companies are more focused on developing a strategy than on its implementation. Analysis of the strategy of opportunities and methods of its implementation are less attractive due to their technical nature and irrationality [20].

The proposed set of models for studying the dynamics of enterprise development is based on the use of multidimensional analysis, econometric modeling and decision making [14], and includes the following main steps:

1. Formation of the information enterprise space performance indicators;

2. Build and analyze VAR – models (vector autoregressive) – vector autoregressive models for studying the dynamics development;

3. The choice of priorities for the development of the enterprise based on the analysis of VAR models.

At the first stage, the selection of the most significant indicators to assess the effectiveness of the enterprise. As a mathematical tool for solving problems of this stage, expert and finance analysis methods are considered. [12] The main task of the first stage is the assessment and analysis of the attribute space of the indicators of the enterprise's performance and the formation of an informative system of indicators.

At the second stage carried out the construction and analysis VAR – models in research dynamics of entities. The choice of this mathematical tool for the study of the development enterprises dynamics is due to the following features of these models:

– they are a convenient tool for short- and medium-term forecasting of individual time series.

– allow to detect a dynamic relationship between the current and lag values of the studied indicator;

– represent the apparatus of simulation in several time series using a system of dynamic equations which allows to include and explore the mutual feedbacks between indicators and their lag values.

– allow to perfectly describe and interpret the relationship between economic variables [3].

Algorithm of construction and analysis VAR – includes the following: [2, 4].

1. Checking the indicators time series for stationarity based on Dickey – Fuller's criterion.
2. Analysis of cause-effect connections in time series based on Grenger`s test.
3. Choice of order and VAR – models assessment adequacy.
4. Impulse analysis and variance decomposition analysis, based on estimated VAR – modules.
5. Prediction based on VAR – models.

At the third stage, the choice of priorities for the development enterprise is carried out on the basis of the analysis of VAR models, the use of which will allow:

– determine the processes nature as a whole and for individual local components;

– evaluate the dynamics and interconnection of the system's behavior trajectories;

– identify the causality and development trend of the analyzed enterprise's areas.

6. Research results

Hoshin Kanri requires effective communication because everyone involved in the implementation of the strategy (especially middle managers), employees must know and understand their role in implementing the strategy. The reluctance to share information, the lack of openness and transparency in the implementation process will stimulate unpleasant discussions among employees and slow down the process of implementing the strategy. The main sources of problems that arise during the implementation of the strategy are presented in fig. 1

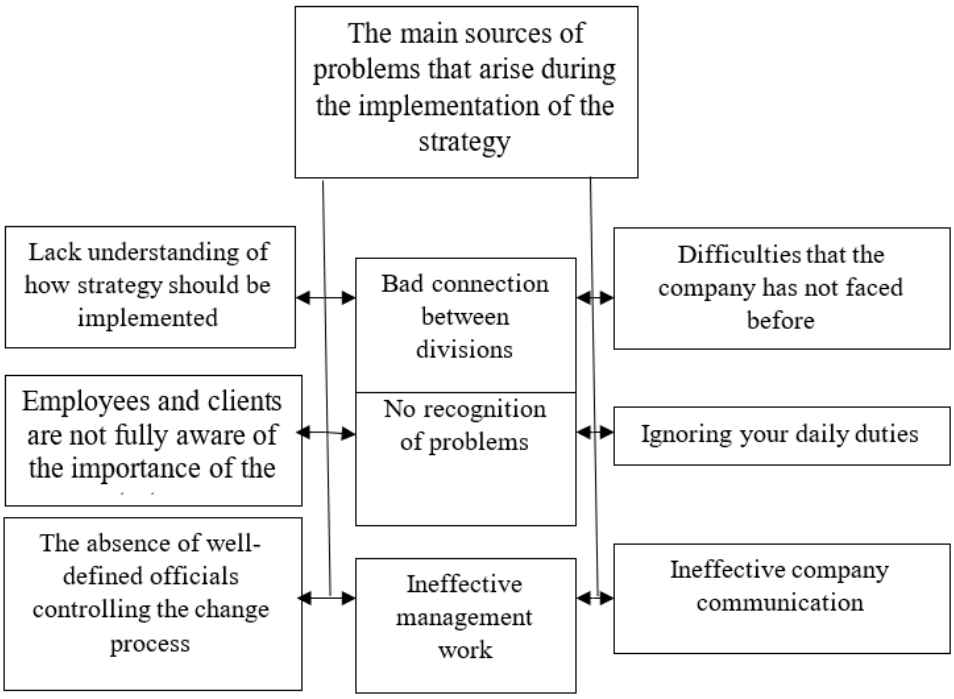


Figure 1. The main sources of the strategy implementation problems.

At present, the greatest weakness of strategic management lies in the practical issue of implementing a strategy [6]. Even the best strategy, carefully designed with the participation of employees, will not bring the company any benefit if the strategy was incorrectly and consistently implemented [7].

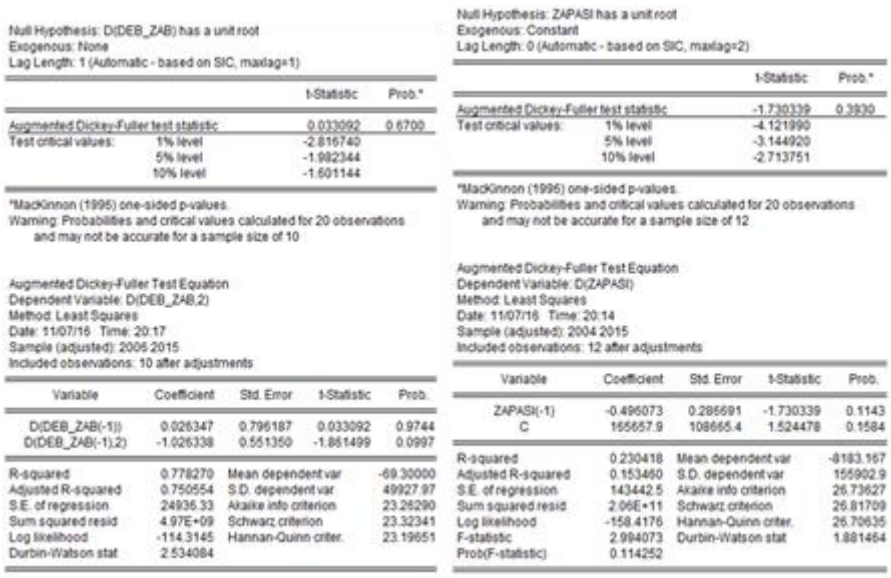
For the stable and dynamic development of enterprises, one of the primary tasks is to ensure financial stability based on the rational management in financial resources. A significant part of these financial resources goes to the formation of current assets. The development of market relations in Ukraine and the experience of the foreign economic system determine the dependence on the results of enterprises, and the effectiveness of managing the formation a process and use the current assets.

Financial management offers numerous methods and mechanisms for managing current assets, but all of them require significant adaptation as to the conditions of the enterprise under study and to account for certain parameters due to the instability in the external environment [6, 3].

The paper proposes the construction of VAR model to assess the interconnection degree the following indicators of Current Assets (C_A): Reserves (RS), Accounts Receivable (A_R), Fixed Assets (F_A), Goods in Process (G_P). Models are built on the example of the Kharkiv enterprise Anheuser-Busch InBev – Ukrainian division of the world's largest brewing concern Anheuser-Busch InBev [2, 5]. The company has been a leader in the Ukrainian beer market since 2000. The VAR model is constructed by EViews application program [9] based on a typical algorithm for VAR models constructing [10, 4].

The estimation of stationarity time series was carried out using the extended Dickey-Fuller test [8], the results fragment is presented in fig. 2. for the dynamics of Reserves and Accounts

Receivable. The test results confirm the hypothesis of stationarity series in levels, since the value of the criterion (ADF Test Statistic) less than critical (Critical Value) at 1%, 5%, 10% significance levels [10]. The indicators of the dynamics Fixed Assets and volumes of Goods in Process are stationary, which is a necessary condition for constructing the VAR model.



Null Hypothesis: D(DEB_ZAB) has a unit root
Exogenous: None
Lag Length: 1 (Automatic - based on SIC, maxlag=1)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.033092	0.6700
Test critical values:	1% level	-2.816740	
	5% level	-1.982344	
	10% level	-1.601144	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 10

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DEB_ZAB,2)
Method: Least Squares
Date: 11/07/16 Time: 20:17
Sample (adjusted): 2006 2015
Included observations: 10 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(DEB_ZAB(-1))	0.026347	0.796187	0.033092	0.9744
D(DEB_ZAB(-1),2)	-1.026338	0.551350	-1.861499	0.0997

R-squared	0.778270	Mean dependent var	-69.30000
Adjusted R-squared	0.750554	S.D. dependent var	49927.97
S.E. of regression	24936.33	Akaike info criterion	23.26290
Sum squared resid	4.97E+09	Schwarz criterion	23.32341
Log likelihood	-114.3145	Hannan-Quinn criter.	23.19651
Durbin-Watson stat	2.534084		

Null Hypothesis: ZAPASI has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.730339	0.3930
Test critical values:	1% level	-4.121990	
	5% level	-3.144920	
	10% level	-2.713751	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 12

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(ZAPASI)
Method: Least Squares
Date: 11/07/16 Time: 20:14
Sample (adjusted): 2004 2015
Included observations: 12 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ZAPASI(-1)	-0.496073	0.286691	-1.730339	0.1143
C	165657.9	108665.4	1.524478	0.1584

R-squared	0.230418	Mean dependent var	-8183.167
Adjusted R-squared	0.153460	S.D. dependent var	155902.9
S.E. of regression	143442.5	Akaike info criterion	26.73627
Sum squared resid	2.06E+11	Schwarz criterion	26.81709
Log likelihood	-158.4176	Hannan-Quinn criter.	26.70635
F-statistic	2.994073	Durbin-Watson stat	1.881464
Prob(F-statistic)	0.114252		

Figure 2. The results of testing indicators stationarity according to the Dickey-Fuller test (fragment).

To compare various hypotheses of the relationship, VAR-models were constructed with the lag value in one and two periods, which corresponds to the quarter, according to the reporting data. The final version of the model is selected based on the lowest value of the Akaike Information Criteria and Schwarz Criteria [12, 4]. From the obtained calculations, a choice was made in favor of second-order vector autoregression. The results of the adequacy the VAR-model for assessing the current assets relationship of the enterprise according to the main evaluation criteria are presented in fig. 3.

Adequacy criterion	Reserves (RS)	Accounts Receivable (A_R)	Fixed Assets (F_A)	Goods in Process (G_P)
R-squared	0.9904	0.9146	0.9478	0.9410
Adj. R-squared	0.9524	0.7267	0.7392	0.7051
Sum sq. resids	1.5E+08	4.5E+08	7.1E+10	1.6E+10
S.E. equation	8522.38	14914.0	187241.1	88877.6
F-statistic	26.010	3.3987	4.5440	3.9892
Log likelihood	-105.78	-111.94	-139.77	-131.57
Akaike AIC	20.870	21.989	27.049	25.559
Schwarz SC	21.195	22.315	27.375	25.885
Mean dependent	30202.4	21720.1	1484071.	345550.3
S.D. dependent	39062.4	10744.5	366687.5	163674.2

Figure 3. VAR model adequacy assessment.

The dynamic equations system of the VAR-model for assessing the relationships of indicators current assets is presented in fig. 4. The presented system reflects the nature of the short-term relationships the studied variables and shows how each specific indicator affects the change in all other indicators of the system.

$$
\begin{cases}
(RS) = 1.29 * (RS)(-1) + 4.23 * (RS)(-2) - 1.93 * (A\_R)(-1) - 1.62 * (A\_R)(-2) + \\
+ 0.14 * (F\_A)(-1) - 0.27 * (F\_A)(-2) + 0.05 * (G\_P)(-1) + 0.24 * (G\_P)(-2) + 101049.0 \\
\\
(A\_R) = 0.31 * (RS)(-1) + 1.18 * (RS)(-2) - 0.32 * (A\_R)(-1) + 0.06 * (A\_R)(-2) + \\
+ 0.03 * (F\_A)(-1) - 0.05 * (F\_A)(-2) + 0.05 * (G\_P)(-1) + 0.12 * (G\_P)(-2) + 48746.36 \\
\\
(F\_A) = 017.28 * (RS)(-1) + 61.13 * (RS)(-2) + 20.68 * (A\_R)(-1) + 16.03 * (A\_R)(-2) - \\
- 0.55 * (F\_A)(-1) - 1.09 * (F\_A)(-2) + 2.28 * (G\_P)(-1) + 5.32 * (G\_P)(-2) - 936094.1 \\
\\
(G\_P) = - 4.22 * (RS)(-1) - 12.9 * (RS)(-2) + 23.37 * (A\_R)(-1) + 18.96 * (A\_R)(-2) - \\
- 1.48 * (F\_A)(-1) + 2.25 * (F\_A)(-2) + 0.73 * (G\_P)(-1) - 1.45 * (G\_P)(-2) - 104909.0
\end{cases}
$$

Figure 4. The dynamic system of VAR model equations.

To study the dynamic properties of the model and its stability over time, an analysis based on impulse response functions was performed (fig. 5). This figure (fig. 5) shows how changes in one standard deviation (shock of one standard deviation) on one indicator will affect changes in all the others in the system under study. From fig. 5, we can conclude that the fluctuations decrease and approach zero with increasing time, i.e. we have damped oscillations that reflect the relative stability of the system.

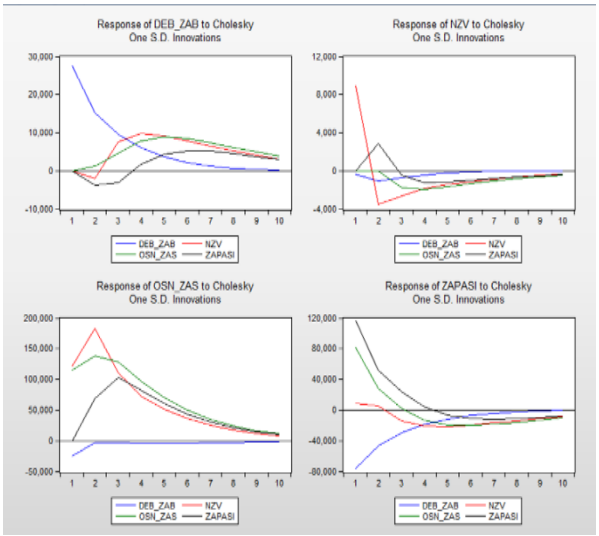


Figure 5. Dynamics of function of impulse responses for simulated variables.

To assess the degree of mutual influence studied indicators, the variance decomposition was constructed [13], a multidimensional graph is shown in fig. 6. Based on the analysis of the graphs, we can conclude about the level of endogeneity or exogeneity of each studied model variables and quantify the mutual level influence in the dynamics, as follows:

– the variance decomposition for accounts receivable and work in progress indicators show that the trajectories of these indicators in dynamics are explained by their previous values, i.e. changes in time to a greater extent explain themselves - the variables are exogenous.

– in the dynamics of changes in receivables and work in progress are explained by a change in the volume of work in progress by 20% and inventories by 15%, respectively.

– a change in the level of fixed assets is explained by a 50% change in work in progress and a 20% change in inventories.

– a change in the dynamics of Reserves by 20-30% depends on the state of receivables and fixed assets and less than 50% is determined by its previous values.

Thus, the most endogenous variable is the indicator of fixed assets, first of all, and reserves which are more dependent on the dynamics of changes in related indicators.

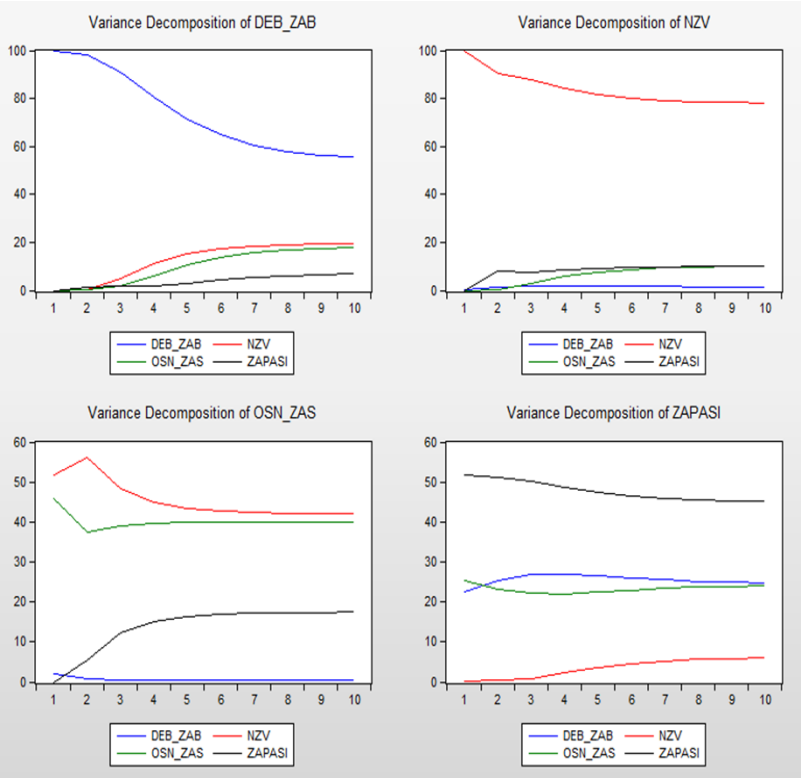


Figure 6. Graph of the variance decomposition of variables.

Thus, the proposed toolkit allows you to improve the management policy of enterprise current assets on the basis of identifying the degree of causality and interdependence for the studied time period and selected indicators, which can become the basis for adjusting management decisions of various time horizons and structural relationships.

7. Prospects for further research development

Future research development prospects include expanding the methodological framework through integration of additional quantitative analysis methods, such as cointegration models and panel regression techniques, to achieve deeper understanding of long-term relationships between strategic enterprise indicators. The developed integrated strategic management system could be adapted for various sectoral applications within the Ukrainian economy, including agriculture, information technology, and energy sectors, with subsequent creation of industry-specific modifications of Hoshin Kanri methodology and corresponding VAR models. Further research directions may focus on developing automated strategic decision support systems based on the obtained results, incorporating artificial intelligence and machine learning elements for strategic scenario forecasting, as well as exploring the applicability of this methodology under conditions of post-crisis economic recovery and digital transformation of Ukrainian enterprises in the context of evolving global market dynamics and technological advancement.

8. Conclusions

In conclusion, this research addresses the critical challenge faced by Ukrainian enterprises operating within an unstable economic context, characterized by intense market competition and internal operational weaknesses. The study underscores the significant gap that often exists between

strategic planning and effective implementation, which is identified as a primary obstacle to achieving sustained competitiveness and profitability. To bridge this gap, the paper proposes a novel integrated framework that combines the principles of Hoshin Kanri with the analytical power of dynamic modeling.

The research advocates for Hoshin Kanri as a foundational management system to ensure that strategic objectives, formulated at the highest level, are effectively translated into coherent operational actions throughout the organization. This methodology fosters alignment, transparency, and continuous improvement by involving all levels of personnel in the strategic process. However, the study recognizes that a qualitative framework alone is insufficient. Therefore, it introduces a quantitative component through the application of Vector Autoregressive (VAR) models. This set of models provides a robust tool for analyzing the complex, dynamic interdependencies among key enterprise performance indicators over time.

By applying this hybrid approach to the case of the Anheuser-Busch InBev enterprise in Ukraine, the study successfully demonstrates its practical utility. The VAR analysis of financial indicators such as Reserves, Accounts Receivable, Fixed Assets, and Goods in Process revealed crucial causal relationships and feedback loops. A key finding from the variance decomposition analysis was the identification of certain variables as largely endogenous, meaning their dynamics are significantly influenced by other indicators within the system. Specifically, changes in Fixed Assets and Reserves were shown to be heavily dependent on the fluctuations in other current assets.

Ultimately, this research contributes a valuable toolkit for modern strategic management. It provides managers with a mechanism to not only cascade strategic goals but also to quantitatively assess the impact of their decisions on the interconnected parts of the business. By understanding the nature and degree of these interdependencies, enterprises can formulate more nuanced, data-driven strategies and adjust their management policies more effectively. This integrated approach enhances the ability of a company to navigate uncertainty, optimize resource allocation, and foster stable, long-term development in a volatile environment.

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