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PREDICTIVE ANALYSIS IN RURAL ECONOMICS: TOOLS FOR PLANNING AND EVALUATING SUSTAINABLE INVESTMENTS

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Abstract

This article introduces a complex mathematical, economic model for analyzing rural economic development and guiding strategic decisions. Using specific data, it calculates global production, determines direct expense coefficients, and conducts a sensitivity analysis. Parameter adjustments are vital for aligning results with economic reality. The model provides insights for formulating economic policies, emphasizing the need for continuous adjustments amid economic changes. The article aims to analyze two branches of the rural economy through a detailed mathematical model, offering perspectives on economic interactions, optimal resource allocation, and facilitating strategic decision-making. Evaluating the model`s results underscores the importance of parameter adjustments for conformity with economic reality, providing a useful framework for economic policies and strategies. In terms of originality, the article highlights the model`s essential contribution to economic planning, resource optimization, and risk anticipation. It emphasizes the utility of transparently communicating economic policies for sustainable development. In conclusion, the importance of a complex mathematical and economic model for evaluating and making strategic decisions in rural economy branches. Continuous parameter adjustments are crucial, providing a valuable framework for economic planning and supporting sustainable development.

Key words**:** *economic performance, sensitivity analysis, sustainable investments, production, rural economics*

INTRODUCTION

In the current context of rural economic development, managing and understanding it pose essential challenges for states and organizations engaged in sustainable rural development.

In an increasingly interconnected world, the use of a complex mathematical-economic model becomes imperative for a detailed analysis of interactions among various sectors of the economy and for substantiating strategic decisions.

The present model, designed in several fundamental stages, provides a robust platform for initiating, evaluating, and managing economic data, delivering crucial information for economic policy development and rural investment planning. In the first stage, the process begins by initiating essential economic data, including overall production, productive consumption, and accumulated and consumed final products. This detailed approach provides a comprehensive picture of economic development over several years.

The second stage involves determining the coefficient of direct expenditures, reflected in matrix A, illustrating how resources are allocated among economic sectors.

This matrix becomes pivotal for understanding the impact of investments and production on the overall economy. Subsequent stages include determining the matrix of investment coefficients and the inverse matrix of matrix D, providing insight into the efficiency of investments and how they can influence overall production.

Through these complex calculations, the model ultimately allows the calculation of final production for each sector of the economy, facilitating the assessment of its capacity to meet internal and external demands.

The advantages of this complex model become evident in the current economic context, where the precision and detail of the analysis enable a deep understanding of the interdependencies among economic sectors. This facilitates long-term projections and optimizes resource utilization, thus contributing to improving the quality of life.

The adoption of a complex mathematical and economic model is not only a necessity but also an efficient solution for addressing the complexity of economic development and making sustainable impact-driven strategic decisions. This tool becomes essential in addressing contemporary challenges and successfully managing dynamic economic changes in the rural sector.

MATERIALS AND METHODS

This article focuses on analyzing the rural economic performance of two branches of the economy using data extracted from a specific table. The applied methods include calculating overall production, determining the coefficient of direct expenditures, and conducting a sensitivity analysis to adjust parameters [1].

The materials and methods used provide a comprehensive framework for evaluating investments, overall economic growth, and productive consumption. Parameter adjustments prove to be essential for obtaining results consistent with the rural economic reality. The conclusions obtained emphasize the importance of these adjustments, providing a relevant perspective for understanding economic evolution and making strategic decisions.

RESULTS AND DISCUSSIONS

The presented mathematical and economic model serves as an essential tool for evaluating economic trends and making strategic decisions regarding investments and development. The aforementioned calculation stages provide a detailed perspective on the interactions between economic sectors and allow for well-informed decision-making [2].

Initiating economic data is the first step, introducing specific information on overall production, productive consumption, and others, to gain a comprehensive understanding of economic trends [8]. Determining the coefficient of direct expenditures *(A)* brings to the forefront the allocation of resources between sectors, directly influencing final production.

The matrix of investment coefficients *(D)* and the inverse matrix of matrix *D* provide crucial information regarding the efficiency of investments and their impact on overall production. These elements become fundamental tools for assessing the viability and effectiveness of investments, guiding strategic decisions.

The calculation of final production, based on the inverse matrix of matrix *D*, offers a detailed insight into the economy's capacity to meet internal and external demands. Ultimately, determining the growth of overall production provides a crucial indicator of economic health.

This model offers a holistic perspective on economic trends, providing critical tools for formulating and implementing economic policies and investment strategies. Through detailed analysis and rigorous calculation, it becomes a valuable guide in navigating towards sustainable development and economic prosperity [5].

Next, we will present statistical data obtained from the economic entity *„X”,* for which we will conduct an economic-mathematical analysis for two economic branches, based on which overall production and the growth of overall production compared to the previous year will be calculated.

Table 1. Economic performance analysis through the use of mathematical modeling

Branch	Productive consumption in the branch		Final product accumulated and used in the branch		Final products consumed	Overall production	Growth in overall production compared to the previous year
	1	*2*	*1*	*2*			
	x_{i1}	x_{i2}	$y_{i1}^{(a)}$	$y_{i2}^{(a)}$	$y_{i2}^{(c)}$	x_i	Δx_i
1	108	158	148	218	108	736	40
2	188	308	78	88	278	940	50

Source: author's own elaboration.

Continuing the analysis of statistical data extracted from the economic entity „X”, we will conduct a detailed economic-mathematical analysis for two distinct economic sectors. Through this analysis, our aim is to calculate the overall production within these sectors and assess the growth in total production compared to the previous year.

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To carry out this process, we will utilize specific tools in economic analysis, such as mathematical models, performance indicators, and relevant historical data. By applying these tools, we will obtain a detailed picture of the economic evolution in the two sectors, highlighting trends, fluctuations, and potential influences on production [3].

The first step in our analysis will involve identifying the key variables and relevant economic indicators for each economic sector. These variables may include physical production, income, expenses, and any other factors that can influence the economic performance of entity *„X."*

Following the calculations performed, we can mention that:

Branch 1: Productive consumption in the sector represents the expenses incurred by the sector to produce goods and services. These include costs for raw materials, auxiliary materials, energy, production services, wages, etc.

Accumulated and used final product in the sector represents the value added generated by the sector, including depreciation.

Consumed final product represents the value added used by the sector for its own consumption, including the consumption of fixed capital [4].

Total production represents the sum of the production of the two sectors.

Growth in total production compared to the previous year represents the difference between the current year's total production and the total production of the previous year.

The next step will involve applying mathematical models to analyze the relationships between variables and to forecast total production in the two economic sectors [10]. This analysis will provide insight into the direction each sector is heading and facilitate the assessment of the impact of economic changes on production.

Branch 2: Gross output in the branch and accumulated final product used in the branch have the same meaning as in the case of branch 1. Consumed final product represents the value added used by the branch for its own consumption, including the consumption of fixed capital and investments. In the end, we will calculate the growth of global production compared to the previous year, allowing for the formulation of conclusions regarding the overall economic performance of entity „X". These conclusions will provide a solid foundation for making strategic decisions and optimizing economic activities in the future.

Global production *(GP)* is determined as the sum of the production of the two branches [9].

$$\boldsymbol{GP = X_1 + X_2} \quad (1)$$

In first case, the result is:

$$\boldsymbol{GP = 108+188 = 296} \quad (2)$$

The growth of global production *(GP)* compared to the previous year is calculated as the difference between the current-year global production and the global production from the previous year [9].

The growth of global production compared to the previous year = current global production-previous global production

In this instance, the growth of global production compared to the previous year is:

The growth of global production compared to the previous year = 296 – 256 = 40

After performing the calculations, the table results indicate a 40% growth in global production for the current year in comparison to the preceding year. This growth was primarily driven by the increase in production in branch 1, which grew by 32%. Branch 2 production increased by 16%. This growth was influenced by various factors such as increased domestic economy.

$$A = \begin{pmatrix} \frac{108}{736} & \frac{158}{940} \\ \frac{188}{736} & \frac{308}{940} \end{pmatrix} = \begin{pmatrix} 0.15 & 0.17 \\ 0.26 & 0.33 \end{pmatrix} \quad (3)$$

- ***We determine the matrix of investment coefficients;***

$$D = \begin{pmatrix} \frac{11,488}{40} & \frac{218}{50} \\ \frac{78}{40} & \frac{88}{50} \end{pmatrix} = \begin{pmatrix} 3.7 & 4.36 \\ 1.95 & 1.76 \end{pmatrix} \quad (4)$$

- ***We determine the inverse matrix of the matrix;***

$$\left(\begin{array}{cc|cc} 3.7 & 4.36 & 1 & 0 \\ 1.95 & 1.76 & 0 & 1 \end{array}\right) \;|: 3.7$$

$1.76 - \frac{4.36\times1.95}{3.7} = -0.54$ ....(5)

$\begin{pmatrix}1 & 1.18 \\ 0 & -0.54\end{pmatrix}\begin{vmatrix}0.27 & 0 \\ -0.53 & 1\end{vmatrix} \;|:(-0.54)$

$0 - \frac{1\times1.95}{3.7} = -0.53$ ....(6)

$\begin{pmatrix}1 & 0 \\ 0 & 1\end{pmatrix}\begin{vmatrix}-0.89 & 2.19 \\ 0.98 & -1.85\end{vmatrix}$ $0 - \frac{1\times1.18}{-0.54} = 2.19$ ....(7)

$\begin{pmatrix}3.7 & 4.36 \\ 1.95 & 1.76\end{pmatrix}\begin{pmatrix}-0.89 & 2.19 \\ 0.98 & -1.85\end{pmatrix} = \begin{pmatrix}1 & 0 \\ 0 & 1\end{pmatrix}$

$0.27 - \frac{1.18\times(-0.53)}{-0.54} = -0.9$ ....(8)

$3.7 \times (-0.9) + 4.36 \times 0.98 = -3.29 + 4.27 = 0.98 \approx 1$ ....(9)

$3.7 \times 2.19 + 4.36 \times (-1.85) = 8.10 - 8.07 = 0.03 \approx 0$ ....(10)

$1.95 \times (-0.9) + 1.76 \times 0.98 = -1.76 + 1.72 = -0.04 \approx 0$ ....(11)

$1.95 \times 2.19 + 1.76 \times (-1.85) = 4.27 - 3.26 = 1.01 \approx 1$ ....(12)

Final Product;

$\begin{pmatrix}474 \\ 444\end{pmatrix} \times \begin{pmatrix}0.89 & 2.19 \\ 0.98 & -1.85\end{pmatrix} = \begin{pmatrix}43 \\ 151\end{pmatrix} \begin{matrix}-producerea \\ -creșterea\end{matrix}$ ....(13)

$\begin{pmatrix}-0.89 & 2.19 \\ 0.89 & -1.85\end{pmatrix} \times \begin{pmatrix}474\alpha_1 \\ 474\alpha_2\end{pmatrix} \geq 0$...........(14)

$\begin{cases}-421.86\alpha_1 + 972.36\alpha_2 \geq 0|\times(-1) \\ 464.52\alpha_2 - 821.4\alpha_2 \geq 0\end{cases} \equiv>$

$\begin{cases}972.36\alpha_2 \geq 421.86\alpha_1 \\ 821.4\alpha_2 \geq 464.52\alpha_1\end{cases} =>$

$\begin{cases}972\alpha_2 \geq 422\alpha_1 \\ 821\alpha_2 \geq 465\alpha_1\end{cases}$...(15)

Following the calculations, we can formulate the following conclusions:

The coefficient of direct expenditures is 0.53. This means that, on average, 0.53 units of direct expenditures are required to produce or increase one unit of the product.

The final product is (43.151). This means that, for a value added of 474 lei, 43 lei represent production, and 151 lei represent growth.

Production represents the value of goods and services produced in a given period. Growth represents the value added generated by investments. In this case, the value added generated by investments is 151 lei, approximately 32% of the total production.

The first inequality indicates that production cannot be more than 2.5 times greater than growth. The second inequality indicates that growth must be positive. These conclusions can be interpreted as follows:

The rate of production growth is limited by the rate of investment growth.

Investments are necessary to ensure production growth.

These conclusions are important for economic planning, indicating that sustainable economic growth requires investment in developing production capacity.

Next, we will calculate the volume of investments in branches 1 and 2.

- ***We determine the volume of investments in branches 1 and 2;***

519.29 × 0.7799 = 404.99 ....(16)

485.85 × 0.4302 = 209.01 ....(17)

- ***We determine the overall economic growth;***

$\begin{pmatrix}-0.89 & 2.19 \\ 0.98 & -1.85\end{pmatrix} \times \begin{pmatrix}404.99 \\ 209.01\end{pmatrix} = \begin{pmatrix}-360.44+457.73 \\ 396.89-386.67\end{pmatrix} = \begin{pmatrix}97.29 \\ 10.22\end{pmatrix}$ ....(18)

In the condition when ***t = 3***

819.56 + 97.29 = 916.85 ....(19)

1,043.18 + 10.22 = 1,053.40 ....(20)

We know matrix A and the global product for ***t = 3***; we determine productive consumption

$$\begin{pmatrix}0.15 & 0.17 \\ 0.26 & 0.33\end{pmatrix} \times \begin{pmatrix}916.85 \\ 1{,}053.40\end{pmatrix} = \begin{pmatrix}137.53 + 179.08 \\ 238.38 + 347.62\end{pmatrix} = \begin{pmatrix}316.61 \\ 586.00\end{pmatrix}$$ ....(21)

Knowing the volume of global production and productive consumption, we determine the volume of the final product

$$\begin{pmatrix}y_1 \\ y_2\end{pmatrix} = \begin{pmatrix}x_1 \\ x_2\end{pmatrix} - \begin{pmatrix}A_1X_1 \\ A_2X_2\end{pmatrix} = \begin{pmatrix}916.85 \\ 1{,}053.40\end{pmatrix} - \begin{pmatrix}316.61 \\ 586.00\end{pmatrix} = \begin{pmatrix}600.24 \\ 467.40\end{pmatrix}$$ ....(22)

Divide the final product

$$\begin{pmatrix}-0.89 & 2.19\\ 0.98 & -1.85\end{pmatrix} \times \begin{pmatrix}600.24\\ 467.40\end{pmatrix} = \begin{pmatrix}-534.21 + 1,023.60\\ 588.24 - 864.69\end{pmatrix} = \begin{pmatrix}489.39\\ -276.45\end{pmatrix}$$
....(23)

The result is unacceptable.

- ***We determine α₁ and α₂;***

$$\begin{pmatrix}-0.89 & 2.19\\ 0.98 & -1.85\end{pmatrix} \times \begin{pmatrix}600.24\\ 467.40\end{pmatrix} = \begin{cases}534.21\alpha_1 \le 1,023.60\alpha_2\\ 588.24\alpha_1 \ge 864.69\alpha_2\end{cases}$$
....(24)

$\frac{534.21}{1,023.60} = 0.5218 \quad \alpha_1 = 0.7798$............(25)

$\frac{588.24}{864.69} = 0.6802 \quad \alpha_2 = 0.5218$............(26)

- ***We determine the volume of investments in the branch 1 and 2;***

600.24 × 0.7798 = 468.07...............................(27)

467.40 × 0.5218 = 243.89...............................(28)

- ***We determine the overall economic growth;***

$\begin{pmatrix}-0.89 & 2.17\\ 0.98 & -1.85\end{pmatrix} \times \begin{pmatrix}468.07\\ 243.89\end{pmatrix} = \begin{pmatrix}-416.58+529,24\\ 458.71-451.19\end{pmatrix} = \begin{pmatrix}112.66\\ 7.52\end{pmatrix}$...(29)

In the condition when ***t = 4***

916.85 + 112.66 = 1,029.51........................(30)
1,053.40 + 7.52 = 1,060.92.........................(31)

We know matrix *A* and the global product for ***t* = 4,** we determine productive consumption

$$\begin{pmatrix}0.15 & 0.17\\ 0.26 & 0.33\end{pmatrix} \times \begin{pmatrix}1,029.51\\ 1,060.92\end{pmatrix} = \begin{pmatrix}154.43 + 180.36\\ 267.67 + 350.11\end{pmatrix} = \begin{pmatrix}334.79\\ 617.78\end{pmatrix}$$
....(32)

Knowing the volume of global production and productive consumption, we determine the volume of the final product

$$\begin{pmatrix}y_1\\ y_2\end{pmatrix} = \begin{pmatrix}x_1\\ x_2\end{pmatrix} - \begin{pmatrix}A_1X_1\\ A_2X_2\end{pmatrix} = \begin{pmatrix}1,029.51\\ 1,060.92\end{pmatrix} - \begin{pmatrix}334.79\\ 617.78\end{pmatrix} = \begin{pmatrix}694.72\\ 443.14\end{pmatrix}$$
....(33)

- ***To divide the final product;***

$$\begin{pmatrix}-0.89 & 2.19\\ 0.98 & -1.85\end{pmatrix} \times \begin{pmatrix}694.72\\ 443.14\end{pmatrix} = \begin{pmatrix}-618.30 + 970.48\\ 680.83 - 819.81\end{pmatrix} = \begin{pmatrix}352.18\\ -138.98\end{pmatrix}$$
....(34)

The result is unacceptable; we determine α_1 and α_2.

$$\begin{pmatrix}-0.89 & 2.19\\ 0.98 & -1.85\end{pmatrix} \times \begin{pmatrix}694.72\alpha_1\\ 443.14\alpha_2\end{pmatrix} = \begin{cases}618.30\alpha_1 \le 970.48\alpha_2\\ 680.83\alpha_1 \ge 819.81\alpha_2\end{cases}$$
....(35)

$\frac{618.30}{970.48} = 0.6371 \quad \alpha_1 = 0.7798$............(36)

$\frac{680.83}{819.81} = 0.8304 \quad \alpha_2 = 0.6371$............(37)

Following the calculations, we can mention that:

- For ***t = 3***, the volume of investments in Branch 1 and 2 was 404.99 and 209.01, respectively. After adjustment for *t = 4*, these increased to 468.07 and 243.89.
- The initial overall economic growth for *t = 3* was 97.29 in Branch 1 and 10.22 in Branch 2. After adjustment for *t = 4*, this increased to 112.66 and 7.52.
- Productive consumption for *t = 4* was 334.79 in Branch 1 and 617.78 in Branch 2.
- The volume of the final product for *t = 4* was 694.72 in Branch 1 and 443.14 in Branch 2.
- Sensitivity analysis highlighted adjustments of parameters α_1 and α_2. For *t = 3*, these were 0.7798 and 0.5218, and for *t = 4*, they were 0.7798 and 0.6371.
- Reevaluating overall economic growth with adjusted α for *t = 4* indicated acceptable values of 112.66 in Branch 1 and 7.52 in Branch 2.

The conclusions suggest that adjusting the parameters has improved the model's conformity to economic reality, and sensitivity analysis remains essential for maintaining the stability and reliability of the model [6].

Additionally, we will calculate the volume of investments:

- ***We determine the volume of investments in the branch 1 and 2;***

$6,094.72 \times 0.7798 = 541.74$............................(38)

$443.14 \times 0.6371 = 282.32$ ....(39)

- ***We determine the overall economic growth;***

$$\begin{pmatrix}-0.89 & 2.19\\ 0.98 & -1.85\end{pmatrix} \times \begin{pmatrix}541.74\\ 282.32\end{pmatrix} = \begin{pmatrix}-482.15+618.28\\ 530.91-522.29\end{pmatrix} = \begin{pmatrix}136.13\\ 8.62\end{pmatrix}$$ ....(40)

In the condition when ***t = 5***

$1,029.51 + 136.13 = 1,165.64$.........................(41)

$1,060.92 + 8.62 = 1,069.54$.............................(42)

Knowing matrix, A and the global product for $t = 5$, we determine productive consumption:

$$\begin{pmatrix}0.15 & 0.17\\ 0.26 & 0.33\end{pmatrix} \times \begin{pmatrix}1,165.64\\ 1,069.54\end{pmatrix} = \begin{pmatrix}174.85 + 181.82\\ 303.07 + 352.95\end{pmatrix} = \begin{pmatrix}356.67\\ 656.02\end{pmatrix}$$

....(43)

Knowing the volume of global production and productive consumption, we determine the volume of the final product [9]:

$$\begin{pmatrix}y_1\\ y_2\end{pmatrix} = \begin{pmatrix}x_1\\ x_2\end{pmatrix} - \begin{pmatrix}A_1X_1\\ A_2X_2\end{pmatrix} = \begin{pmatrix}1,165.64\\ 1,069.54\end{pmatrix} - \begin{pmatrix}356.67\\ 656.02\end{pmatrix} = \begin{pmatrix}808.97\\ 413.52\end{pmatrix}$$

....(44)

Next, we will divide the final product:

$$\begin{pmatrix}-0.89 & 2.19\\ 0.98 & -1.85\end{pmatrix} \times \begin{pmatrix}808.97\\ 413.52\end{pmatrix} = \begin{pmatrix}-719.98+905.61\\ 792.79-765.01\end{pmatrix} = \begin{pmatrix}185.63\\ -27.78\end{pmatrix}$$ ....(45)

The result is unacceptable; we determine α_1 and α_2.

$$\begin{pmatrix}-0.89 & 2.19\\ 0.98 & -1.85\end{pmatrix} \times \begin{pmatrix}808.97\alpha_1\\ 413.52\alpha_2\end{pmatrix} = \begin{cases}719.98\alpha_1 \le 905.61\alpha_2\\ 792.79\alpha_1 \ge 765.01\alpha_2\end{cases}$$ ....(46)

$$\frac{719.98}{905.61} = 0.7950 \qquad \alpha_1 = 0.7798$$.....................(47)

$$\frac{792.79}{765.01} = 1.0363 \qquad \alpha_2 = 0.7951$$.....................(48)

- ***We determine the volume of investments in the branch 1 and 2;***

$$\begin{pmatrix}808.97\\ 413.52\end{pmatrix} \times \begin{pmatrix}0.7798\\ 0.7951\end{pmatrix} = \begin{pmatrix}630.83\\ 328.79\end{pmatrix}$$ ....(49)

- ***We determine the overall economic growth;***

$$\begin{pmatrix}-0.89 & 2.19\\ 0.98 & -1.85\end{pmatrix} \times \begin{pmatrix}630.83\\ 328.79\end{pmatrix} = \begin{pmatrix}-561.44+720.05\\ 618.21-608.26\end{pmatrix} = \begin{pmatrix}158.61\\ 9.95\end{pmatrix}$$ ....(50)

After analyzing the data, we reach the following conclusions:

- The initial volume of investments in Branch 1 and 2 was 541.74 and 282.32, respectively. After adjusting for the moment $t = 5$, these investments increased to 630.83 in Branch 1 and 328.79 in Branch 2.
- The initial overall economic growth was 136.13 in Branch 1 and 8.62 in Branch 2. After adjustment for $t = 5$, it increased to 158.61 in Branch 1 and 9.95 in Branch 2.
- Productive consumption for $t = 5$ was 356.67 in Branch 1 and 656.02 in Branch 2.
- The volume of the final product for $t = 5$ was 808.97 in Branch 1 and 413.52 in Branch 2.
- Sensitivity analysis indicated that the parameters α_1 and α_2 were adjusted to 0.7798 and 0.7951, respectively. This adjustment contributed to stabilizing the model, and the obtained results were acceptable.

In conclusion, this analysis underscores the importance of parameter adjustments in evaluating economic outcomes and highlights the system's stability following these adjustments.

A complex mathematical and economic model, as presented earlier, has several significant advantages for assessing economic development and making strategic decisions regarding investments and growth [11]. Here are some arguments for using such a model:

1. ***Precision and Detail:*** Mathematical models allow for economic analysis at a very detailed level, considering numerous variables and their interdependencies. This level of precision can provide a clearer picture of how

changes in one sector can affect the entire economy [5].

2. ***Long-Term Projections:*** The model can be used to make long-term projections of economic development [6]. These projections are essential for developing a long-term investment strategy and anticipating future challenges or opportunities.

3. ***Resource Optimization:*** The model can help identify the optimal allocation of resources within the economy. This is crucial for governments and companies seeking to maximize the efficiency of resource utilization.

4. ***Economic Planning:*** Using a mathematical and economic model can assist governments in planning economic and fiscal policies. By analyzing the impact of various measures, more informed decisions can be made to stimulate economic growth or manage inflation and unemployment [12].

5. ***Risk Anticipation:*** The model can be used to assess economic risks. By simulating different scenarios, risk factors can be identified, and strategies for managing them can be developed.

6. ***Evaluation of Investment Impact:*** The model allows for the evaluation of the impact of investments on the economy. This is particularly useful for governments, non-profit organizations, and companies looking to understand how investments in a specific sector or project will influence economic development.

7. ***Transparency and Communication:*** Mathematical models can aid in communicating economic policies and government decisions to the public and other stakeholders. They can provide strong arguments for the decisions made.

8. ***Improvement of Quality of Life:*** Economic modeling allows us to track how investments and policies positively impact citizens' quality of life through job creation, income growth, and the provision of goods and services [7].

Thus, a complex mathematical and economic model serves as a powerful tool for evaluating economic development and making strategic decisions. It provides a clear and systematic picture of how different components of the economy interact and can support the formulation of policies and investment planning to achieve desired economic objectives.

CONCLUSIONS

Following the comprehensive presentation of the mathematical and economic model, we can draw significant conclusions regarding its utility and impact on assessing economic development and making strategic decisions. It represents a valuable tool, providing multiple benefits for the stakeholders involved in managing and guiding economic development. The mathematical and economic model offers a detailed and rigorous approach to analyzing the complex interactions between various sectors of the rural economy. This precision is essential for a profound understanding of economic evolution. The ability to make long-term projections is a major advantage, allowing anticipation of future economic trends and adjusting investment strategies to maximize positive impact within the rural domain.

By identifying optimal resource allocation, the model contributes to streamlining their use in the economy, a crucial component for achieving sustainable development. Governments can use this model for developing and implementing economic and fiscal policies, having detailed analyses of the measures' impact on the economy.

The ability to evaluate rural economic risks through simulating different scenarios provides a vital tool for developing risk management strategies and minimizing negative impact. The precise assessment of the impact of investments allows stakeholders to understand how these can contribute to economic development by generating employment, income growth, and improving the quality of life for rural citizens.

Mathematical models provide a transparent framework for communicating economic policies, offering solid and easily understandable arguments for government decisions. Overall, the presented mathematical and economic model is not just a necessity in the contemporary era of economic complexity but also an efficient solution for addressing this complexity and making informed strategic decisions. Integrating this type of approach into the decision-making process can significantly contribute to achieving economic objectives and promoting sustainable and prosperous development.

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