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# ECONOMIC SCIENCE AND ECONOMIC-MATHEMATICAL MODELING

***Abstract.*** *The global crisis, which has required a rethinking of economic knowledge and corresponding economic and mathematical models (EMM), makes us to return to the origins of the economic science and EMM. Thus the exceptional urgency to exit the global crisis gains the Marx theory of reproduction which study the objective economic laws, and the EMM based on this theory which helps to build the cyber system in order to enter the path of the social progress. The article shows that the EMM, which historical goal was to understand the economic mechanisms deeper, has been developed in two main directions. The article sets out the basic principles of the dynamic model of inter-branch and inter-sectoral balance (MIIB), which can be the basis for the creation of economic cyber system.*
***Key words:*** *Global crisis, reproduction theory, economical cyber system, strategic planning, economic and mathematical models, EMM, model of economic balance, models of economic dynamics (growth).*

## Introduction

The growing threat of the global crisis force the governments of all countries to develop anti-crisis measures. However, no country has no plan of action as an algorithm of the recovery from the global crisis.

It is proved that the cyclical economic development based on the phases of the cycle "inflation – deflation", which was launched during the First World War, contributing to the concentration and centralization of the global capital, enhances the deployment of the global crisis and hostilities [1].

These phases of the cycle are served by the monetary theory of Keynes – Friedman, who consider the Ministry of Finance and the Central Bank as the main regulators of the economic development. The adherents of institutionalism, in fact, offer to carry out the certain structural transformation of the economy, depending on the phase of cycle. The international system of national accounting and the econometric models applied for forecasting and planning of the economy are the monetary targets. Almost all modern researchers do not pay attention to the root cause of crisis – the disparity of economic development. The task of achieving the proportionality of the economy can not be solved only by monetary and institutional methods. This task is the task of the strategic planning of the economy, which provides the organization of social production for sustainable growth of quality of life.

To access such planning it is required to utilize entirely the possibilities of modern information technology (IT), which involves the development of the corresponding dynamic economic-mathematical model (EMM) on basis of which it is possible to coordinate the orders of final consumers and manufacturers, taking into account the introduction of new technologies. Implementation of such EMM will transfer the economy management to the fundamentally new level of

technology and will allow to carry out the systematic adjustment of the current global economic model.

The objective of this article is to justify the need for EMM which describes the force of objective economic laws, to build economic cyber system – the tool that can release us from the global crisis.

From the specified objectives the following tasks are derived:

– to show the need of using the Marx's theory of reproduction as the scientific basis for the development of EMM, capable to use the modern IT in strategic planning of the sustainable economic growth;

– to explore the evolution of EMM from the position of the possibilities of their practical application;

– to justify the need of the dynamic model of inter-sectoral and inter-branch balance (MIIB) as a basis for creating the economic cyber system, enhancing the effectiveness of management decisions.

## 1. Global crisis as a signal to rethink the basics of economic knowledge.

In the reproduction theory of Karl Marx it had been proved that the transition to a new type of production relations is primarily determined by the revolutionary changes in the instruments of labor. So, as soon as the machine appeared, a revolution in production relations took place – the capitalist mode of production as a definite system of economic relations with the corresponding material and technical base became dominant. The machine, overcoming the limited capacity of man in the area of the synchronous operating of a variety of work tools, significantly increases productivity of labor. The industrial revolution is considered to be complete with the advent of machine-made machines, i.e. machine-building plants, when capitalist industry created its corresponding material and technical base. This extended process that led to the leading role of industry in the economy, was given the name of industrialization. The further production development is associated with automation. If the managing of an ordinary machine involves the the human brain and hand, the automatic machine replaces them with the control devices and thereby the productivity overcomes the limitations, associated with the natural human capabilities.

Currently the world faced the necessity to rethink the basics of the economic knowledge in order to emerge from the global crisis. Economic theorists, admitting the need for implementation of strategic planning of the economy, limit themselves by listing the same monetary "anti-crisis" measures with proposals to restrain or to launch inflation, which means the continuation of the crisis. During the Second World War the United States significantly increased their interest in the information necessary for the strategic decision tasks. A new science – cybernetics appeared and studied the processes of information processing and attached importance to the feedback in order to create the automated control systems of different nature, including the economy. The special importance the US attached to the economic information - the system of national income accounts, inter-sectoral balance and the mathematical models which could be used in the electronic computers (computers) for the calculation of macroeconomic indicators and their relationships for the purposes of anti-cyclical regulation. Starting from the second half of the XX century, the special attention is

paid to the automation of production, the introduction of IT systems in production management processes, transmission of control and monitoring functions to the automatic machines (robots). This was due to the fact that during the 50s the role of factor of organization and management had increased dramatically. In the United States during this period the number of managers in the total working-age population increased from 40% to 51%, and in the Soviet Union only in the field of business management the number of employed amounted to 63%. In the US, since 1961, this rapid process was restrained with the help of the automated control systems (ACS), and the Soviet Union only started these developments [2].

With partial automation the dependence on the reliability of operators is reserved. The appearance of cybernetic systems (cyber systems) means a transition to the higher level of automation when cyber machines (IT), performing many functions of the direct management of the complex systems of various nature (technical, economic, biological) leave the function of cybe rsystem improving and creating function of the person who makes the decisions (DMP) to man, due to the inability to formalize the decision-making process entirely.

Under conditions of the permanent global crisis, accompanied by uncontrolled growth of administrative structures, the information flows circulating among them, document flow, and the loss of control over the object – the economy – the extremely urgent issue becomes the implementation of economic cyber systems. The ttempts to "make" the economy to get out of crisis on the basis of monetary and institutional theories failed, because these theories ignore the objective economic laws that regulate the social reproduction. Development and use of these theories and the economic and mathematical models by their adherents in order to justify the proposed anti-crisis measures do not produce the desired results. The substitution of the object of the strategic planning by document flow and, therefore, the introduction of IT for its automatization is not conducive to handle the economy. Moreover, the academic studies, limited by the abstract theoretical constructions, do not offer the specific practical measures and mechanisms, but at the same time apply for state doctrine, and can greatly move back the development and implementation of science-based anti-crisis measures.

Crisis of the modern economic theories and EMM developed on their basis, fancy for the IT introduction with the aim of document flow automatization, forced us to return to the origins of the economic science and to rethink the accumulated experience of EMM for the effective use of modern IT in the interests of social progress.

If we ignore or block this important area of research, the future will be such as it is "described" by the Davos Forum President Schwab K. [3]. According to him, the digital revolution, which starred in the middle of the 50-ies of the last century and is associated with the introduction of electronics and IT for production automation, today acquires a systemic character of rapid technological breakthroughs in areas such as artificial intelligence, robotics, etc. The revolutionary changes caused by modern IT can, according to K. Schwab, bring humanity to the following consequences:

– significant increase in productivity, when robots replace people everywhere, may cause the global changes in the labor market and strengthen the social inequalities;

– people will be able to access the huge volume of information and will be able to express their opinions on various issues, and the authorities will get new opportunities for the development of surveillance and monitoring systems;

– strong IT influence on the national and international security;

– robotization of mankind – the deprivation of human heart and soul.

Indeed, all these processes will have such a development, if the global crisis continues. Considering the growing threat to the humanity, it is important to return to the theory of reproduction. This return does not mean its dogmatic interpretation of the Soviet school position. In this theory the systematic approach to the study of the economy is carried out, which means that all of its categories perform the certain functions in ensuring the dynamics of economic system, which then changes during the transition to the next type of society. The knowledge of the reproduction theory is necessary for understanding of force of objective economic laws discovered by Marx, and their reflection in the EMM. In this connection it is relevant to recall the words of V.I. Leontiev: "If, before someone tries to give any explanation to the economic development, he wants to know what the profits, wages, capitalist enterprise are, from three volumes of "Capital" (from the source) he can get the more realistic and qualitative information than that one he could find in ten consecutive reports of the US census Bureau, a dozen textbooks on modern economy ... " [4].

The objective economic laws discovered by Marx – cost, savings, time savings, the proportionality of economic development, the growth of the organic composition of capital, the formation of prices of production and others, perfoming in one system, form the mechanism of functioning of the economy and its development under the influence of the scientific and technical progress. EMM and the theoretical constructions that ignore or criticize the reproduction theory, that discovered the objective economic laws, are not able to solve practical problems and pursue the narrowly selfish goals. A modern interpretation of the reproduction theory involves the construction of EMM, simulating the operation of objective economic laws in order to create the economic cyber systems serving to the cultural, scientific and technological progress of society. In this context, the study of the evolution of EMM from the point of view of the development of the fundamental ideas of the reproduction theory is very interesting for science.

## 2. Balance Models

Historically, the mathematical school of political economy appeared in the second half of the XIX century. Its founders are considered to be W. Jevons (England), L. Walras (France) and Pareto (Italy), who used the mathematics to create the models of economic balance. One of the first representatives of Russian school of mathematics was V. Dmitriev, whose works were regarded as the theoretical basis for the creation of MIB and SNA.

The basis of the mathematics school were the ideas of marginalism, explaining the economic processes with the use a marginal (incremental) values. The achievements of this school are:

– concept of economic optimum, meaning the best condition of the economic system in terms of its inherent objective criteria of certain restrictions;

– use of mathematical tools for the analysis of marginal values – the marginal utility and marginal costs;

– studies over terms of balance;
– analysis of dependences of demand, prices, income;
– analysis of factors determining the cost of production;
– analysis of relationship of the issues of pricing and the total proportionality of the economy.

The model of the general economic balance, developed by L. Walras in the late XIX century, was in fact the first mathematical model that described the macroeconomic system with the help of micro-economic indicators (in the model a separate equation is allocated for each item) that characterized the behavior of producers and consumers. Its contribution to EMM was in application of the technological coefficients $a_{ij}$ characterizing the structure of the cost in the production units to describe the economy through the system of algebraic equations. This approach is still the basis of modern EMM.

The task of the optimal behavior of producers and consumers was not set in this model. However, this problem was set by Walras in his exchange model in which the demand for the final product is determined by the criterion of maximizing utility, formulated W. Jevons. He found the main problem of economic science in the study of consumption, the basic law of which he considered to be the law of diminishing marginal utility. Under the concept of "utility" Jevons meant an abstract property of the object to correspond the objectives of consumers. He believed that the total value of units of goods depended on their quantity, and the utility of the last increment of the good tends to decrease with increasing amounts of goods [5]. The follower of Walras, who contributed to the development of the Lausanne school, became Pareto, who introduced the concept of optimum, named after him - "the optimum of Pareto" [6]. Pareto optimality means to attain such condition of the economic system, in which the criterion function value of any participant of the system cannot be improved without impairing the other participants in the target function values. The concept of Pareto optimality is widely used in the theories of economic balance and coordination of interests.

In fact, the creators and researchers of the models tried to describe the proportionality of the economy development using a static system of algebraic equations. It was a step forward from the point of view of understanding of the relationship of producers and consumers in their attempt to achieve proportionality. Moreover, the authors of balance models contributed significantly to the understanding of achievement of the optimum system, both in terms of behavior of individual agents, and the total system. Their introduction of the concepts of marginal utility and marginal costs proved to be useful for better understanding of marginal and average cost pricing mechanism in the reproduction theory. Analysis of the conditions of balance and optimum implemented by Walras, Jevons, and Pareto had a great influence in the 40th and especially in the 50-ies of XX century on the economists involved in EMM. The model of Leontiev, who developed the method of "Input – Output" can be considered as a development of the Walras model because it also describes the economic system by means of linear equations and uses the technologic coefficients $a_{ij}$ characterizing the cost of production of goods in one branch in the production of goods in the other industries. At the same time Leontiev model can be seen as the first step towards the practical use of EMM, as it reflects the real economy in the existing relationship between the final, intermediate and gross domestic product.

While the Leontiev model "Input - Output" (model of inter-branch balance) was increasingly being used in the state regulation of the economy in the post-war Europe, Japan, and then in the USSR (1958), the researches in the development of mathematical balance models of intensified. A typical example of such research was the balance model of Arrow – Debreu [7]. In this model, besides the criterion functions of consumers, the target functions of manufacturers - to maximize profits – were taken into account. The balance in the model of Arrow – Debreu means the totality of the price vector, the cost – production vectors and vectors of purchasing, that are optimal for the participants at these prices, and in which the total demand for each product type, that has a non-zero price, does not exceed its total supply. It is proved that under the general assumptions, the balance in the model of Arrow – Debreu exists, although its uniqueness cannot be guaranteed. Balance of Arrow – Debreu obtains many optimal properties under very general assumptions, in particular, the balance vectors consumption and costs-production maximize a balanced sum of the criterion functions of consumers.

Some researchers thought it was possible to use this theory to simulate the planned economy [8].

In the 60s-70s many new versions of models of economic balance appeared, they had the different ways of formation of consumer income, different participants and assumptions about their behavior. The attempts to reflect them in the balance model, to take into account the existence of the collective goods, and so on, was taken. The ideas of marginalism and balance theory became popular among the representatives of neoliberalism. Today they are used in the main branches of economics – demand theory, theory of the firm, and so on. However, developing the mathematical apparatus of balance models, their supporters, in contrast to the Leontiev school, do not focus on the use of these models in the modern IT in order to improve the efficiency of administrative decisions in the economy.

### 3. Growth models (models of economic dynamics).

Under the models of economic growth (dynamics) the models, in which time is one of the parameters and the calculation for the next year is based on the calculations for the current year are understood.

One of the first models of economic dynamics was developed in 1937 by the American scientist John von Neumann – a model of balanced growth (expanding economy) [9]. The model suggests that the production output of this period is the cost of the next period. The concept of stationary trajectories imposed by Neumann, which is understood as the constant growth of output at its constant structure, is widely used to predict the possible trajectories of growth in output and cost estimates. The particular importance for the researchers is the stationary concept, which is used to determine the optimal trajectory, close to the main, which is understood as a stationary trajectory, which figures are growing with the constant, the maximum possible rate. For economic dynamics models it is mathematically proved that, regardless the initial condition, any optimal trajectory after some time becomes closer to the main. On the one hand, the value of the von Neumann model is in attempt to describe the economy as a dynamic system, and in the introduction of concepts of stationarity and mains, which can be used in the scenario calculations of economic development. On the other hand, the model gave the impetus to the use the mathematical programming apparatus for solving a

system of linear inequalities and for development of the mathematical apparatus used in it. In particular, a new direction appeared on its base - the theory of games. The further development of the Neumann model followed the way of its combination with the other models and complexity of the mathematical apparatus. Therefore, the Neumann model was developed by the Japanese economist M. Morishima in 1965 [10], which saw its resemblance to the Marx's schemes, introduced a number of additional conditions, and a new mode was called the "model of Marx – Neumann." Other researchers tried to connect the Neumann model with the model of Walras – Arrow – Debre.

During the 50-70-ies the most important results in mathematical economics (optimal programming, game theory, the theorem on mains, and others.) were reached mainly by the professional mathematicians. The mathematical tools developed by them could be useful for the analysis of some economic phenomena.

The important contribution to the development of mathematical programming as a tool of EMM had been made by mathematician R. Bellman (USA), who worked in the field of dynamic programming. He developed the theory and numerical methods, which was a multi-step process of finding the optimal solutions for some of the criterion function. His main method was the method of recurrence relations, the base of which was the optimality principle: if the process of control is optimum in the first step, it will be optimal for the process, remaining after the first step [11]. Dynamic programming methods are used for simulation of random processes such as inventory management, where the costs of storing of the excess inventory at the reduced demand are compared to the losses from the lack of reserves at the intensive demand. EMM of the dynamic programming of the stochastic processes are called Markov chains.

Bellman optimality principle was used in the models of economic dynamics which had have been used in the practice of the state regulation of economy in the 50-s as the instrument of prediction. These models are, first of all, the growth model (Harrod, Domar, Solow and others) and the dynamic model of Leontiev. In the growth models based on Keynesian ideas, in addition to the time factor, the relationship between capital investment and production was taken into account [6]. Then the growth models became more complex in different directions, mainly used to account the time lags between investment and production. The further development of the growth models was the use of the principle of optimality: the criterion function of the economic system or the criterion function of separate entities of system, if they have autonomy.

The development was given to two approaches to the modeling of economic dynamics, that reflected the existence of two directions in the economic research, conditioned by the existence of two economic systems – the planned economy of the USSR and the market (oligarchic) economy of the US.

The first approach (constructive) was based on the principle of control of the economic system, and contained the formulation of the extremal problem in a great number of the permissible trajectories of movement of economy. These models are often called the models of optimal economic growth or the welfare models.

The second approach is descriptive, according to which the trajectory of economic development is the condition of balance which is formed by the interaction of different entities of system. The developers of these models showed that in some cases there was the balance theorem, according to which any balance

trajectory is optimal at the certain criterion function, and vice versa, each optimal trajectory is balanced at a certain organization of the system entities interaction.

When developing the models of balance and dynamics the Soviet economists and mathematicians followed two mentioned approaches. The research center was the development of dynamic Leontiev model [12]. Researches were undertaken in the following areas: accounting of the criterion function in the model; the introduction of the variance in the technological production methods that vary with time, depreciation of funds, different time of construction and development of facilities; accounting of the lag of capital investments, and so on. In general, the researches were limited by the introducition of additional exogenous parameters and the improvement of mathematical apparatus that describies the inter-branch balance (MIB). The attempts to use the MIB in automation of routine calculations (ARC) were made [13]. However, these attempts were unsuccessful for the following reasons.

First of all, the planning process is iterative and the models as the system of linear equations were static. Secondly, in the modified Leontiev models the law of proportionality of the economy was ignored, and this law assumed the coordination of links of producers with the orders of final consumers taking into account the effect of feedback - balance prices and the law of economy of time, according to which the effective range of new technologies is calculated: the planned norms of cost were the exogenously given values.

Such use of mathematical methods in economic research had been criticized by academic economists. So, V.V. Novozhilov noted that EMM helped you to systematize the ideas about the functioning of economy, but the most obvious truths could be missed during their creation [14].

The value of the mathematical models in economy lies in the fact that they allow us to describe the economic phenomena and to obtain the valid conclusions in the language of formulas and algorithms. This explains the inclination of the Western economists to the creation and practical use of econometric models based on the models of economic balance and growth, the principle of optimization, game theory, and other old and new economic theories. But, there is another side of these models. No matter what the actual statistics these models are built on, if the precondition used in them was false, the calculation results would be biased.

## 4. Econometric models

Econometrics means the development of mathematical and statistical models of economics and quantitative assessment of their parameters. A significant contribution to its formation was made by the studies of the economic cyclicity made by Clément Juglar, J. Kitchin, S. Kuznetsov and N.D. Kondratyev, who discovered the "long waves" lasting for 45-60 years [15].

The the Harvard School can be considered as the founder of econometrics. It was organized in 1914-1918 to study the nature of economic cycles and to forecast the economic situation using statistical methods and mathematical analysis. The basic principle of this school was the notion that "the science meant measurement". According to this, the theory should reveal itself in the result of statistical analysis that was fundamentally different from the position of the founders of mathematics in economic theory school [16]. The short-term forecasting models had mostly extrapolation character. An example of such models was the "Harvard barometer",

developed under the leadership of W. Pearson in order to assess the "economic weather" on basis of statistical observations. "Barometer" was a set of three curves (stock market, commodity market and money market) concerning to which it was believed that they have nearly the same vibrations with some shift in time. This made it possible to predict the behavior of one curve, for example, commodity market, based on the behavior of another, such as the stock market.

In the 20's the ideas of Harvard School were widespread in Europe, where the opportunistic institutions were created and they studied the statistical data in order to predict the "economic weather." The all-USSR Market Research Institute (AUMRI) was created in 1922 in the USSR, whose main task was to study the economic situation, time series and seasonal fluctuation for the short-term forecasting of price indices and purchasing power of money. The well-known scientists of the institute were A. Conus, E. Slutsky and others. In 1926 the League of Nations established the Committee of Experts who were using the "economic barometer". Practice showed that the "Harvard barometer" predicted the "economic weather" in the period of stabilization relatively well, but not during the "storm": before crisis of 1929-1933 the Harvard University made a forecast of "prosperity" of the economy.

Due to the crisis of 1929-1933 the United States began to pay a special attention to the development of econometrics in order to study the problems of the economic cycle with the help of statistics and mathematics methods. In 1930 the International Econometric Society was created in the United States. On the first stage of its development the researches were carried out in the following areas:

– Mathematical school in economic theory, which assumed the use mathematics and statistics in theoretical studies of the economy;

– Econometrics, which method was essentially statistical and didn't investigate cause and effect relationships;

– Mathematical economics as a branch of mathematics devoted to the development of mathematical tools for EMM.

Among the first Russian developers of econometric models there was G.A. Feldman, who, being an employee of the USSR State Planning Committee, developed the first model to the predict the rate of economic growth (1928-1929 years). The basis for its construction became the Marx scheme. The model reflected the correlation of the national income rate of growth, changes in capital productivity and labor productivity, the structure of use of the national income. According to this model the Gosplan calculated the expected rate of growth of the national income.

Starting with the 30-40-ies econometrics gained the rapid development and today it is the main method of research of economic processes and forecasting.

If in the the 70-ies the economists - supporters of econometrics considered that it was necessary to use its methods for the quantitatively confirm of the theoretical constructions, then starting with the 70-ies the econometric methods are used to describe the cause-effect relations between the economic parameters. Today econometrics is actively used by monetarists to substantiate the choice of scenario of economic development, of a certain type of economic policy.

A powerful impulse to the use the econometrics was given by computers, and by these means there was the development a statistical analysis of time series, as well as the rapid development of the world market of loan capital and derivatives. Statistical models of different countries were integrated into the general system in

order to understand the international economic relations and predict the global economy. For example, the project "Link" – a global model of international trade – was created in 1968 from the Wharton Econometric Forecasting Associates (WEFA) in order to provide the US Department of State with the advisory assistance in development of effective measures in the domestic and foreign policy. The principal disadvantage of econometrics was the study of quantitative relations in the economy without determining the control parameters and feedback from the object of management. Econometrics uses essentially the extrapolation methods, and it limits its practical application in solution of economic problems. Like all other modern researches of EMM, these studies are in crisis because they are not able to offer the effective solutions of the practical problems in the economy [17]. According to N. Petrakov, when forecasting of the economy on basis of multifactor models the internal laws of functioning of the economy as a whole system fall out, leaving unanswered such important questions as, for example, whether the concept of efficiency of the economic system is limited by the indicator of rate of production growth [18].

To carry out the EMM calculations some initial economic information is required. The modern standardization of the national accounts, calculations of economic growth, international comparisons and the creation of strong research departments was organized by the international economic organizations (the World Bank and the International Monetary Fund, the UN and others) and occurs outside the system links with the information needs of the great amount of EMM.

To carry out the calculations with the help of new indicators of models (e.g., the index of inflation expectations, the country's credit rating, and so on) the developers require the additional collection of information that leads to its cascade growth and inefficient use of IT. The groundlessness of the modern economic theories and EMM that serve the cyclical development is primarily explained by the the fact that they are not able to offer a way out from crisis cycle to the trajectory of sustainable economic growth. This can be done only on basis of implementation of the scientific approach in the construction of EMM, which suggests in the models the reflection of force of objective economic laws and creation on their base the cyber systems serving the optimization of management decisions in the economy.

## 5. A dynamic model of inter-sectoral and inter-branch balance (MIIB)

The force of the objective economic laws and the EMM experience are reflected in the dynamic optimization model of inter-branch and inter-sectoral balance (MIIB), developed by the economist-cybernetics N.I. Veduta [19]. This model can serve as a basis for creation of cyber system in order to improve the effectiveness of management decisions. In this model the following principles are realized:

– economy is regarded as the consciously optimized system based on the mixed ownership of the means of production;

– there is a single criterion of optimality, characterized as an objective tendency of society to maximize the growth of quality of life (maximization of the utility growth). Quality of life is determined not only by the non-productive consumption, but also by the content of the labor process, free time, intended to meet the social needs;

– national economy is considered as a complex hierarchical system, which proposes the hierarchical structure of public administration and the implementation of systematic approach in the question of defining the "input-output" indicators, the collection of economic information, its aggregation and disaggregation at different levels of government (economy – industry – corporation);

– social working time, as the only limiting (unreproducible) factor of social reproduction is the starting point for planning;

– force of objective economic laws and, above all, the law of value as a natural regulator of the economy through the proportional balance price deviations from the prices of producers, and the law of economy of time, which is expressed in the effective replacement of the old technology with new one in order to maximize the cost savings are reflected in a dynamic MIIB;

– MIIB as a dynamic system is an iterative process of harmonization of planned calculations, including the choice of effective technological methods of production and adjustment the criterion values depending on the production capacity;

– problem of the efficient distribution of productive investment is solved in the MIIB simultaneously with the task of optimizing of the structure and volume of the final non-production goods;

– taking into account the implementation of the model and its improvement the direction of the Public Administration reform is determined.

The principal difference between the MIIB table from those tables based on the concepts of the "System of National Accounts 2008" (2008 SNA) and the Balance of National Economy (BNE) is that MIIB is an absolutely symmetric matrix, which presents the interlinked accounts of all sectors of the economy. Correction of the initial MIIB information by recalculation of its indicators in reliable assessments allows to get rid of the balancing rests presented in other tables and hidden in the line "gross income" or "profit". Such correction allows to perform the calculations of the MIIB while retaining the balance of all accounts of industries and sectors.

Using some of forecast parameters, macro-economic proportions and the original data over the structure of the final non-production goods, the dynamic MIIB allows to specify them in the course of the optimization plan calculations.

## Conclusion

Exit from the global crisis assumes an appeal to the economic science, which studies the objective economic laws. These laws were discovered in the reproduction theory by Karl Marx. The next step in the development of economic science were to be EMM, as a tool solution of practical problems. With the appearance of computers the possibility of practical use of EMM in order to improve the quality of economic management increased significantly.

The first EMM (equilibrium models and growth models) developers contributed to the use of mathematical formalism to describe the economic phenomena, which in its turn contributed to the better understanding of the force of objective economic laws.

Later the EMM was developed mainly in the direction of the complexity of the mathematical apparatus that turned the EMM into the object in mathematical research.

Another direction of EMM development is the econometric models, on basis of which the forecast calculations are conducted, they extrapolate the current trends, without giving an algorithm for solving the current economic problems.

However, the denial of the EMM and its substitution with the abstract theoretical constructions that reject all scientific research and practical experience, and, in fact, are lobbying the narrow selfish interests through the designation of certain priorities, does a great harm to the proportional development of the economy. The task of the economic science was formulated in the XIX century as "systematization of laws obtained by the theory, regularity and observations in order to control the various manifestations of the practical economic and social life of the society and the State" [20].

Today the dynamic MIIB based on the objective economic laws allows to implement the cyber systems in the management of the national (global) economy to ensure the sustainable growth in the quality of life.

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