

MATHEMATICAL AND INFORMATIONAL MODELS IN ECONOMY

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MODELING OF FINANCIAL FLOW REGULATORS IN SYSTEMIC MACROECONOMIC ENVIRONMENT

***Abstract.** The peculiarities of macroeconomic influence on the innovation process of development in emerging market countries are explored. The emphasis is on economic mechanisms that create «instability zones» of monetary and fiscal policy instruments. The external and internal factors of their origin are determined. The monetary, financial and socio-humanitarian factors implementing the functions of redirection of financial flows are considered. The economic-mathematical approach to theoretical modeling the self-organization processes of economy is proposed.*

***Key words:** economic-mathematical modeling, national economy, innovation development, management of economic development, macroeconomic environment, financial system, interest rate, percentage reduction, disposable (available) income, socio-humanitarian factor.*

Introduction

Modeling of mechanisms of the economy self-organization, which carry out redirection of financial flows, is a new scientific direction. In the context of management impacts, macroeconomic policy instruments (fiscal, currency, and monetary) are usually considered. They do not operate in the mode of self-organization, but are in the field of legal economic institutions. However, there are powerful factors of non-normative influence on the processes of self-organization.

One of the problems of the macroeconomic policy development is the need for multicriteria optimization. At the same time, it is necessary to ensure low inflation and low interest rates for the stability of the exchange rate. Target fixation (setting the value to be achieved) of one of these indicators is a complex but solvable task. While simultaneous targeting of each of them by a single macroeconomic instrument is often unattainable as a result of the "conflict" of these indicators (the acquisition of some of them different vectors opposite to the purpose of targeting). Because reaching the goal of targeting will require simultaneous enforcement of the opposing actions from the same policy tool. Such conditions are called an "area of unstable influence" by macroeconomic instruments. Overcoming the problem of managing an economy in

such situation is possible under development a certain algorithm for the interaction of instruments (and indicators), in particular with the innovation sector of the economy.

The novelty of our approach to the consideration of the task of managing the national economy development lies in the study of self-organizing mechanisms for the regulation of financial flows.

The purpose of the article is to develop the basis of the methodology and justification of indices-indicators for the economic-mathematical modeling of financial flow switches as macroeconomic mechanisms of economy self-organization on an innovation basis.

Among them, the influence of monetary, financial, currency and socio-humanitarian factors (markets) of the systemic macroeconomic environment¹ on innovation development is considered.

Almost all studies in this area have been made by the author. However, their theoretical background has been developed before. In particular, the macroeconomic aspect of the problem was studied by A. Galchinsky [1], V. Heyets [2], S. Korablin [3]. The methodological foundations for its study were laid down by J. Keynes [4] and his followers [5], whose works defined the content of the Keynesian revolution in economic theory [6]. In terms of general macroeconomic theory and macroeconomic modeling they were investigated by J. Hicks [5], P. Samuelson [7] and G. Mankiw [8].

The role of money and interest rates before J. Keynes was considered by M. Tugan-Baranovsky [9], K. Wicksell [10] and I. Fisher [11]. Monetary theory and monetary policy were developed by M. Friedman [12]. The theory of economic growth – by R. Harrod [13], E. Domar [14], R. Solow [15]. The innovation theory – by J. Schumpeter [16] and P. Romer [17]. Issues of economic cyclicity and dynamics of financial and currency flows – by M. Tugan-Baranovsky [9], G. Calvo [18], M. Kondratiev [19]. Mathematical models of currency and financial crises – by P. Krugman [20] and M. Obstfeld [21].

The phenomenon of the macroeconomic environment (in its traditional sense) was described, first of all, by J. Keynes [4] and his followers within the framework of the Keynesian Revolution Mainstream. Mathematicalization of theoretical developments and the first systematization the results of this "Mainstream" was carried out by P. Samuelson in "Economics" [7]. The most significant publications also include the works of R. Mundell [22]. They had formulated the foundations of macroeconomics as a science.

The creator of modern monetary policy from the standpoint of the neoclassical approach was the Nobel Prize winner M. Friedman [23]. The role of the exchange rate as a macroeconomic instrument is considered in the writings of P. Krugman [20] and M. Obstfeld [21]. Their creation of equilibrium models of the economy and the models of monetary and financial crises approached science to consideration of currency exchange rate as important indicator of the systemic macroeconomic environment.

In recent decades developers of methods of economic management have received additional opportunities through the use of information technology (IT). Thanks to them they got close to creating new management standards based on the combination of IT and macroeconomics. This challenge requires changing in the

¹ The term is introduced and explained by the author in [26].

methods of achieving the objectives of governance and targeting the macroeconomic indicators.

Macroeconomic methodology developed at Harvard University of the USA [8], macroeconomic accounting standard – System of National Accounts (SNA), adopted by the US State Committee [24], international accounting standard of the balance of payments developed and improved by the IMF [25] – in aggregate they not only provide the opportunity to create and structure a new information and analytical space for the economic management at the macroeconomic level, but are themselves structural elements of this space.

Scientific support is required to introduce computer technologies in the forecasting and economic development managing processes. And it is growing the urgency of working up algorithms that create an opportunity for implementation the software tools of economic-mathematical modeling.

This task is facilitated by the fact that the macroeconomic methodology from the beginning is mathematical. Recently it is actively perfecting by IMF and World Bank experts. Thanks to them it was improved macroeconomic accounting standards of the balance of payments of the countries and was developed methods of teaching macroeconomic analysis used at MF Joint Vienna Institute and at World Bank [27].

But attempts to use such methods for constructing algorithms of economic and mathematical analysis of macroeconomic policy in developing countries have met with difficulties. They arose due to inadequate study of the peculiarities of the systemic macroeconomic environment development in these countries.

We faced the actual task of adequately describing the processes of economic dynamics (economic growth, cyclicity, etc.), especially the crisis processes in economic systems where macroeconomic stabilizers and indicators are not sufficiently developed. The difficulties are compounded by the need to take into account the influence of external factor of global macroeconomic environment of such countries.

1. External and internal holding factors of developing countries grows

Modern developing countries are surrounded by powerful economic systems with a developed macroeconomic environment characterized by very low interest rates and floating exchange rates. The exchange rates in them are stabilized for a long time mostly as a result of the self-organization of economic mechanisms rather than the use of macroeconomic policy instruments. Because of this developed systems look static, but in reality they are extremely flexible and sensitive to changes.

At a time when modern-day world leaders were developing their international environment was fundamentally different. There were no systems with extremely low interest rates around. The studies of world leaders countries development became the classics of economic science, but the regularities described in them do not work in modern conditions in the countries of second wave of development where operate other external factors of their macroeconomic environment.

New development conditions are extremely insufficiently researched. This negatively affects primarily the efficiency of managing the economy in the so-called "instability zones". The term "instability zone" was introduced by the author to determine the macroeconomic situation that arose as a result of the automatic action

of braking economic mechanisms after the use of a macroeconomic instrument (monetary or fiscal). When as a result of the reaction of the economic system there is a complex of multidirectional processes that impede the achieving goal of management and macroeconomic policy instruments fall into the "area of unstable influence". That is the economic situation of the multi-vector impact on the investment (innovation) process by interest rates, inflation (prices), exchange rate, income. Moreover, the multi-vectority dynamics of these factors hinders the achievement of the targeting goal.

For example it may be situation when the weakness of economic system sectors makes it impossible to accelerate investment processes due to high interest rates. Then excessive use of state economic instruments as accelerators of development can lead to the investments crowding out effect in these sectors and in the whole economy.

This effect, described in [28] arises from the impact of state finances on monetary and financial markets, which negatively affects interest rates, increasing them even more. Rising interest rates reduces the attractiveness of investments realized through the credit market. It negatively changes the structure and directions of financial flows, complicates the choosing of innovation priorities and, despite the attempts to accelerate investment processes by means of government programs, suppresses the economic development.

The large-scale impact of the investments crowding-out effect can threaten economic and national security as it may cause a slowdown in the rate and quality of economic growth.

To minimize the negative affects of this effect it is important to promote the development of macroeconomic mechanisms of economic self-organization. This can be achieved by changing the focus from fiscal to monetary policy. Soft monetary policy is capable of intensify the growth of economic activity which will be accompanied by an intensification of the processes of economic self-organization.

However in weak economic systems such a policy causes the problem of accelerating inflation – Fisher effect [29, p. 104]. Therefore in emerging economies the use of monetary (and currency) instruments causes a "conflict" of management tools, that is the emergence of "areas of unstable influence". The conflict is that the situation requires multi-directional, sometimes diametrically opposed actions from the monetary instrument. It extremely complicates the monetary policy application. And not optimal use of monetary instruments can cause an economic crisis.

For example the policy of reducing inflation involves the central bank's monetary constraint. But such actions will lead to an increase in interest rates, which will suppress investment processes and slow down development. The policy of stimulating investment and lower interest rates on the contrary will require the implementation of a soft monetary policy. But such a policy will stimulate inflation and crisis processes owing to overheating of the economy. That is, there will be negative consequences in both directions of the monetary instrument – and in the case of increasing, and in the case of reducing money supply.

Because of this the "enchanted circle" is formed which every time returns monetary policy to hardcore restrictions, raising interest rates and suppressing investment activity. If as a result of the struggle with the negative consequences of this "circle" a powerful crisis arises the fiscal anti-crisis policy may be the last remedy to counteract it. But in the case of its application the effect of crowding out investments will reappear. That is, everything will return to the starting position

from which the transfer of political accent to monetary instruments began. So the economic development process is slowed down again.

In developing economies there are several "enchanted circles" similar to the described. This makes it difficult and sometimes impossible the transition to optimal use of fiscal, monetary and currency management tools. It is important that such difficulties arise only in certain states of economic systems and their macroeconomic environment. Namely, in a state of weakness or lack of innovation sectors of the economy combined with the weakness of the systemic macroeconomic environment (because of what it is in the "instability zone" and its instruments – in the "area of unstable influence").

Overcoming the "instability zones" is complicated task. In some countries it is impracticable due to the fact that developing countries are surrounded by developed countries with low interest rates. As a result there is a percentage reduction which becomes an amplifier of wave-like processes of free capital inflow and outflow [30, p. 77-90, 140-170].

Therefore the greatest problem of development management optimizing in developing countries is reducing the risk of sliding the economy into a crisis due to its overheating or excessive collapse of business activity. The solution of this problem only by the efforts of the central bank and government requires continuous monitoring of indicators: employment, real disposable income, interest rates, exchange rates, etc.

It is also necessary to take into account the ambiguous influence of humanitarian factor which determines the nature of development management of each economy. Even in the presence of a professional approach by regulators, the lack of ethics and positive social capital will become a major constraint in the design and implementation of efficient algorithms for simulating the switches of financial flows. Since the creation of such switches on the basis of self-organizing mechanisms becomes impossible due to the need for constant intervention of government instruments distorting interest rates in the economy. It is the humanitarian factor that laid the foundation of European civilization contributed to the formation of science, culture, modern financial and innovation systems. For all that has provided an explosion of innovation development in Europe and then throughout the world.

Unfortunately, the influence of the humanitarian factor can not yet be formalized in macroeconomic mathematical models. Mostly because it can not be exhaustively evaluated in monetary, financial and currency formats. Only some of its aspects are evaluated (by the indicator of patenting intensity, etc.) because it is a category of ethics and faith in the Absolute not an economic exchange.

Consideration of the humanitarian factor influence on the development of countries with a weakly developed systemic macroeconomic environment is traditionally carried out in the political-economic context. Such compensation models have been called "liberal", "social", ect. "Compensation" consists in an attempt to reflect the influence of the humanitarian factor on the development of the economic system indirectly in particular through political-economic or cultural aspects.

2. Theoretical foundations of mathematical modeling of development regulators

In mathematical modeling, in addition to the described difficulties, there are also complications in the description of the macroeconomic environment in terms of creating a methodology to overcome the "instability zones". Within the framework of a positive economy it has been developed. However, in the framework of normative economy its formalization is complicated.

The simulation of macroeconomic mechanisms of financial flows redirection operating in conditions of economic self-organization is a relatively new scientific direction.

Only macroeconomic policy instruments are usually considered as the managerial influences. They operate mainly in the legal field of economic institutions which are inherent in stability. Instead of it we focus on the tools of economic self-organization which are in the field of action of economic mechanisms and are described by market categories. They reflect prices in the relevant markets (monetary, financial, currency) which characteristic feature is volatility.

The use of these instruments faces many difficulties because of their excessive volatility (fluctuation) and multi-vector impact on the objects of management. For "manual" economic management these problems are solved. However, such a management style requires a lot of special training and qualifications of performers especially in the field of macroeconomics. Moreover, even such successfully used instruments are always far from optimum in their results. This is especially evident when there is a need for multi-criteria optimization. For example, if the task is to simultaneously ensure low inflation, low interest rates and a stable exchange rate.

The theoretical basis for the creation of economic-mathematical toolkit for methods to overcome this problem is partly contained in Harrod-Domar's model of balanced development [13, 14]. In it the balanced increase of investments provides the growth to incomes and savings. It can be assumed that this increase leads to an increase in the commodity supply. In its turn it keeps inflation which enable the central bank to increase the money supply regardless (to a certain extent) of inflation. But this model does not give an answer to what volume and quality should be an investment.

Such an answer can be found in the R. Solow's model of economic growth [15] which leads to the conclusion that for balanced development is not enough investment (capital formation). There is also a need for certain number of population and the quality of investment (availability of innovations). That is, the problem of balanced development in the real sector of the economy can be solved by stimulating innovation processes.

For developing countries the situation is complicated by the fact that innovations at the level of economic self-organization are possible only with the honesty of economic agents to each other: a banker to a client, a client to a banker, entrepreneur to entrepreneur, entrepreneur and banker to a scientist and others like that. For lack of such virtues innovations take place in response to economic or national security challenges (the state of war, the defeat in it, the risk of losing sovereignty, etc.) as a catch-up race for the leader (adaptation efforts) implemented by the hard-willed means inherent in political dictatorships.

Personal and corporate mutual honesty is a prerequisite for realizing all aspects of economic self-development. It should be considered in the context of

categorical imperative of E. Kant [31, p. 5] as the economic factor of "social capital" [32] – special ethics of the "spirit of capitalism" [33]. If it is lacking the processes of economic self-organization become destructive. In such conditions the transition to active monetary policy will increase the risks of losses and economic chaos.

Therefore, the list of factors stimulating innovation development must include a characteristic of social capital in terms reflecting the degree of honesty, which requires special research.

To create software systems for the economic development managing in emerging markets countries it is necessary to be mathematically described the factors of innovation development stimulation: fiscal and financial (income, disposable income), monetary (interest), export (exchange rate), as well as socio-humanitarian (indirectly reflected by financial categories).

3. Modeling of "switches of financial flows" in the national economy

Before considering the "switches of financial flows" it is expedient to outline the theoretical and methodological basis of formal description of the macroeconomic environment in which management factors of economic development are in force.

In the macroeconomic context the national economic system consists of four institutional sectors ("households", "firms", "government" (state), "abroad"). The basis for such structuring is the: methodological standard of the System of National Accounts, grouping by the type of institutional units in the national economy macroeconomic environment [24, c. 67-97]. For each of the institutional sectors one can identify the affecting factors of macroeconomic environment. In this case it is: disposable income (Y-T), market interest rate (r), taxes (T), market exchange rate (e).

Each of these factors has its own channel of influence on a particular segment of the national economy. They characterize the functioning of subsystems of the economic system, are arguments of the corresponding functions and have the following common features:

- affect the consumption of a certain institutional sector; Because of this, they can be considered with some assumption as instruments for managing the relevant sector of the economy they are influencing;
- characterize the state of money and financial markets (interest rate and exchange rate are the price of money in the money markets, and the disposable income and the state budget revenue is a reflection of household and general government finances);
- each of them depends on the state of money markets and affects these markets.

Gross Domestic Product (GDP) is the sum of the income of all subjects of macroeconomic relations (institutional sectors) or the sum of goods and services consumed by the institutional sectors, which is equal to these receipts. In this case the basic identity of the SNA (2) and (3) is fulfilled. That is, the flows that constitute the sum of receipts in the institutional sectors of the economy (Y) are equal to the flows that compose the expenditure (consumption) of the same sectors (E):

$$\sum_{i=1}^n \sum_{j=1}^n Y_{ij} = \sum_{j=1}^n \sum_{i=1}^n E_{ji} \quad (1)$$

This follows from the balance of income and expenditure flows (2) that are accounted in national accounts:

$$C + I + G + NE = L + K + T + NI, \quad (2)$$

where:

$(C + I + G + NE)$ is the amount of expenses by the institutional sectors of the economy, as a rule in a year (aggregate demand);

$(L + K + T + IN)$ – the amount of receipts of all institutional sectors of the national economy;

C – consumption by households;

I – gross private investments;

G – consumption of public authority (government expenditures, expenditures of state and local budgets);

NE – net export, difference between export (EX) and import (IM) ($NE = EX - IM$);

L – income received by households;

K – income received by firms (financial and non-financial corporations);

T – income received by government (sector of the state administration), revenue part of the state and local budgets;

IN – income received by "abroad".

Y – in equations (1) and (3) is the aggregate income (GDP). In accordance:

$$Y = C + I + G + NE, \quad (3)$$

where:

$$Y = C(Y - T) + I(r) + G;$$

$$Y = C + I + G + NE;$$

$$C = C(Y - T);$$

$$I = I(r);$$

$$NE = NE(e);$$

$$NE - (S - I) = 0;$$

If $NE = Y - C - I - G$, and $Y - C - G$ – national savings (i.e. S), then:

$$(S - I) = NE.$$

All of the above categories belong to the SNA. In accordance with the structure of aggregate demand reflected in the right side of identity (3) the main participants in macroeconomic relations are determined aggregated into four institutional sectors of national economy. Their demand $C + I + G + NE$ is the aggregate demand.

The relationship between the functions of the exchange rate (r) and the interest rate (e) ($I = I(r)$, $NE = NE(e)$) can be presented as:

$$NE - (S - I) = 0, \text{ i.e. } NE = (S - I), \quad (4)$$

Equation (4) gives an analytical expression of the balance of payments of the national economy. Balance of payments characterizes the state of foreign economic relations. It consists of a current account NE and a financial account ($S - I$). The current account includes a trade balance (flows of goods and services) and current transfers. Equilibrium of payments balance is the equilibrium between current NE

and financial (*S-I*) accounts of payments balance. This equilibrium is determined by the economic mechanism $NE = NE(e)$ with the help of the exchange rate (e).

According to the concept of the balance of payments (the equality of the amount of purchases and the money spent on it - actually consumed money), the demand for goods and services is proportional to the demand for money. The demand for money is permissible to be considered within the general economic framework, that is not only the external but also the wider market, in the form of a unit of two functions - income (Y) and interest rates (r):

$$\Delta M^d = k\Delta(Y - T) - h\Delta r, \quad (5)$$

where:

ΔM^d – changes in demand for money;

$\Delta(Y - T)$ – changes in real disposable (available) income;

Δr – change of nominal interest rate;

k – coefficient of elasticity of demand for money at income;

h – coefficient of elasticity of demand for money at interest rate.

According to equation (5) the demand for money is in direct proportion to real income (Y) and in the inverse – to the nominal interest rate (r).

The demand-for-money elasticity coefficients reflect the ratio between its change (ΔM^d) and the changes of the real disposable income $\Delta(Y-T)$ (6) and the nominal interest rate (Δr) (7):

$$k = \frac{\Delta M^d}{\Delta Y}; \quad (6)$$

$$h = \frac{\Delta M^d}{\Delta r}. \quad (7)$$

According to (4) an indicator of imbalance in the balance of payments (crisis processes) is excessive volatility of:

– interest rate (r), which causes the connection: inflation \rightarrow bank interest rate \rightarrow discount rate \rightarrow investment;

– exchange rate (e), which causes the connection: exchange rate (e) \rightarrow net export NE (current account) \rightarrow interest rate (Δr) \rightarrow investments \rightarrow financial account ($S - I$); And also \rightarrow disposable income $\Delta(Y - T)$ \rightarrow intermediate and final consumption.

Because volatility, if it exceeds the adaptive possibilities of economy, it breaks all balance of payments, trade balance, dramatically reduces investments.

The central bank's struggle with excessive volatility through restrictive measures leads to some stability but the growth of interest rates and exchange rates in this case can not be avoided. An increase of interest rate in such conditions will form a "zone of volatility" as well as interest and currency reductions. It will complicate investment and suppress the innovation processes in the economy. That is, there will be a "enchanted circle" which can be terminated only by increasing the supply of goods by resident firms. But high interest rates would prevent it from doing so as it would impede investment. Attempts to overcome these difficulties by

increasing public expenditures (on investments) will lead to an even greater increase in interest rates and to an investments crowding out effect. The solution to this problem is possible only at the expense of innovation process which due to increase of high-value goods and services supply holds back inflation in the markets of traditional goods. This will allow the central bank to liberalize monetary policy.

The positive growth rate of the monetary supply (positive first derivative, zero second derivative), corresponding to the level of liberalization that the central bank can afford without increasing the risk of inflation, will stimulate investment and business activity. It is a key indicator of the innovation processes availability.

It is clear that the absence of internal interest reduction in terms (4) and (5) can be achieved only in one case when the share of return on investments (money consumption) exceeds the share of costs for these investments. This condition is also possible only in one case when there is a monopoly on innovation¹ (in particular in the real sector of the economy). However, such excess of income over expenditure sooner or later exhausts all investment resources formed at the expense of disposable income ($Y-T$). Therefore, further increase in investments will be possible only through borrowing on the financial and money markets. At this time there will be a change in the sign of coefficient of elasticity of the demand for money at interest rate (h) from negative to positive in the expression (5).

That is, the redirection of financial flows will only take place due to the processes of economic self-organization. This theoretical conclusion provides a reliable basis for the creation of a methodology for economic-mathematical modeling of such switches.

In the case of a simple (traditional) monopoly due to the large internal interest reduction and consequently high interest rates, investments will be made at the expense of the disposable monopoly income. Then the role of $k\Delta(Y-T)$ in demand for money will increase in the expression (5). Incidents of deviation from this situation are considered in [30].

Moreover, the appearance of a positive value of the coefficient of elasticity (h) becomes a signal for the innovation process activation stimulated by the processes of economic self-organization.

The level of humanitarian factor development (the accumulation of positive social capital) can be partially measured and formalized as an indicator of the monetary sufficiency of the economy (the monetization ratio). The thresholds for this ratio are given in [30]. However, their relationship with the switches of financial flows and the influence of humanitarian factors will require further research.

Thus, the methodology for managing the redirection of financial flows can be reduced to a simple algorithm using indices-indicators based on the coefficients of elasticity (k and h) in the demand model for money (5). Switching the vector of financial flows through the interest channel of managerial influence occurs in the presence of economic mechanisms for holding inflation and stimulating innovation process. It is the stimulation of innovation that allows the central bank to increase the money supply and reduce interest rates accordingly reducing the domestic interest reduction.

¹ To determine whether there is monopoly of innovative or traditional goods is possible only in the conditions of a free market and a high level of positive social capital. In a catch-up economy this can only be determined by the strict adherence to the requirements of the selected development priority.

Differently directed changes in the values of the three indices-indicators, namely: an increase in the percentage of interest channel in the structure of demand for money (the increase in demand through this channel of influence should exceed the increase due to the factor of disposable income (5); the reduction of interest rates; the growth of the monetization rate of economy to over 80%; lowering inflation and exchange rate – can be taken as a basis for modeling the influence of the humanitarian factor on economic development. The fact of simultaneous observation of the mentioned values of these indicators is important here. It is assumed that without mutual trust reached in the evolutionary process of society self-development the formation of innovation sector is not happening.

The interest rate is an important indicator of the state of systemic macroeconomic environment as well of the presence or absence of crisis processes in the economy. The interest rate begins to effectively influence the acceleration of economic development if the processes of money supply increasing are self-regulated by the market and if the monetization ratio of the economy exceeds 80% without increasing inflation risks. Under such conditions the interest rate at or below 5% becomes the main source of intensification of investment processes.

The author is aware that the methodological approaches discussed in this article can not claim to be complete coverage of the problem. In particular, the article does not fully considered issues of currency policy and currency reduction, transmissions, fiscal and financial policies optimization, the interaction of fiscal and monetary policies optimization. Given this and the general novelty of setting the problem, the material presented in the article may trigger a discussion in an expert environment that will be received by the author with gratitude.

Conclusions

1. Introduction of methods for managing economic development on an innovation basis, using the processes of self-organization, requires the formation of mature systemic macroeconomic environment, especially money, financial and currency markets. Particular attention is needed to the development of humanitarian factor.

2. Modern information technology, combined with macroeconomic methodology developed at Harvard University of the USA, and the worldwide expansion of macroeconomic accounting standards (SNA) provide the opportunity to create a new toolkit for the macroeconomic level of self-development of the economy.

3. Economic and mathematical modeling of the management processes of innovative economic self-development should be aimed at solving the problems of its withdrawal from the "zone of instability" where the inhibitory processes hinder the achievement of the goal of application the macroeconomic tools for managing the national economy development.

4. In the model of a developing economy managing the foreign and domestic percent and currency reductions should also be taken into account.

5. The influence of management tools takes place in the macroeconomic environment, that is in the "field" of transmission and adaptive mechanisms of the national economy. Their effectiveness depends first of all on the development of high level markets (financial, monetary, currency).

6. Compensation for the underdevelopment of macroeconomic environment in developing countries should take place through the growth of industrial potential

and commodity supply of innovation sector of the economy. And in the conditions of its insufficiency during periods of economic crises should be use the state budget and financial instruments.

7. The systemic macroeconomic environment is an important subsystem of innovation development management. Changing its basic conditions will cause the restructuring of innovation systems. Therefore, one should take into account the key factor of this environment – the demand for money as a function of: disposable income, interest rate, state influence by fiscal and monetary instruments.

8. It is necessary to take into account the contradictory nature of management efforts (their negative outcome) in the "zone of instability" in the form of effects: crowding out investment and rising interest rates for active state investment policy, rising inflation for soft monetary policy, falling business activity under tight monetary policy. As indices-indicators to control the development of this negative phenomenon are offered the coefficients of elasticity of demand for money at interest rate and at disposable income.

9. The humanitarian factor of honesty (a positive social capital) can not be properly formalized in the monetary and financial categories. We propose to carry out its mediated evaluation on the set of threshold values of three indicators: an increase in the percentage of the interest channel in the structure of demand for money, the reduction of interest rates, an increase the monetization factor of economy, lowering prices, lowering exchange rate.

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