

# The Paradoxes of the World's Progress (I)

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## Abstract

An unbiased systematic view on the modern innovation allows you to see three key groups of innovations that are still very few people differentiate. The first is the technical and technological innovations that are the basis of development and change in technological ways of the world. Secondly, it is monetary and financial innovation, the progress of which determines the change in monetary ways of life of the world. And third, it is the socio-political innovation, progress of which is in the basis of the change of socio-political models of the world. A clear distinction between these three "floors" of innovations is crucial for understanding the global crisis and the ways to quit it. Since the essence of it lies in the tangle of clearly long overdue and contradictions between the rates of introduction of the world's technical and technological, financial and socio-political innovations. As the global crisis clearly shows, technical and technological way today, is not decisive for the country's prosperity and peace. Exactly the countries with the highest level of technology development have become the main source and a key cause of the global crisis.

**Keywords** global crisis, SONA analyzer, technical and technological innovation, monetary and financial innovation, socio-political innovation

## 1 Analyzer SONA - the system weapon of independent analysts of Kazakhstan

### 1.1 Why the global crisis can not be regarded as finished?

The tone of the work on the VI Astana Economic Forum was given by the President of Kazakhstan. His conclusion is that the global crisis can not be regarded as finished. Nazarbayev believes that the crisis now acquires explosive features, with local manifestations, such as in Cyprus.

What is the reason? According to the President of our country, this is the artificial "inflation" of financial bubbles and desire for "easy money". This is the lack of proper responsibility of national financial institutions, the ineffectiveness of anti-crisis measures because of the weakness of the mechanisms of global financial governance.

Anti-crisis measures taken at national level by the dictating of the IMF and other UN institutions themselves become the cause of recession. Thus, the Pact of growth and stability, adopted recently in Europe, did not give real results. A year

has not passed since the Pact ; there is a new Pact on the promotion of growth and competitiveness preparing. Headache for leaders of European countries is unemployment, a large proportion of non-employed people among youth.

To accept radical solutions to the global economy, sufficient will and responsibility have not yet been manifested. There are neither effective global anti-crisis mechanisms, nor reliable global reserve currency. The rules of international consensus were not worked out, meeting the mutual interests of global financial institutions and nation-states actors of the financial sector and the real economy of the world. Any Pact of economic growth and stability will be reduced to practice of the “patching holes up”, if the boundary of the regional union, as in the European Union, expanding blindly, mechanically, without regard to the interests of each country separately.

The conclusion of the President of the Republic of Kazakhstan is original : the world needs a new economic model of governance, which should be based on well-developed tools of their integration. Thus, the financial sector can not and should not develop in isolation from the real production at all levels of management. And, it is important to study and solve the problem of monetary system off-shore in some countries.

According to N. Nazarbayev, the current global crisis is multidimensional. Its speed and dynamics are determined not only by the economic but also the political, humanitarian and moral-value causes. In the end, the President of Kazakhstan proposed to begin work on the Pact of global regulation. It is said about the multidimensional innovative tool for construction a new global financial system and the creation of global regulator, which determines a uniform playing rules. The basis of its design is capacity of five simple and clear principles :

- ▶ evolution and rejection of revolutionary change in policy ;
- ▶ justice, equality, consensus ;
- ▶ global tolerance and trust ;
- ▶ global transparency ;
- ▶ constructive multipolarity.

### *1.2 Three types of innovation in the economy of the world : analysis and problem*

There is an urgent objective need for a number of analytical researches, including but not beyond one-sided judgments about the benefits of the existing models of management of the national economies of individual countries, such as Anglo-Saxon. Today’s rapidly changing world of market forces in the world economy makes innovation management to lift to new heights and to achieve consistency with the development of its real and financial sectors.

The steady growth of the national economies of individual countries and the building of its respective management model, as pointed out by N. Nazarbayev in his article “The Fifth Way”, are closely related to the harmonization of the rates

of development of the three types of innovations :

*type 1* - Innovations in the production of real goods ;

*type 2* - innovations in the field of renovation of monetary system ;

*type 3* - innovations in the field of social and political life of people, business, organization, region, etc.

Of course, the economic model of the future, that will enable implementing the principles of mutual coordination of rates of development of these types of innovations, defines a roadmap for sustainable post-crisis economic growth of not only individual countries but for all countries in the world[1-3].

Market economy itself is based on the principles of competitiveness and innovation development in the production of real goods and services. Due to the modern information and computer technology there is a scope for the smooth implementation of the first type of innovation in the real sector of the economy. There are no obstacles to the development of innovation *type 1*, except legal obstacles and restrictions on private sector development and further liberalization of its work.

As for the second type of innovation, now in most countries of the world unlimited possibilities for the development of innovative technologies in the monetary and financial system are created. Here, same as in production, there are no obstacles in the way of innovation *type 2*.

The main obstacle, which is now holding back the potential of both of these types of innovative development, is the third type of innovation. Innovations in the field of social and political life of people, business, organization, region, etc. in most countries are based on a mechanical copying the Anglo-Saxon model and implementation of the principles of the Washington Consensus. But these models and principles of its construction have already reached their limits and were inadequate for preventing the crisis manifestations and overcome the consequences of the crisis. This explains the incompleteness of the global crisis, the permanent duration of local manifestations and long term duration of its consequences.

Thus, the stagnation in the development of economic science and the lack of technical - technological innovation in governance does not enable control on the gaps between turnover of money and goods flows between the rates of development of the real and financial sectors of the economy, not to mention the innovative rate of development of tools of economic management.

The rate of the third type of innovation and the development level is the weakest link, which is an obstacle in the whole chain types of innovation development of economy and ensuring its financial stability. At the moment, the only obstacle in the way of innovation development of the world economy is exactly the type of innovation *type 3*, innovations in the field of socio-political life of people, business, organization, region, etc.

An innovative tool *type 3* analysis and management is needed not only at the

level of macroeconomics : it is needed in each area of the economy - from home economics, including the economics of the business sector and ending with the national economy. Otherwise making the systematic and right decisions excluding the formation of imbalances in the implementation phase of projects and programs are not possible.

To date, the initiative group of Kazakh analysts developed a system tool with innovative components that meet the principles of "Fifth Way" realistic "estimate, measure, exchange, transfer the true cost of goods and services"[1]. This versatile tool of economic management is **analyzer SONA**, which is fully belongs to the "new financial instruments of a new quality : the real measuring instruments of cost of goods and services"[ibid].

### *1.3 Three indexes of economic development and financial stability*

SONA analyzer is able to determine the rate of balanced growth (growth index I3, which determines the level of innovation of the type 3), which will connect the index of the nominal growth rate of financial stability - I1, which determines the level of innovation of type 1 with an index of the rate of real growth in the sphere of production - I2, which determines the level of innovation type 2.

Thus, the establishment of a balanced growth rate measures the gaps between the development of the real sector and the financial system. And measurable economy is manageable economy.

What does the index for balanced growth mean? The answer to this question, just like the question of what the index of the real growth means is directly related to the concept of index of nominal growth. So first you should understand the index of real growth. If the index of the nominal growth is determined by the ratio of nominal GDP in the prices of the current year  $t$  to nominal GDP of base year  $0$  by the formula  $I_1(t) = NGDP(t)/NGDP(0)$ , then the index of real growth rate is determined by the index of the physical volume of a good or service by formula  $I_2(t) = RGDP(t)/RGDP(0)$ .

The first index is the GDP growth rate in prices of current year. But the economic content of the index is determined not only by market prices of the current year, but the nominal value of the national currency of the country concerned. This is important, the fundamental advantage of a market economy compared with a directive - command economy, which is focused on the principles of hard pricing.

It should be noted that the index of growth of nominal GDP is expressed in nominal charge of the national currency of current year. Thus, the nominal price of the national currency of Kazakhstan in 2008, according to official statistics was 120.30 tenge per U.S. dollar, and three years later, in 2010 it was 147.35 tenge per U.S. dollar. Its rate of growth for only three years was 122.5%.

The second index, which is called the index of the real growth, is the growth

rate of GDP in 2010, but prices of the base year 2008.

The official statistics, using special methods for calculating, transfers nominal GDP of current year to GDP of the same year, restated to prices of the base year. In our example, the nominal GDP in 2010 prices is transferred to GDP-2010 at 2008 prices.

So far, to ascertain the nature of the GDP deflator, we have two GDP growth rates of 2010 relative to the same, let's say, a base 2008. One is index of GDP growth in the nominal value of the national currency of the current year, the other is in the nominal value of the national currency of the base year. If we define the growth rate of nominal GDP relative to 2008, we have growth index  $I_1(t) = NGDP(t)/NGDP(0)$ , and if we define the growth rate of real GDP relative to 2008, we have index  $I_2(t) = RGDP(t)/RGDP(0)$ . Basis for calculating both indexes of growth is 2008 and their performances in the base year equal to each other :  $RGDP(0) = NGDP(0)$ . Both of these figures represents a monetary phenomenon, and except Tenge, Kazakhstan national currency, does not contain any ounces of gold, or a watt of energy, not an ounce of food or a basket of rational budget or one unit of another substance in nature, and not even a single unit foreign currencies, including the U.S. dollar.

One more step to determining the rate of balanced growth brings us the concept of the nature of the GDP deflator. Denoting index of GDP deflator to official statistics  $p(t)$ , we can express its meaning in classical method :  $p(t) = I_1(t)/I_2(t)$ , which measures the gap between the nominal and real indexes of growth.

Analysis of the formula of the GDP deflator shows that at equal rates of growth of nominal GDP and real GDP ( $I_1(t) = I_2(t)$ ), the GDP deflator is constant and equal to one. The rate of growth of the real sector and the financial system are in an equal distance from the bisector of the coordinate system  $(x, y)$ . This equilibrium line of growth rates in both sectors of the economy represents an ideal balanced growth dynamics - the index  $I_3(t)$ .

Of course, the nature of the change of each index of growth is influenced by its source of innovation development. Thus, the source of market forces development of the growth rate of nominal GDP of financial stability -  $I_1(t)$  is the potential of innovative development of the monetary system. And source of market forces development of the growth rate of real GDP -  $I_2(t)$  is the potential of the innovative development of the production in the real sector of the economy. On the equilibrium trajectory of the development rates of the real and financial sectors of the economy equality of not two, but three indexes of growth is attained. This third index, as already indicated as  $I_3(t)$ , is the index of balanced growth. The function of this third type of innovation is to ensure the comparability of development the real and financial sectors of the economy not only in the indexes of prices of goods and services, but also on the purchasing power of the national

currency, to provide scientific management by the first two types of innovation.

However, in reality a balanced of growth rate ( $I_3(t)$ ) does not coincide with any index of real or nominal growth, and may be freely deflected to either side of the line of the ideal dynamic equilibrium. Let his deviation from the growth rate of nominal GDP is  $\alpha : \alpha * I_1(t) = I_3(t)$ , and the growth rate of real GDP is  $\beta : \beta * I_2(t) = I_3(t)$ .

The growth rate of the economy  $I_3(t)$  on the equilibrium line  $\alpha I_1(t) = \beta I_2(t)$  is said to be the dynamics of the rate of balanced growth. How accurately does a triple measurement tool for economic growth meet the criteria of democratic governance and the principles of liberalization of the market economy?

The section of the article "The Fifth Way" N. Nazarbayev "*The paradox of the global progress*" will help to answer this question : **"An unbiased systematic view on the modern innovation allows you to see three key groups of innovations that are still very few people differentiate. The first is the technical and technological innovations that are the basis of development and change in technological ways of the world. Secondly, it is monetary and financial innovation, the progress of which determines the change in monetary ways of life of the world. And third, it is the socio-political innovation, progress of which is in the basis of the change of socio-political models of the world.**

A clear distinction between these three "floors" of innovations is crucial for understanding the global crisis and the ways to quit it. Since the essence of it lies in the tangle of unsolvable contradictions between the rates and levels of development of technological, financial and monetary, social and political structure of each country and world as a whole. Or, in other words, it is the tangle of clearly long overdue and contradictions between the rates of introduction of the world's technical and technological, financial and socio-political innovations.

As the global crisis clearly shows, technical and technological way today, is not decisive for the country's prosperity and peace. Exactly the countries with the highest level of technology development have become the main source and a key cause of the global crisis "[1].

#### 1.4 *The transformation of the GDP deflator into indicators of balancing real growth rates of production areas with the rate of monetary and financial system*

Remains to find out what forces withdraw the initial equity indices of growth in both sectors of the economy in 2010 from balance, when in the base 2008 they were equal :  $RGDP(2008) = NGDP(2008)$ . No force will make us to consider nominal GDP balanced to real GDP in 2010, when at the point  $p(2010) = 113.4\%$  economy has become an equilibrium with only two indices of growth  $I_1(t)$  and  $I_2(t) : 113.4 * I_2(t = 2010) = I_1(t = 2010)$ . At this point, equilibrium in the face

of the national currency of Kazakhstan has not yet reached because in 2008 the price was 120.30 tenge per U.S. dollar, and three years later, in 2010 it was 147.35 tenge per U.S. dollar. What kind of balance can be discussed if the price of the national currency in only three years has deviated from its base by 22.5%, and the magnitude of the gap was even 8 percentage points more than the value of the GDP deflator (inflation rate) for the same years

That's why N. Nazarbayev in his "paradox of the global progress" highlights the need to overcome "tangle of clearly and long overdue contradictions between the rate of introduction of the world's technical and technological, financial and socio-political innovation" [1].

According to claims of training manual of Sachs and Laren on the economy, the GDP deflator used to calculate the inflation rate in 2010 is not the same as the index of growth of actual prices of goods and services of that year : "Note - *J. Sachs and F. Laren support our conclusion* - that we calculate the price index indirectly. At first, we take the nominal GDP (NGDP) in current prices, then find a real RGDP in constant prices, ie  $Q = \text{RGDP}$ . Therefore price deflator calculated in this way is sometimes called implicit price deflator of GDP "[13].

Only the determination of the nature of the GDP deflator (inflation index) will help to understand the "tangle of unsolvable contradictions between the rates and levels of development of technological, financial and monetary, social and political structure of each country and world as a whole" which was mentioned by President [1]. To assess those market forces that unbalance the economy, we assume that the GDP deflator in 2010 represented the integrated expression of two opposite market forces. The first of these forces  $\alpha = pp(t)$ - represents purchasing power of national currency, and the second one  $\beta = c(t)$ - represents market force of technical and technological structure of modern production sphere, expressed by the ratio of NTP in the real economy.

As a result of this assumption, the rate of balanced growth is represented by two components of the GDP deflator, one of which serves as the weighting factor of equilibrium with the rate of nominal GDP growth (growth index  $I_1(t)$ ), and the other is with the rate of growth of real GDP (growth index  $I_2(t)$  ). Now easy to prove that the rate of growth of the real sector with a weighting factor NTP  $c(t)$  is balanced with the rate of growth of the financial sector of the economy on the line  $I_3(t) : c(t) * I_2(t) = pp(t) * I_1(t)$ .

Thus, the objective necessity of studying the nature of the GDP deflator does not derive only from the assessment of purchasing power of the national currency, but also from the assessing the contribution of scientific and technological developments in real growth rate of production of material goods.

### 1.5 The function of scientific and technological progress

However, the theory of economic growth does not allow us to calculate the size of the contribution of scientific and technical progress, the more the contribution of innovations to economic growth. Thus one of the most important conclusions drawn from the theory of “Romer and Lucas - according to Russian sources for economic research - is the fact that the economy, which manages large resources of human capital and the development of science in the long run is more likely to increase than economy, not having these benefits” [5]. It emphasizes only opportunities and points to the overall usefulness of technical and technological improvements.

An attempt to solve the problem of estimating the contribution of STP, independently as the effect of investments in fixed assets at the time was made by N. Kaldor and J. Mirrlees [6]. James Mirrlees is an active member of Astana Economic Forum in recent years, the Nobel Prize in 1996. Thus, the formulation of this problem in the model of Kaldor - Mirrlees is stated as follows :

Let the balanced growth path is described by the interrelated functions of exponential following type [7-8] :

$$G_t(x) = G_0(x)e^{z(x)t}$$

where  $G_0(x)$  - required initial level of indicator x to the balanced growth path ;

$G_t(x)$  - level of indicator x on the balanced growth path at time t ;

$Z(x)$  - required parameter value that determines the rate of increase in the index x on the same trajectory.

Kaldor - Mirrlees model forms a system of 11 equations with 11 unknowns. The peculiarity of this system is the presence within it of the equation that determines the function of scientific and technical progress. The function of scientific and technological progress is a performance increase depending on the growth of capital-labor ratio.

In the simplest case, the function of scientific and technical progress is linear. In the latter case, the rate of balanced growth  $\lambda = z(x)$  is determined from the linear regression equation :

$$\frac{\varphi t}{\varphi t} = \sigma_1 + \sigma_2 \frac{i't}{it}; \lambda = \frac{it}{it} = \frac{w't}{wt} = \frac{\sigma_1}{1 - \sigma_2} \quad (1)$$

$$\sigma_1, \sigma_2 > 0, \sigma_2 < 1$$

where  $\sigma_1, \sigma$  - the coefficients of the regression equation.

The economic content of the regression equation (1) reduces to the fact that with increasing intensity of labor productivity increases, but to a lesser extent, because it is assumed  $\sigma_2 < 1$ . In fact, this limitation restricts the border of the

use of STP when the  $\sigma_2 < 1$  condition is not satisfied. Models of this type do not take into account the explosive effects of individual scientific and technological activities. And because we believe that the contribution of scientific and technological progress allows us to understand more deeply the following two indicators.

The first of them is the technical and economic level of production, which expresses the qualitative characteristics of scientific and technical activities at any given point in time. The second is effectiveness of the scientific and technical solutions that characterizes his return [13]. Due to this mating pair of economic indicators a realistic model of the contribution of scientific and technical progress in the economy can be built. And the models as of the Kaldor-Mirrlees and other macroeconomic models are mostly theoretical and unlikely in the near future will find practical expression in economic management.

However, the NBRK in its analytical work practices using the following econometric models, including :

- inflation equation, which is determined by the model :

$$\mathbf{DLOG(CPI)=0.3*DIOG(CPI(-1))+0.2*D(ULC)+0.02*GAP+0.2*DLOG(P\_IMP)-0.3*(LOG(CPI)-1.3-0.4*ULC-0.2*LOG(P\_IMP))},$$

• CPI - consumer price index,%, December1999=100

• ULC - labor costs per unit of output

•  $P\_IMP$  - import price index, 2000q1=100

• GAP - deviation of GDP,

- equation of the GDP deflator by the other model :

$$\mathbf{DLOG(PGDP)=-1.3*(LOG(PGDP)+6.5-0.9*ULC-0.3*LOG(P\_IMP(-1)))+0.4*DLOG(PGDP(-1))+0.3*DLOG(PGDP(-4))}$$

• PGDP - GDP deflator,%, 2000 q=100

• ULC - labor costs per unit of output

•  $P\_IMP$  - import price index, 2000q1=100

Since the NBRK for determining an indicator of inflation applies one econometric regression equation, and to determine the GDP deflator applies other economic regression equation, it is easy to estimate the difference between them and it can be represented as a contribution to the scientific and technological activities. But the difference between two related indicators obtained in this way will be far from its real value.

Shown here a brief overview of the features of scientific and technological progress and econometric models of the GDP deflator (inflation index) allows us to understand the nature of the GDP deflator. So, in terms of content GDP deflator is different from the inflation index. Inflation, as we know, is an immediate harm to the sustainable development of the market economy. However, the methodology for determining the inflation index and the GDP deflator is still single. In teaching aids and textbooks of such famous authors as Sachs, Dornbusch,

McConnell, Menkyu these terms are used interchangeably and even are written together “GDP deflator (inflation rate).”

However, the GDP deflator and the inflation rate needs to be systematically studied as indicators having different roles in determining the rate of balanced growth. Thus in the construction of the analyzer SONA, the contribution of STP is determined by a formula, the purchasing power of money to a different formula, and the GDP deflator by the third formula. These formulas of three mutually independent indicators allow to estimate the contribution of each of the real and financial sectors on the dynamics of qualitative and quantitative parameters of the development of the national economy.

#### *1.6 Analyzer SONA is a versatile tool to support economic management*

Analyzer SONA is versatile tool that allows assessing, firstly, the contribution of scientific and technological developments in the real economy, and secondly, the purchasing power of the national currency, not only of Kazakhstan but also the U.S. dollar, as well as the national currencies of other countries.

The strength of analyzer SONA is that the foundations of its construction are the laws of political economy. In the words of British economist John Stuart Mill, the laws of political economy act like the law of gravity, which is “without any compunction breaks neck to the best and dear man”, if he does not care about the consequences of the law of nature.

Unfortunately, in most countries of the world, the economy is dominated by legal laws that do not always conform to the objective economic laws. In some countries, political reform is not linked to the level of economic development, iron principle of scientific management of the market economy is disturbed, “Economy first, then politics”.

The main advantage of the analyzer SONA is the use of an entire system of economic laws to ensure the sustainable development of a market economy. The analyzer shows that in a market economy is not market forces rule, but the system of economic laws by which equilibrium is established between the rate of nominal, real and balanced growth in the economy. The principle that has allowed them to balance is the principle of reversibility between the purchasing power of money and the market prices of goods and services.

Due to the principle reversibility indicators of the real and financial sectors are equally involved in the management of the market economy. Both indicators conform to the methodological provisions of the Statistics operating in the Republic of Kazakhstan. It is encouraging that in these methodological positions on statistics the difference between the deflators and price indices of goods and services is clearly indicated : “ *Comparing with the price index for goods and services, GDP deflator measures the change of wages, earnings (including mixed income) and consumption of fixed capital as a result of changes in prices and nominal net of*

*taxes*" [9].

The formula for calculating the difference between the GDP deflator and the price indices of goods and services in Kazakhstan is defined as clearly defined as Ohm's law in physics. The formula of this law is mathematically proved in Section 4 of this paper, and it is economically justified that it is meaningful. The difference between them (its designation,  $c(t)$ ) was equal to the production of GDP - GDP (t), divided by gross output - X (t), defined by amount of current material costs for the production of GDP - QP (t) and of the GDP at current prices - GDP (t) :

$$c(t) = GDP(t)/X(t) = GDP(t)/(QP(t) + GDP(t))$$

Thus, the impact of STP defined by its coefficient -  $c(t)$ , represents the effectiveness of the scientific and technical solutions. And the techno-economic level of production that defined the impact of STP, is - GDP (t) / X (t). The peculiarity of the construction rate of STP is its expression ratio of two key indicators of national accounts : GDP and gross output. These indicators form the foundation of Leontief table "Input - Output".

It is considered that the total cost of production of specific types of products are gross output - gross output (X). If you subtract from it a work in progress, it is determined by commodity products, expressed in money. If the cost of raw materials is deducted from commercial products, the newly created value or GDP will be determined. At one time, the index of gross output, called "gross social product" and the indicator "gross domestic product (GDP)" served as an apple of discord between the supporters of the private and public modes of production.

The fact remains that the economists of the former Soviet Union, for the most part, considered gross output as the main indicator of economic development of the country, it is output X (the total social product X), giving parity to its natural-material structure, the European Union economists believe that GDP is the main indicator of the economy, giving the parity to its monetary cost structure. In the first case the goods were deficit in nature; in the second case the money were deficit.

The above formula for the contribution of the technical and technological progress shows that the dynamics of the growth rate of the indicator  $c(t)$  is expressed in a well-defined mathematical function defined by the ratio of GDP to be released. Thus, it is strictly proved that the parity status should be fixed for the output and GDP, without mutual exclusion : either GDP or gross output. Moreover, the GDP deflator is just one of the equivalent indicators of control and itself can serve as the function of the indicator ratio  $c(t)$  to the index of the purchasing power of money ( $pp(t)$ ) :

$$p(t) = c(t)/pp(t)$$

In general, the originality of the principle of reversibility of commodity prices and the purchasing power of money is that the difference between the GDP deflator and price indices of goods and services determines the level of scientific and technological competitiveness (STC) of the real sector. And this difference between the GDP deflator and the price indices of goods and services can be called “contribution” of scientific and technological improvements aimed to increase the competitiveness of the real economy. The information necessary to calculate the difference between them is in the official statistics of the world, which is in line with international standards.

However, the “contribution” of scientific and technological competitiveness (growth factors NTC) can be either positive or negative. Negative growth of the STC rate in the real sector of the economy is formed when the current material costs of production - QP (t) per unit of product will be greater than in the base year. Conversely, the positive contribution of the STC in the real economy means lower production costs per unit of output of goods on the market conditions of development.

In the case of the positive contribution of STP rate of economic growth is incremented by the value :

$$\Delta c(t) = c(t) - 100 > 0$$

and the index of the GDP deflator is reduced by the same amount.

In the second case, on the contrary, when the contribution of STP is negative ( $\Delta c(t) < 0$ ), the index of the GDP deflator is incremented, and it increases on this multiplicity  $-(\Delta c(t))$ . At the same time the rate of economic growth decreases by the same amount.

Thus, the objective the need to define index of market prices of goods and services is brewing other than the level of the GDP deflator. To save the GDP deflator as an independent regulator of the economy and deal with anti-crisis measures leads to a waste of money and time, as its value can be larger or smaller than the index of prices of goods and services by the amount of the contribution of STP. As evidenced by international experts, the losses of the world, gone with the wind of the global crisis of 2008-2009 exceed 10-12 trillion U.S. dollars. It is recognized that N. Nazarbayev was right, pointing back in 2009 at a bottleneck in the chain of development of the three types of innovation as the paradoxes of world progress. Despite the huge losses of the world economy, a tangle of “unsolvable contradictions between the rates and levels of development of technological, financial and monetary, social and political structure of each country and world as a whole” remains unsolved to this day.

The initiative group of economists Kazakhstan believes that the GDP deflator is “explosive substance” containing in its composition “contribution” of scientific and technological improvements. The more real the positive effects of scientific

and technological progress is, the more powerful the explosive force of the GDP deflator. *Purification of the real price index of goods and services from this “explosive mixture” of the GDP deflator is impossible to carry out without the knowledge of the forces of economic laws and their practical application skills.* Its purification is performed only by those who know the power of these laws. Otherwise, as shown by the economic crises of recent years it is impossible to pass the permanent shocks in different countries of the world.

## 2 The function of the GDP deflator in defining the principles of balanced growth

### 2.1 Reciprocity principle is the core of the theory of balanced growth of the real economy and financial stability

It is recognized that inflation is the scourge of the market economy. To control inflation, this section studied the nature of the GDP deflator, as a factor determining the trajectory of change in inflation. Schematic diagram of the presentation of the GDP deflator by two mutually independent indicators and the definition of balanced economic growth is shown in Fig.1.

The designations :  $p(t) = I_1/I_2$  - GDP deflator, where  $I_1 = NGDP$  and

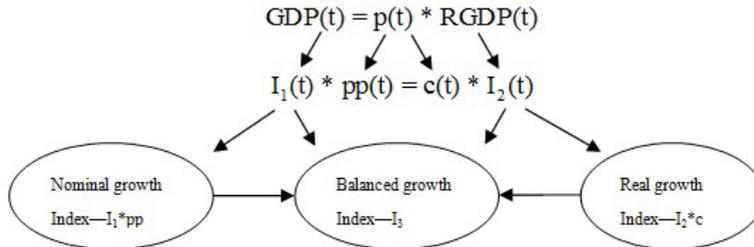


Рис. 1. Иллюстрация взаимосвязи трех индексов роста.

$I_2 = RGDP$   $c(t) = NGDP(t)/X(t)$  - risk management index (RMI), where  $X(t) = NQP + NGDP$ , where  $NQP(t)$  - Current material production costs  $NGDP(t)$ . RMI is a synonym of STP coefficient or rate of scientific and technological competitiveness.  $pp(t) = c(t)/p(t)$  - index of the purchasing power of money.

As can be seen from Figure 1, the GDP deflator (inflation index) is expanded by a factor of STP -  $c(t)$  and the indicator of purchasing power of the national currency -  $pp(t)$ . By the coefficient of STP further integrated expression of risk management in manufacturing is understood, which is synonymous with the level of scientific and technological excellence of production. More precisely, the coefficient of STP is hiding all the integrated effect of all risk management decisions of the current period of analysis.

Main thing in theory of reversibility of indices of commodity prices and the

purchasing power of money is that it opens the door to reveal the entire system of economic laws that govern the development of the market economy. Thus, based on the above formula economic laws are defined, which are very useful for the stability of the market economy. So if the appropriate formulas of these laws are used in the analysis of the market economy not the market elements will dominate, but the system of economic laws by which the principle of market equilibrium is realization. And the indicators of of real and financial sectors in equal measure will participate in the analysis and management of the market economy. Basic economic laws that meet the above logic, analysis, and outlined in the terms of the indices of growth of major management indicators, the following :

► Law of determining the overall impact of the adopted incentives for innovation and investment in the economy of scientific and technological improvement -  $c(t)$  :

$$c(t) = GDP(t)/(QP(t) + GDP(t))$$

► Law of determining the purchasing power of money -  $pp(t)$  :

$$pp(t) = (c(t) * i_2(t))/i_1(t)$$

► Law of determining prices of goods and services -  $1/pp(t)$  :

$$1/pp(t) = i_1/(c(t) * i_2(t))$$

► Leading law of determining the real growth of the economy -  $i_3(t)$  :

$$i_3(t) = pp(t) * i_1(t).$$

► Control law of definition of the real growth of the economy -  $i_3(t)$  :

$$i_3(t) = c(t) * i_2(t)$$

► Law of general price deflation -  $p(t)$  :

$$p(t) = c(t)/pp(t) = i_1(t)/i_2(t)$$

► Law of definition of net benefits from the stimulation of scientific and technological improvements -  $\Delta c(t)$  :

$$\Delta c(t) = c(t) - 100$$

It should be recalled that, in our notation,  $i_1(t)$  is the index of GDP growth in the prices of the current year,  $i_2(t)$  - the index of growth of GDP at comparable prices. And  $QP(t)$  indicated the current material costs necessary for the production of GDP ( $GDP(t)$ ).

If earlier political economy as the ideological basis of private or socialized economy disconnected the world into two camps, but now it is special science freed from ideology and will be used for the benefit of all, starting with the economy of the individual entrepreneur and completing with the individual economies of the world.

All participants of production will have to study and use these laws in economic activity, just as natural scientists in their work using Ohm's law, or the law of gravity without regard to ideological awnings hanging over them. Learning about and using them in their work is forced not the directive from above or below, and their own economic interests. They are equally beneficial and at the enterprise level and at the level of the economy.

### *2.2 Investment in fixed assets as carriers of innovation*

The relationships between the key indicators of economic will change under the influence of capital investments, innovations in technology, science and other technical or organizational and technological measures. The main carrier of innovation is an investment that has a direct impact on the change in the structure of the market forces of the real economy, hence, on the purchasing power of the currency.

Of course, these investments will be effective if they are focused on the major discoveries in the natural sciences, which are expected in the areas of space technology and nano technology. Space technology is only in the field of telecommunications has opened doors to new scientific and technological revolution, which is already being implemented in almost all human activities, ranging from educational processes, ending municipal services to the population.

It is widely implemented in the management process and monetary institutions. It is expected that within the framework of e-government in the near future high technology breakthroughs of intelligent systems of state management of the economy and finance will be created.

Based on the current intensity of research and development work carried out at universities in the U.S. and Western Europe in the field of nanotechnology, breakthrough technology in the near future will be implemented in the real sector rapidly. As M. Ratner and D. Ratner write [11], nano technology will become the foundation of many advanced technologies. Feature of this technology is that it can be developed in university laboratories and individual scientific - research centers. And, in these institutions intellectual work comes to the forefront.

Even today, without noticing it, we use "smart materials" obtained through the use of nanotechnology. Under the "smart materials" the latest developments in the field of materials consumer or industrial purposes in the nano world of electrons and neutrons are meant. The basic technology of their production is realized using the theory of quantum mechanics. From the point of view of science, here is the integration and sharing of existing knowledge of various branches of basic

sciences - chemical, biological, physical, mathematical and others. In developing such a “smart material” skilled professionals and financial capital are involved, the integration of which will give a new impetus to a high-performance production.

SONA analyzer is highly effective and innovative product that allows transferring responsibility for the managerial decisions, including, forecasting and planning at the appropriate levels of microeconomics. Macroeconomic policy stops focusing on the development of planning and forecast indicators and, thus, increases the analytic function of public service staff of macroeconomic management.

Once management functions of microeconomics remains at a real sector, the main condition for profit maximization at the enterprise level is the dynamics of total factor productivity and attraction of additional labor. What is the reason for changes in the dynamics of total factor productivity and capital?

First of all, they are due to the intensity of capital investment in the real economy and its effectiveness. Investments in fixed assets contribute to changes in the labor armament with basic production assets and return of capital. In the analyzer SONA, armament of labor with fixed assets is measured by a special indicator that expresses the level of industrialization of the economy and the price of capital is measured by other special indicator that expresses the change in the level of innovation and contribution to innovations, carrier of which is the newly introduced in the production of new capacity and replacement of fixed assets.

But the dynamics of changes in total factor productivity and fixed capital is associated by productivity of economic labor, which is represented by the ratio of the total factor productivity to the average annual wage per worker. These special indicators in the analysis of management decisions are of great practical meaning, since not all the “innovative activities and innovations”, in practice, increase the level of productivity of economic labor and often work in the opposite direction due to miscalculations in the stages of their design and implementation.

Thus, the two key indicators of interrelated capacities - total factor productivity and productivity of economic labor - determine the levels of innovation development of any part of the real, and after aggregation, also the national and global economy.

### *2.3 Resource productivity of intermediate consumption as a measure of growth of production of the final product*

Both labor productivities are arguments of the function of the third productivity - the resource productivity of intermediate consumption for the production of the final product. This includes all products and services, including, first and foremost, energy, environmental, and other natural resources that are annually involved in the turnover of the current material costs of the real economy and are constantly in circulation.

They are annually deducted from turnover. However, these resources of inter-

mediate destination reserve the mark elusive at first sight in the measurement of progress, and the money in circulation, and the mass of commodities in circulation. And the growth of the total number of employed people and other factors of increasing the working time can only affect the quantitative growth of economic indicators.

Productivity of intermediate product for the production of the final product (GDP) is a function, which reflects the dynamics of total factor productivity of labor and capital, hence, productivity of economic labor. As it is known, natural resources, primarily fuel and energy resources and mining and smelting clusters that are involved in the production, form the bulk of intermediate product values. Therefore, this key indicator, defined by the relation between the final and intermediate products is the relationship between the natural environment and human society. And therefore the relevant performance indicator of intermediate resources of consumption is a crucial tool of economic management in a single technology of analyzer SONA.

What caused the changes in the productivity of intermediate product for the production of the final product (GDP) ? Capital expenditures on scientific, technical, organizational, technological, and any other events, including, events aimed at resource conservation, improvement and updating of the commodity nomenclature lead to changes in productivity of the intermediate product for the production of the final product (GDP). These changes take place mainly under the influence of scientific and technological developments, including technical, technological and organizational measures that are used by certain people's knowledge and monetary resources. But SONA analyzer does not work out and does not offer a specific administrative decision and, therefore, does not control the quality of science and technology and other measures implemented in the real economy. It only establishes a de facto existing levels of three key performance indicators in the annual real time, and assesses changes in the level of armament of capital for labor (indicator of industrialization) and in the level of prices of fixed capital (the indicator of innovation) due to management decision-making and the definition of economic laws. That is, it does not replace the persons taking management solutions.

Subordinated system of indicators of SONA analyzer is used only for audit and examination of the quality of the management decisions they made. A key indicator of the analyzer along with the number of employed people in the economy allows us to determine the quantitative parameters of the growth of its main indicators. It includes :

- productivity of intermediate product for the production of the final product ;
- total factor productivity of labor and capital ;
- productivity of economic labor ;
- the number of employed people in the economy.

All other indicators needed to analyze the economic development of the country are derived from these four basic concepts and categories. Official annual statistics of the national economy has background information on the definition of these key and additional indicators of analysis and management.

Thus, global practice of measurement of purchasing power of money is limited to assessment the physical volume index (PVI) of goods and services and the establishment of the GDP deflator in the real sector of the economy, as the ratio of the index of growth in prices of the current year to an index of growth in the prices of the base year. And the theory of balanced growth is still out of sight of management practices. Until now, application tools of analysis of key sectors of the national economy are not synchronized, there are no direct and inverse relationships between indicators of the real and financial sectors, as part of a single economic system. As a result of the lack of mechanisms to control deviations of interrelated indicators of development of market forces, the gap “between those who are doing business and those who make money” is increasing.

The proposed technology of work based on the analytical formulas of the system of economic laws is highly effective. And the appropriate navigation system for the analysis of planned, project and other management decisions gives concrete results in the form of a system of the control indicators based on data from official statistics. In particular, the indicator of growth of the price of a particular product or service in the real sector is clearly defined, which is the reciprocal of the purchasing power of money in relative terms.

#### *2.4 The index of prices of goods and services as the inverse of purchasing power of money*

The scientific basis of the principle of reversibility as well as the principle of determining the SONA analyzer is based on the use of the global economic thought and practice. It is based on a procedure that meets the basic rule of international consensus :the equality of the indices of growth of the sum of the seller’s commodity prices and the reciprocal of the growth indexes of purchasing power the buyer’s sums of money. This means that all price indicators of economic analysis and management of the real economy are under the authority of the power unit of the national currency, determined, in this particular case, in accordance with the principles of international consensus :

$$\Pi_T * K_T / K_{\Pi} = 1 \quad (2)$$

where  $\Pi_T * K_T$  - as the numerator of this equation expresses the value of commodity mass of the seller, and  $K_{\Pi}$  - is the money supply from the buyer at face value of the national currency.

But this is only the rule; “one” in the right-hand side of (1) is a relative quantity, necessary to compare purchasing power of the national currency of the

current time with its level in the base year. Since the gross profit  $\Pi_{\top} * K_{\top}$  is actually output in monetary terms  $-X = \Pi_{\top} * K_{\top}$ , and money supply  $-M = K_{\Pi}$ , then velocity of money circulation at face value of the national currency will be  $-v_x$  :  $v_x = X/M$ , or by the conditions of international consensus :  $\mathbf{X} = v_x * \mathbf{M}$ .

Hence :

$$\mathbf{X}/(v_x * \mathbf{M}) = 1 \quad (3)$$

It is clear that the output  $X$  contains the repeated recording of individual components of products that are sold and resold, then nominal GDP is defined as :  $NGDP = X - QP$ , where  $QP$  is intermediate consumption, and  $NGDP$  is GDP for the production, the product without double counting.

Since the equation of exchange of the monetarists :

$$NGDP/v_n * \mathbf{M} = 1 \quad (4)$$

Then replacing  $NGDP$  by  $X - QP$  we have the equality that defines the difference between the three speeds :

$$v_x - v_z = v_n \quad (5)$$

Which are clearly determined by the gross profit  $X = \Pi_{\top} * K_{\top}$ .

This rule is fully consistent with international and Kazakhstani practice of analysis of nominal and real GDP and GDP deflator. Introduction to the analyzer SONA of three key performance indicators allows focusing the purchasing power of money at one point. And this point of consensus core of world currency can not be determined without consideration of gross profit  $X = \Pi_{\top} * K_{\top}$ , on the basis of which three velocities of money are determined by the equation of the  $-v_n = v_x - v_z$ .

The initiative group of Kazakhstani analysts, after the analogical settlement of the economies of states of the Customs Union and the economy of the Customs Union as a whole, has come to the conclusion that there was an opportunity to focus their national currencies to a single point. In this case, the currency of the Customs Union will have its consensus core, other than the core of the national currencies of countries of the Customs Union. The point of this consensus itself, adopted as a basis for currency of CU, as well as world currency itself is in constant motion. Thus, the price of the U.S. dollar in 2000 was equal to 0.75, in 2008 - 0.62, and in 2010 regained the relatively high level - 0.81.

Similarly, as the U.S. dollar, all other national currencies will have their equilibrium prices different from world currency prices. Price of world currency is needed for countries of the world to support the effectiveness of the exchange rate of its currency and the favorable choice for the country's economic policy. In this case, the relative value of the power unit of the nominal value of world currency at the point defined by the application tool of the analyzer such as SONA, will become

a concentrated expression of the purchasing power of all national currencies of the States concerned - UN member states, including the United States. Once for each country purchasing power of its currency is determined, then the basis for calculating the SDR can be taken the following formula, which does not contradict the general methodological principles of the IMF's definition of "price" of world currency :

$$PP(SDR, t) = \sum_{i=1}^{i=n} NGDP(i) / [pp(1) * NGDP(1) + pp(2) * NGDP(2) + \dots + pp(n) * NGDP(n)]$$

Where n expresses the number of countries included to the zone of foreign trade.

The cost of one million of Kazakhstan tenge, as well as other national currencies in their official rate, which were included in the determination of the value of world currencies, is an equivalent product, and can be freely exchanged for a certain amount of other goods and services at their market prices. But its purchasing power, as well as other national currencies, undergoes a change with changes in the velocity of circulation not just one product, say, gold or oil. It varies with the velocity of circulation of all goods and services, including the prices of intermediate goods and services.

### 2.5 *Function of the velocity of circulation of goods and services in determining the rate of balanced growth*

All indicators of the analyzer SONA are a function of main performance indicator of intermediate product for the production of the final product, which determines the economic content of the relative velocities of the key indicators of macro-and microeconomics. They include :

- dynamics of intermediate product performance (QP) for GDP at face value  $(GDP(t)) - \frac{GDP(t)}{QP(t)} = \mu(t)$ , the reciprocal of material consumption of GDP ;
- rate of STP, the value of which is equal to  $GDP(t)/X(t)$  in macroeconomics in this case is expressed by formula —  $c(t) = \frac{\mu(t)}{1+\mu(t)}$ . This indicator defines the contribution of innovation factors in the development of the economy and serves as a general indicator of technical, technological and other organizational measures implemented in the real economy as a whole ;
- rate of turnover (X) on the face value of GDP, in this case, is defined by the formula —  $v_x(t) = \frac{X(t)}{GDP(t)} = \frac{1+\mu(t)}{\mu(t)} = \frac{1}{c(t)}$  ;
- turnover rate of the money supply - M on face value of GDP is expressed by the formula —  $v_n(t) = \frac{X(t)}{M(t)} * \left( \frac{\mu(t)}{1+\mu(t)} \right) = \frac{GDP(t)}{M(t)}$  . As can be seen from this equation turnover rate indicator of the money supply does not take into account the contribution of all innovations in the real economy.
- turnover rate of the money supply  $v_n$  from the perspective of the circulation of goods and services is determined by a different formula :

$$v_n(t) = v_x(t) - v_z(t)$$

where  $v_z$ - the turnover rate of the current material costs used in the production of each unit sold goods and services is determined by the formula —  $v_z(t) = \frac{QP(t)}{M(t)}$ .

- The purchasing power of money is determined directly proportional to the ratio of NTP and inversely proportional to the GDP deflator :

$$pp(t) = c(t)/p(t)$$

- Balanced economic growth, defined by multiplication of the purchasing power of money and nominal GDP :

$$RNGDP(t) = pp(t) * NGDP(t)$$

- balanced economic growth, defined by multiplication of the coefficient NTC and real GDP :

$$NRGDP(t) = c(t) * RGDP(t)$$

- The principle of invertibility :

$$NRGDP(t) = RNGDP(t)$$

or

$$pp(t) * NGDP(t) = c(t) * NGDP(t)$$

A key indicator in determining the efficiency of the financial sector of the economy is the value of money, expressed as purchasing power of the currency. The value of money, as the prices of goods and services, changes over time. But the value of money does not contain a single atom of natural ingredients : no gold, no coal, no oil, no labor, no capital, no bread, no meat and other goods. And therefore it makes no sense to look for another form of money, other than paper form. There are no prospects, for example, of the return to the gold standard, the more no prospects of energy (watt, joule) and other material substitutes for paper money. Only deviation of index of prices of goods and services relative to the GDP deflator can accurately estimate the purchasing power of money, and set the real price and exchange rates of the national currencies of the world. Its formula is defined from equation  $p(t) = c(t)/pp(t)$ , where  $p(t)$  is GDP deflator,  $c(t)$  is the coefficient of STP and  $pp(t)$  is an indicator of purchasing power of money.

Analyzer SONA, as the technology of management of unity development of the real, financial and monetary sectors of the economy is used to measure the purchasing power of money and the gap between the real and nominal GDP. As a result, the third dimension of economic growth is defined as the product of nominal GDP and purchasing power of money ( $pp(t)*NGDP$ ) and a double of this measurement, defined by the product of real GDP of and the STC ratio

( $c(t) \cdot RGDP$ ). Exactly this dual pair is the economic content of the principle of mutual convertibility, with the help of which the indices of growth of prices of goods and services ( $1/pp(t)$ ) are defined as the reciprocal of the index of the purchasing power of money -  $pp(t)$ .

The analytical model for determining the threshold levels of indicators of economic management based on official statistics of GDP deflators ( $p(t)$ ) and on the human dimension of the purchasing power of money is composed of the following recursive system of equations :

$$\begin{aligned}
 NGDP(t) &= NGDP_N(t) \cdot L_N(t) \cdot N(t). \\
 TW(t) &= \gamma(t) \cdot L_N(t) \cdot N(t). \\
 TR(t) &= NGDP(t) - TW(t). \\
 X(t) &= \left(\frac{1}{u(t)} + 1\right) \cdot q(t) \cdot \gamma(t) \cdot L_N(t) \cdot N(t). \\
 c(t) &= \frac{GDP(t)}{X(t)}. \\
 p(t) &= \frac{NGDP(t)}{NGDP(0)} / \frac{RGDP(t)}{RGDP(0)}. \\
 pp(t) &= \frac{c(t)}{p(t)}. \\
 pp(t) * NGDP(t) &= c(t) * RGDP(t).
 \end{aligned} \tag{6}$$

Additionally accepted designations :  $N$  - number of the country's population,  $L_N$  - the proportion of people employed in the economy of the total population,  $TW$  - fund salaries,  $TR$  - Income on equity,  $NGDP_N$  - GDP per capita.

Equality between GDP by income, GDP by production and GDP by end-use remains in this analytical model.

$$pp(t) * NGDP(t) = c(t) * RGDP(t).$$

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