

## The SONA Project: A New Set of Innovations Indicators to Measure Efficiency of Managerial Economics in Developing Countries

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### Abstract

The present paper reflects the outcomes of the in-depth analysis relating to the development of the economic analyses indicators to assess growth at different levels of the process of innovations in a national economy. It presents a new model of market equilibrium, which has been designed to restore a balance between the levels of production, employment, income and prices. Specifically, the paper developed a theorem, which has built on the set of the innovations indicators to measure growth in innovations in the development of national economies of world's developing countries. The novice of the paper is in its justification of the qualitative theory of money as the core basis for assessing economic changes in the growth of innovations under the realities of the globalized world economy. The prime contribution of the study is that it puts a halt to the inefficient and ineffective utilization of natural, material, capital and labor resources. Moreover, it opens up an undisturbed path to the development of green economy thereby leading to the sustainable economic development that saves capital, labor, and environmentally-friendly resources.

**Keywords:** Macroeconomics; Innovations; Conservation of resources; Market equilibrium; Growth; Productivity

### Introduction

Ten years have passed by since the time when brainstorming discussions were held in preparing for the Astana Economic Forum. In this current year, we will mark the tenth anniversary of that cornerstone historic event where growth perspectives of productivity in individual sectors of national economies and overall competitiveness indices were discussed, at full length. The participants of those resulted discussions configured concrete steps along the prospective direction. Among those is a special project, named as the SONA Project, which primarily targeted the development of the public management analyses tools and techniques, to support managerial economics [1].

In 2017, the tenth Astana Economic Forum developed a new agenda for world experts. That included qualitatively new methodologies, concepts and approaches relating to the assessment of GDP, new accounting units for trade transactions and new growth rate indicators to be mainly focusing on the concepts of *clean energy* and environmentally friendly economics.

Today, all those key factors continue exerting their direct impact on the competitiveness indices of world's countries that are currently growing under stark realities of the comprehensive globalization. Against this backdrop, the synergy effect was set to define the level of the development of every of world's countries. It is the synergy effect that now stands out at the fore front of the interaction between the three key sectors of the national economy. Those sectors are:

- Real sector, having its own innovations development technology;
- Financial sector with its own innovations development technology, and
- Managerial sector with its unique innovations development technology.

Since then, a new task has been set to build a novice model of market equilibrium to restore much needed balance between

production, employment, income, and pricing. Such task may be handled by developing a qualitatively new model of monetary policy deriving from the quantitative theory of money. From that perspective, the new model of the quantitative theory of money has been defined by the following Fisher equation:

$$V \times M = pb \times RGDP, \quad (1)$$

where  $V$  and  $M$  – velocity of money circulation and the money mass, which is currently being transacted,  $pb$  – GDP deflator,  $RGDP$  – real GDP. By deriving from this equation, we then obtain the following equation:

$$NGDP = pb \times RGDP, \quad (2)$$

where  $NGDP$  – nominal GDP that is equal to  $V \times M$ .

By multiplying both sides of eqn. (2) by the purchasing power indicator of national currencies –  $pp$  (which is never equal to zero)  $pp \neq 0$ , we obtain the following equation:

$$pp \times NGDP = pp \times pb \times RGDP \quad (3)$$

Let us introduce a new value of  $pp \times pb = c$ . Then, a new model of market equilibrium on productivity, employment, income and prices may be presented, as follows:

$$pp \times NGDP = c \times RGDP \quad (4)$$

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In this instance, since we already know the value of indicator  $c$  we may easily define the purchasing power of the national currency –  $pp$  by applying the following formula:

$$pp = \frac{c}{pb} \quad (5)$$

To build a new model of market equilibrium, we would need to understand the economic essence of the innovations indicator. We also need to uncover its possible variables. For these purposes, let us put the following hypothesis forward in this paper to prove our assumptions. Let us assume that the dynamics of value  $c$  reflects the changes in the value of the scientific and technological potential of the country.

### Theorem

In every instance of the currently elapsing time, the purchasing power of the national currency of any of world’s countries is defined by dividing the indicator of the scientific and technological potential of the country –  $c$  by the GDP deflator –  $pb$ .

**Proof:** Since the output of goods and services of any type of economic activity ( $X$ ), based on the system of national accounts (SNA), is presented by the sum of the nominal GDP (NGDP) and intermediate consumer goods (QP) -  $X=NGDP+QP$ , then the value of capital productivity, in its form of intermediate consumer goods -  $\mu$ , will be defined by the proportion formed of NGDP and QP, as follows:

$$\mu = \frac{NGDP}{QP}$$

Here, on the one hand, the trend of value  $c$ , will be defined by following formula:

$$C = \frac{\mu}{1 + \mu} = \frac{\frac{NGDP}{QP}}{1 + \frac{NGDP}{QP}} = \frac{\frac{NGDP}{QP}}{\frac{QP + NGDP}{QP}} = \frac{NGDP}{X} \quad (6)$$

At present, eqn. (6) presents the productivity of full costs of the conserved (reserve) potential of country ( $X$ ) expressed in cyclical processes of reproduction of goods and services. If the growth rate of the nominal GDP proves to be greater than the value of the costs, then the growth rate indicator will tend to decrease. In other words, value  $c$  presents the growth rate of a relative value of the nominal GDP in structure  $X$ .

On the other hand, having obtained eqn. (6), by further extrapolating this formula, we may easily obtain the following equation:

$$C = \frac{NGDP * RGDP}{RGDP * X} = pb * \frac{RGDP}{X} \quad (7)$$

Now, we need to prove that value  $\frac{RGDP}{X}$  equals to  $pp$ . Accordingly, since we already have eqn. (6), value  $c$  will then equal to  $C = \frac{NGDP}{X}$ . In further calculations, this particular indicator will be termed as ‘the indicator of the scientific and technological potential of the country’ [2], and its corresponding theoretical basis will be named as ‘the qualitative theory of money’.

Deriving from eqn. (6), the scientific and technological potential of the country presents the share of the nominal GDP (NGDP) in output ( $X$ ), which, at the same time, presents the quality of full material costs, labor costs, the costs of natural and other capital resources. Since the value of the scientific and technological potential of the country has already been defined, the purchasing power value may easily be identified by applying eqn. (5), as follows:

$$pp = \frac{c}{pb} = \frac{\frac{NGDP}{X}}{\frac{RGDP}{X}} = \frac{RGDP}{X}$$

The resulting formula may be written, as follows:

$$c = pp \times pb. \quad (8)$$

*Result.* By definition, the cost of national currencies is equal to the reverse true value of the costs of goods and services –  $pc$ . If that is true, we may then present eqn. (9), as follows:

$$pc = \frac{1}{pp} = \frac{1}{\frac{RGDP}{X}} = \frac{X}{RGDP} \quad (9)$$

The overall price index of goods and services is defined on the basis of world’s countries’ official statistical reporting. The latter complies with the international standards applied to the system of national accounts (SNA). The common logic in applying this formula is that the gold rule of market equilibrium, which equalizes the levels of production, employment, income and prices, may be written, as follows:

$$pc = \frac{c}{pb} \quad (10)$$

At any given moment in time, the indicator of the purchasing power of the national currency is defined by the proportion of the technological potential of the country and the GDP deflator. The new set of the innovations indicators measuring the level of the growth in innovations in developing countries is based on the equation, which is defined by the Fisher equation on exchange, which, in its turn, has been regarded as one that had been developed on the basis of the quantitative theory of money. It does not contradict with the rules that govern construction of the monetary policy. It rather enables obtaining the accurate and authentic input data and economic information for conducting credible economic analyses on developing countries while at the same time assessing the dynamics of world’s reserve currency units based on the US dollar.

### System of the innovations indicators for developing countries

Almost all advanced countries avail of their individual sets of the indicators designed to measure the characteristic qualities of the innovations. In this regard, the solution to the Baye problem set, which was, at times, associated with the choice of the economic analyses tools applied in investigating the case study with the American and Japanese companies and the fact that those opposed one another, were well presented in Baye’s book titled “Managerial Economics and Business Strategy” [3]. The similar set of the indicators to assess innovations is being currently applied by countries of the European Union. The latter, among others, guides the developing courtiers on economic analyses methodologies [4].

Building further on the qualitative theory of money, an entirely different set of indicators on innovations of the national economy is being suggested, herewith [5]. Those are as follows:

The function of capital productivity that has been utilized in the production, in its form of intermediate consumption (QP(t)), the key indicator of the innovations, which represents the time trend as the proportion of the nominal GDP (NGDP(t)) and

$$QP(t) - \mu(t) = \frac{NGDP(t)}{QP(t)};$$

The function of the technological potential of the country of which the key indicator of the innovations is the time trend –  $c(t)=\mu(t)/(1+\mu(t))$ ;

The function of the purchasing power of national currencies of which the indicator is defined as growth in the proportion of the technological potential of the country (c) and the indicator of the GDP deflator –  $(pb(t)): pp(t)=c(t)/pb(t); (pb(t))$ :

The indicator of the input by the National Bank of the Republic of Kazakhstan to the rates of the incremental growth of the product actually utilized for consumption and savings (FUNP(t)):  $FUNP(t)=pp(t) \times NGDP(t)$

The indicator of the real input by the Government of the Republic of Kazakhstan to the rates of the incremental growth of the final product actually utilized for consumption and savings (FUNP):  $FUNP(t)=c(t) \times RGDP(t)$ , where  $RGDP(t)$ - real GDP;

Testing of the viability and authenticity of the solution of the market equilibrium of the levels of production, employment, income and prices:  $c(t) \times RGDP(t)=pp(t) \times NGDP(t)$ .

## Conclusions

This particular set of the indicators of innovations fulfills the tasks set by the President of the Republic of Kazakhstan when addressing the international forum in 2017, in Astana. The key indicators of the above-reflected set of indicators help to accurately assess the scientific and technological potential of every of world's countries and the purchasing power of national currencies of those countries. It follows Sraffa's methodology on defining productivity of intermediate consumer goods [6].

## Comparing the new set of the innovations indicators with that of the European Union

The key indicator of the innovations in the EU countries is the hourly labor productivity [7]. According to the views of those experts who developed the above-noted set of indicators, the latter is sensitive to any changes, except changes in the scientific and technological potential of the country as the cost of money is defined by the GDP deflator and the overall prices index by the changes in goods and services.

The volatility of labor productivity is known to well assess the value of productivity of the real economy. In the view of this paper, the developers of the EU-led set of the innovations indicators, while having in mind the value of volatility of labor productivity, proposed to supplement GDP by technical parameters, such as, the units of patent applications, the percent of the employed population in the science-intensive industries, the share of the rapidly growing and newly emerging innovations firms in the national economy [7].

In other words, the EU avails of the set of the innovations indicators, which implies a sum of multi-level technical, social, and economic indicators. Compared to that set, the new set of the innovations indicators of the qualitative theory of money represents a complete energy-based model of market equilibrium of levels of production, employment, income and prices. It has been defined by means of applying the methodology of juxtapositioning the costs of the outcome products thereby enabling accurate assessment of market efficiency in any country.

The justification of the above-noted characteristics is itself an

assertion of the fact that the rate of the hourly labor productivity is one of the two components defining growth in the technological potential of a country, given the following equation:

$$\frac{\dot{c}}{c} = \frac{\dot{\varphi}}{\varphi} - \frac{\dot{\psi}}{\psi}$$

Where  $\varphi = \frac{NGDP}{L}$  and  $\psi = X / L$  accordingly, the rate of the

hourly labor productivity, and labor productivity by full costs of goods and services incurred for production of the annual income, where L-worker's time in man-hours.

The first of the components in the above formula, namely, the hourly labor productivity is, in fact, the key indicator for defining the level of the innovations in various sectors of a national economy in most of the EU countries as well as in those of the US. The second is labor productivity by full costs of goods and services incurred for production of the annual income. It is the key indicator defining the innovations level of the sectors of the Japanese national economy, according to the theoretical developments in Baye's book: *Managerial Economics and Business Strategy*.

In his book titled *The Kremlin deadlock and Nazarbayev* (1993), a renowned economist D. Valovoi pointed that the lack of a viable methodology to accurately measure economic growth in countries of the ex-soviet economic system was one of the key factors that led to the eventual decay of the entire ex-soviet economic bloc in the late 80s of the past century.

In overall, given that accurate statistical data and economic information are provided for the purposes of conducting economic analyses to assess growth in world's economies at the macroeconomic level, to comply with standards of the World Bank's system of national accounts, the set of the innovations indicators, as proposed in this paper, may be applied. The latter has been designed according to the six rules of market equilibrium, as described earlier in this paper. It defines the quality of performance in all three key sectors of a national economy based on the macroeconomic indicators of innovations. In effect, it represents a macroeconomic proxy of the rules governing the six sigma of the American firms. Those helped define the quality of the output goods and services at the macroeconomic level.

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