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HIDDEN RESOUCE OVERUSE AS INITIAL DRIVING FORCE OF MACROECONOMIC DYNAMICS: RESOURCE MODEL OF ECONOMIC CYCLES

A new resource model of economic cycle is proposed. It is shown that the hidden resource overuse used in GDP production is an initial driving force of economic cycles. The resource overuse is a result of cumulative market imperfections caused by various market conditions and embodied in the gap between calculated natural and actual market price deflators. Total efficiency of the regulatory policy can be evaluated by the size of this gap. This enables feedback between actions of the regulator and their impact on the economy. The resource model was empirically tested on the USA economy using a period of 40 years or six empirical business cycles in a row. The model allows us to identify and forecast recession with the lead period 6 to 18 months. Empirical testing of the resource model reveals the absence of false signals when recession starting points forecasting.

Keywords: business cycles, economic growth rate, recession forecasting, driving force of macroeconomic dynamics, regulation policy efficiency.

A great number of macroeconomic dynamics models were proposed in the past decades of systematic research of economic cycles: structural, nonstructural, and various combinations of both [1; 2; 5–8]. However, most models are far from solving one of the most difficult problems of macroeconomic dynamics – forecasting the starting points of recessions [3]. Unpredictability of the recession and multiple financial shocks starting points during the years 2006–2010 resulted in unprecedented and arguably inefficient spending to stimulate the world economy.

Although various models significantly differ from each other, one can highlight some common drawbacks that can partially explain the inability to accurately forecast starting points of recessions. Those drawbacks primarily include: 1) multiple assumptions that simplify the reality of things (perfect competition, price and wage flexibility, ceteris paribus, etc.) and make a model local, i.e. applicable to specific market conditions; 2) there is the time lag when identifying macroeconomic dynamics turning points; 3) there are false signals when the economic crises starting points identification.

To increase the economic crises forecasting efficiency the resource model of economic cycle is proposed. An attempt to neutralize noted above drawbacks is made within the model. Besides, the common driving force of macroeconomic dynamics that is valid for any market conditions is grounded.

Author hypnotizes that the "vicious circle" problem (that is price depends on cost, and the last one depends on prices of incoming goods and services) may be considered as a visualization of the model drawbacks noted. Standard models posit rationality of market valuations, but are unable to verify their rationality rate. The accuracy of production cost valuation in monetary terms depends on efficiency of markets. In case of perfect markets, the problem of «vicious circle» is absent and market valuations are efficient both for exchange and production automatically. A proper solution of the «vicious circle» problem would lead to avoiding of mentioned above drawbacks of models.

To solve the "vicious circle" problem author proposed to introduce additional (to monetary) measure of resource expenditures into economic valuations. The idea is that both exchange and production require their own unit of measure to reflect specific features of both of these fields. While money is a natural measure for exchange, «available energy» is proposed as a common measure of all kinds of resources used in production. Thus, cost can be measured in both monetary and energy terms.

It is well known that under perfect competition (markets) all goods and services are produced using minimum resource expenses (technical efficiency) that is we consider profit maximization as minimization of input under fixed output. However, in monetary terms, minimum resources mean minimum monetary expenditure. In energy terms, minimum resource use is associated with minimum energy expenditure. Therefore, we have two minima of resource allocation depending on the term of measurement. They are not coinciding, in general. It seems reasonable that the state of minimum resource expenditure for aggregate income production should not depend on measurement terms.

Original method for energy cost counting was proposed [1]. Input/Output tables provide a base for this method [10]. Energy cost vector is a result of minimizing energy expenditures values, which are taken from every input-output equation system solution. The minimum historical energy cost reflects its maximum total energy efficiency that has been observed in the past. The energy cost includes the same types of resources (capital, labor) as the monetary cost. Energy cost includes not only direct energy flows in any form, but also expenditures of all types of material resources, which are termed in energy form.

To compare market price with energy cost the latter must be recalculated in monetary form, preserving unchanged relative energy costs, which provide most effective technologies to be chosen. For this purpose a recalculation coefficient k_0 was proposed [1]. The coefficient is based on a ratio of the money supply, the growth of which is limited by the growth of inflation, and the sum of primary energy of all resources used in GDP production. Multiplication of each energy cost quantity by k_0 generates a vector of «natural» prices in monetary form (P_0). Author hypnotized that this energy-based price can be considered «natural» in its classic economic meaning that is market price gravitates towards natural one over time. Then he proposes the resource model of the business cycle, and its further empirical testing provides this hypothesis validity checking.

In general, we can distinguish three correlations between market (P_i) and natural (P_{0i}) prices over time (t) for i-sector of an economy (Fig.1, a, b, c). At Fig.1a market price permanently exceeds natural price, and, vice versa, at Fig.1c natural price always is above market price. Figure 1b corresponds to the case of perfect market if $\Delta P \rightarrow 0$.

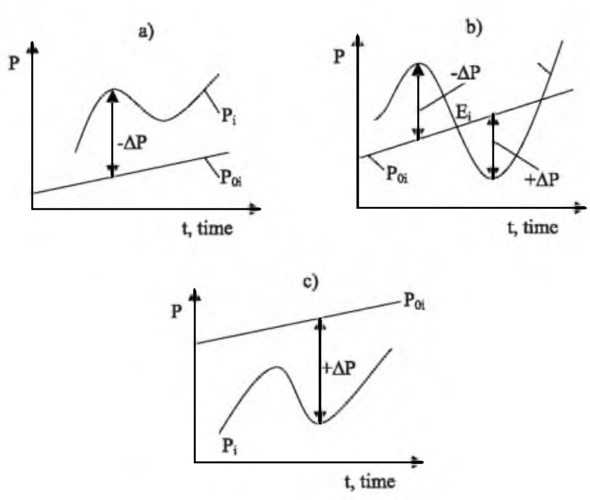

Fig. 1. Market (Pi) and natural (P0i) prices dynamics for i-sector of an economy

In general, for any i-sector of economy we can present market price (P_i) as

$$P_i = P\downarrow_{0i} \pm \Delta P_i \qquad (1)$$

where P_{0i} – natural price for i-sector of economy and ΔP_i – corresponding deviation of market price from natural price.

As is proportional to $e_{min\,i}$ with coefficient k_0, any deviation from natural price $\pm\Delta P_i$ will lead to overuse resources in energy terms (Δe_i). The less natural price deviates from market price, the lesser the rate of microequilibrium imperfection in a market is. The case when the gap ($\pm\Delta P_i$) is equal to zero (natural and market prices coincide) corresponds to the case of *perfect* market. Thus, microequilibrium on a separate perfect market is considered here as an ordinary balance between supply and demand that is established when $\pm\Delta P_i \rightarrow 0$ and $\Delta e \rightarrow 0$. Obviously, in real world it is impossible to establish and preserve all markets to be perfect at the same time. The quantity of $\pm\Delta P_i$ (Δe_i) is proposed here as a measure of *imperfection rate* for a separate market in any market conditions.

Switching to macroeconomic level it is natural to assume that the real state of economy, at which the minimum amount of resources is used in GDP production, should not depend on selected measure of those resources. Thus, there is the following determination of macroeconomic equilibrium is proposed: long-run macroeconomic equilibrium is determined as a state where natural (P_0) and market (P) price levels or their GDP deflators are numerically equal.

Such definition of macroequilibrium provides a complete microeconomic grounding for macroeconomics, because macroequilibrium is determined as a simple arithmetic sum of microequilibrium of all markets that make up economy.

If the state of the economy differs from the macroequilibrium, the traditional monetary cost minimization leads to overuse of resources in the energy value above the technologically achieved minimum (Δe). Author names Δe the «hidden overuse of resources» for the feature, owing to which it cannot be measured without implementing an additional unit of measure, other than the market price. The aggregate quantity of $\pm\Delta P$ (Δe) is proposed here as a measure of market imperfection rate for the whole economy in any market conditions.

When $\Delta P_i = 0$ on all markets, all markets are in perfect equilibrium in microeconomic level. In this case the proposed definition of macroeconomic equilibrium fits the classical definition of the equilibrium by L. Walras that an economy is in general equilibrium if every market in the economy is in equilibrium. We define this state of the whole economy as *perfect macro-equilibrium.*

When $\Delta P_i \neq 0$ on all markets, but the sum of $\Delta P = 0$ for the entire economy, the general equilibrium for the economy is still achieved according to our definition of macro-equilibrium. We define this state of the whole economy as *efficient macro-equilibrium*.

In the state of *perfect* macro-equilibrium the aggregate hidden overuse of resources (ΔE) equals to zero. In a state of *efficient* macro-equilibrium the size of this overuse does not equal to zero. In this state markets are minimally inefficient, which is unavoidable in a real economy. The amount of the aggregate hidden overuse of resources in the state of the efficient macro-equilibrium reflects initial specifics of a country.

A new resource model of economic cycles is proposed (Fig. 2). Figure 2 presents a scheme of natural (P_N) and actual market price levels (P_M) dynamics dating over time.

Macroequilibrium points (E-type) divide the phases of growth and recession.

The resource model has five critical points (as compared with two critical points – peak and trough – of the U.S. business cycle model [5]): three pivot points, which mark the beginning and the end of the growth and contraction, and two inflection points, which mark local peaks of the growth (O_1) and the trough (O_2) of the recession phases.

Distinctive feature of the resource model are:

1) each critical point does not only have an economic basis, but also a physical grounding that makes grounding for its unambiguous identification;

2) Figure 2 shows the value of initial and common driving force of economic cycles that is ΔP. The curves of natural and market price is determined independently that allows us to get rid of any lag in identification of macroeconomic dynamics turning points;

3) the presence of the lead period in the resource model. This period between the point of origin of a recession (E_2) and official dating of the recession is characterized by high economic growth and formation of various bubbles on different markets. As ΔP decreases further into the negative, the potential for recession increases and businesses start to feel the pressure of lower than normal revenues. Statistics usually generate mixed signals and speculations on

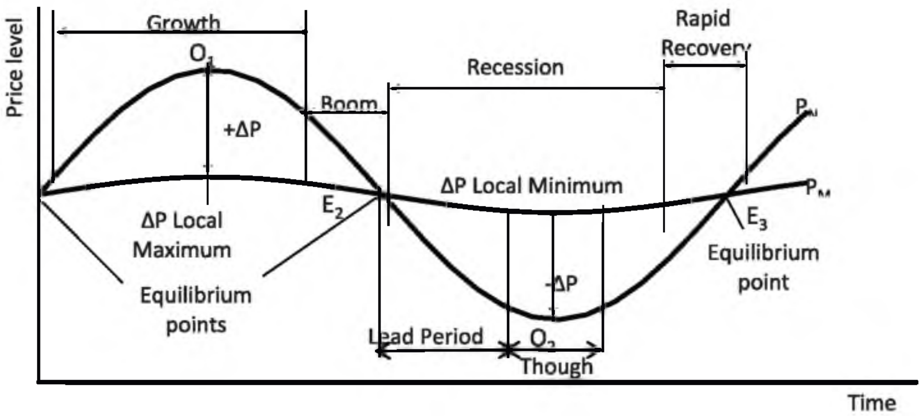

Fig. 2. Author's resource model of business cycle
Critical points: E1, E2, E3 – macroequilibrium points, recession starting and end points;
O_1, O_2 – local maximum and minimum points, growth tendency changing.

If the level of natural prices is higher (lower) than the market price level, then the latter price is underestimated (overestimated) as compared with natural price. It makes potential for growth (recession) as market production cost is higher (lower) than natural ones, and potential profit is higher (lower) than natural one. Any deviation (±ΔP) from equilibrium (P_0) causes the rise of resource overuse in energy terms (Δe). Points of O-type (O_1, O_2) are points where this hidden resource overuse reaches its maximum value. This resource overuse provides natural limits both for growth and recession depth and duration.

capital markets accelerate. Even as the real growth rates decline, this does not limit speculations, which are fueled by Ponzi finance [4]. Thus, the recession is originating within the boom stage of cycle;

4) the same model is used as for economic cycles dating, as for initial driving force of the cycles explanation in any market conditions. The hidden resource overuse (ΔP, Δe) is a general driving force of economic cycles as actual market price level is exogenous factor of the resource model. Therefore, we do not need any assumption to explain prices.

By its nature the hidden resource overuse is a result of cumulative market imperfections (ΔP_i) caused by various market conditions. It provides objective fundamentals for recessions that is market mechanism of economic valuations generates crisis endogenously. However, various subjective factors (supply shocks, regulation policy, speculations, force major) may strengthen or weaken these fundamentals.

Author tested the resource model using the U.S. economy as a pattern. A period of consideration is 40 years or six empirical business cycles in a row (1970–2010). Earlier this model was tested on the economy of Spain and Ukraine [1] that additionally proves the model to be general. Figure 3 presents dynamics of market (P_i) and natural price (P_0) GDP deflators built up in real time. Critical points of the resource model are determined from the figure. Grayed areas represent periods of recessions according to the official dating [9]. Points E_1, E_3, E_5, E_7, E_9 identify recessions long before GDP turns negative. We can see the lead periods 6 to 18 months for all the recessions.

According to the model we should expect the growth rate deceleration near the local maximum or minimum points and, vice versa, the growth rate is going to be the highest in efficient macroequilibrium ($\Delta P \to 0$).

To test this conclusion, the average GDP growth rates for different ranges of ΔP was measured (Table). The highest GDP growth rate is observed when $\Delta P \to 0$. Total efficiency for different kinds of regulation policy can be evaluated by the size of the ΔP as the market price by definition includes results of all regulatory measures. This enables feedback between actions of the regulator and their impact on the economy. Therefore the key aim of the regulatory policy should be to maintain ΔP about zero.

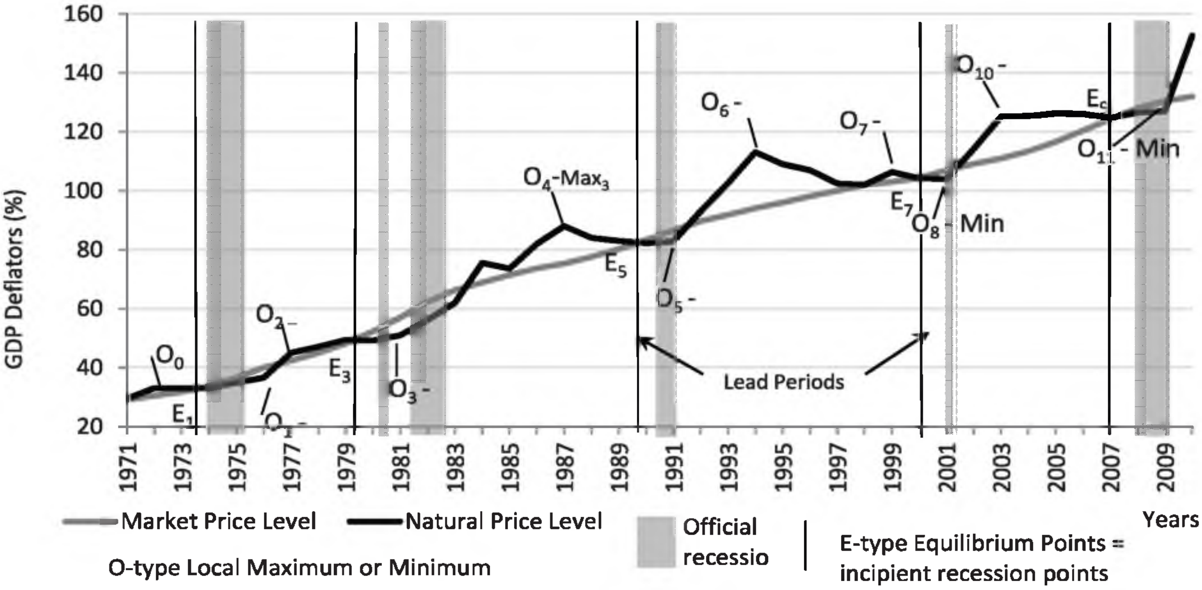

Fig. 3. Resource model of macroeconomic dynamics: critical points determination

Besides, empirical testing of the resource model reveals the absence of false signals when recession starting points forecasting that is an important comparative advantage of this model. Moreover, the resource model generated signals for all recessions from 1970 to 2010 with the lead period 6 to 18 months. Finally, macroeconometric models generate the same signals as for recessions, as for slowdowns, while the resource model differs recessions from temporary slowdowns. Figures 4 presents forecast efficiency of recession starting points for the U.S. economy based on the proposed models and two contemporary macroeconometric models: the yield curve model of Wright, and the dynamic probit model [2; 7; 8].

Table. **Average GDP growth rates for the cycle's growth phases and various ranges of ΔP, years 1971–2011**

Years	1971-1973	1976-1979	1983-1989	1992-1996	1997-1999	2002-2007	2009-2011
GDP average growth rate, %	4,83	4,70	4,31	3,3	4,6	2,5	2,3
ΔP maximum for growth phase	2,6	2,7	12,7	19,0	3,3	14,2	20,6

If $\Delta P > 0$, the economy is in a phase of growth. If $\Delta P < 0$, than the economy is in a phase of recession. If $\Delta P = 0$, starting or ending points of the recessions are occurred. The bigger is ΔP, the bigger is hidden resource overuse (Δe) above achievable technological minimum, and the greater is the force, restoring equilibrium once it is disturbed (Fig. 2, 3).

Both recovery and recession are characterized by O-type points, where the hidden resource overuse (ΔP) reaches its maximum (Fig. 2, 3).

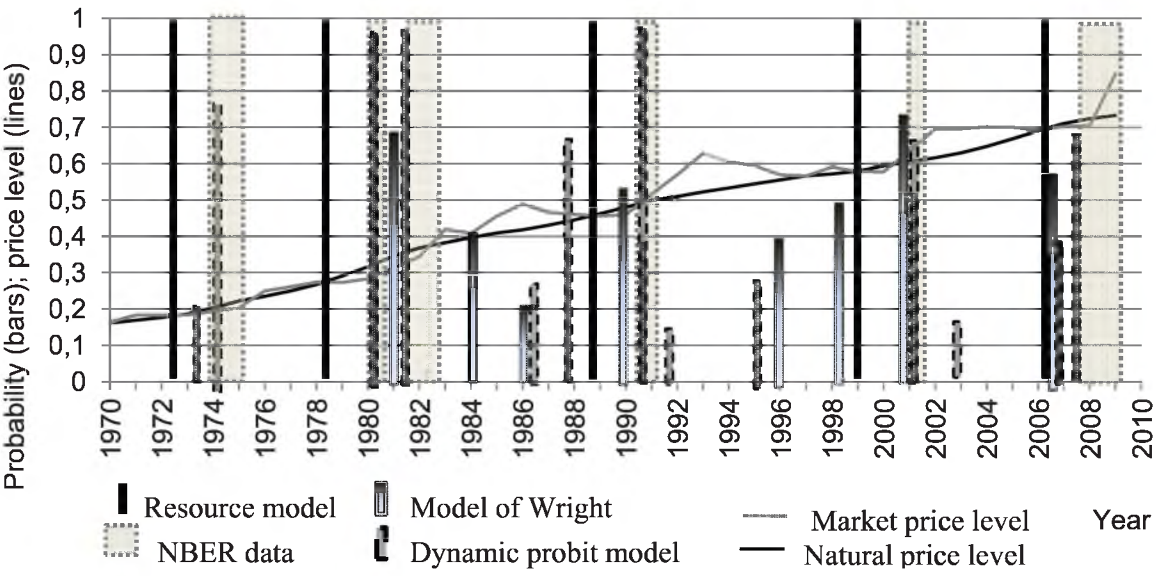

Fig. 4. Forecast efficiency comparison of the resource model to the model of Wright and the dynamic probit model

As shown on fig. 3, it is impossible to find two identical cycles within all testing period. Every cycle has its specific features and configuration inherent just to this cycle. This fact proves the idea of P. Samuelson to consider every cycle as one-factor and multi-factors or complex model at the same time [6]. On the one hand, all the U.S. economic cycles for the last 40 years were explained by the hidden resources overuse (one-factor model). On the other hand, some local models (Keynesian, monetarist, real business cycle etc) were used for the same period to explain these cycles. Then we can conclude that the hidden resources overuse is an initial driving force of economic cycles and any local model presents one of the form of this force manifestation depending on current combination of market conditions. At the same time, various local factors are functionally interdependent that is any factor can be chosen as an initial driving force and the rest of local factors are able to be explained at the base of this initial factor. Therefore, the hidden resource overuse is functionally independent from its manifestation forms, from any of local factors. There is a cause-effect relationship between the resource overuse and any of local factors. However, these conclusions require additional groundings and verifications.

Thus, a new resource model of macroeconomic dynamics is proposed. The aggregate hidden resource overuse is an initial driving force of economic cycles for any market conditions. The highest GDP growth rate is observed when the gap between market and natural price levels is the smallest. Total efficiency of the regulatory policy can be evaluated by the size of this gap. This enables feedback between actions of the regulator and their impact on the economy. The resource model actually allows us to identify and forecast recession with the lead period 6 to18 months. Empirical testing of the resource model reveals the absence of false signals when recession starting points forecasting that is an important comparative advantage of this model.

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ПРИХОВАНІ ПЕРЕВИТРАТИ РЕСУРСІВ ЯК ПЕРВИННА РУШІЙНА СИЛА МАКРОЕКОНОМІЧНОЇ ДИНАМІКИ: РЕСУРСНА МОДЕЛЬ ЕКОНОМІЧНИХ ЦИКЛІВ

Пропонується нова ресурсна модель економічного циклу, в рамках якої доводиться, що приховані перевитрати ресурсів, які задіяні у виробництві ВВП, є первісною і загальною рушійною силою макроекономічної динаміки. Перевитрати ресурсів є результатом накопичення недосконалостей ринків, що вимірюються як різниця між дефляторами «природних» та поточних ринкових цін. Сумарна ефективність регуляторної політики може бути оцінена за цією різницею. Ресурсну модель було протестовано на прикладі економіки США протягом 40 років або шести емпіричних циклів поспіль. Модель дозволяє однозначно визначити початок рецесії з упередженням в 6-18 місяців. Емпіричне тестування ресурсної моделі показало відсутність неправдивих сигналів про час початку рецесій.

Ключові слова: бізнес-цикл, економічні темпи росту, прогнозування рецесій, рушійна сила макроекономічної динаміки, ефективність регуляторної політики.

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CORPORATE SOCIAL RESPONSIBILITY AND ITS IMPACT ON COMPANY'S FINANCIAL PERFORMANCE

Corporate social responsibility practical implementation experience in Ukraine is investigated, the main drivers for ccorporate social responsibility activities are distinguished. The relationship between Ukrainian companies` corporate social and financial performance is evaluated. The main obstacles for socially responsible activities of Ukrainian companies are underlined.

Keywords: corporate social responsibility, corporate financial performance, sustainable development, responsible business.

Problem description. The concept of corporate social responsibility (CSR) has gradually become a vital issue in business making. Primary emerged from solitary occurrences of charitable donations and propounded as corporate philanthropy, it has now expanded to core business strategies and the process of its implementation requires considerable cogitation and reasonable preparations. Building up a CSR strategy and enshrining it into all business processes could be a remedy for companies enduring crisis or an additional competitive advantage for already stable companies. A deep interest to CSR is an outcome of reasonable motivations behind responsible practices. These incentives involve sustainable development of a company and world community in general, however reasonable investors do not permanently put their money in the projects without any return. Therefore, an assumption can be