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NEW APPROACH TO EXPLAIN NEUTRALITY OF MONEY

This paper presents a new explanation of neutrality of money in general case, regardless of the duration. It is based on the CMI-model of macroeconomic dynamics, which proposes the fundamental relationship between the efficiency of the use of production resources, money supply, inflation, and dynamics of the economic growth. This relationship is proved empirically by its testing on the examples of two completely different economies (the U.S. and Ukrainian ones). The testing period covers several consecutive real business cycles for each of these economies. According to this relationship, the value of money supply affects GDP growth rate in every period of time. Thus, monetary aggregate M2 is divided in two parts: one part is always non-neutral and the other is always neutral, both in the short run and in the long run.

Keywords: neutrality of money, money supply, monetary aggregates, business cycle, economic growth, macroeconomic dynamics.

JEL classification: E30, E31, E32, E37

Introduction and publication analysis. The question whether changes in money supply affect GDP growth (non-neutral money) or not (neutral money) has been the most discussable one for many decades. Some models (for example, the monetarist one by Friedman) posit non-neutrality of money at least in the short run. The other ones hypothesize the neutrality of money at least in the long run (for example, the rational expectation model by Lucas) or even the super neutrality of money, i.e. the neutrality of money both in the long and short run (for example, the real business cycle model by Kidland and Prescott) [1].

Moreover, we can find empirical evidence for both hypotheses at the same time [2–6]. Most economists believe that monetary policy appears to have a strong influence on the real economy, i.e. non-neutrality of money in the short run. A study in the history of monetary policy has proved this idea [5; 6]. However, interpretations of history are always open to dispute. Advocates of the real business cycle model, for example, have their own specific interpretation of this empirical evidence. They claim that the money supply is endogenous, that is to say fluctuations in output might cause fluctuations in the money supply [2]. In other words, they change the cause and effect direction of causation between money and output. Depending on specific assumptions inherent in any of macroeconomic models, we can get explanation of both neutrality and non-neutrality of money. Therefore, the direction of causation between fluctuations in the money supply and fluctuations in output is hard to establish. The cause and effect relationship between the money stock and real output remains discussable.

Thus, the classical key macroeconomic hypothesis assumes that change in the money supply does not affect the level of the real output in the long run, but it affects the real output in the short run. However, this assumption is more a suitable theoretical consensus between different models rather than a useful instrument for practical usage. The problem is that, having two opposite interpretations of the neutrality of money for different time periods, we will inevitably have some period of uncertainty (between the short and long time periods) when it will be unclear whether the money stock is neutral or not.

All of these explanations of the neutrality of money are based on local economic theories (models) which are valid for the specific market conditions. This may explain that classical interpretation of the neutrality of money is local too, i.e. it depends on specific market conditions.

Research goals. This paper demonstrates a novel approach to explaining the neutrality of money in the general case and to eliminating noted ambiguity associated with long and short time periods by using the author's model of macroeconomic dynamics that uses the cumulative market imperfection model (CMI-model) [7]. This model may be considered as a general one that is valid for all kinds of market conditions and synthesizes the main principles of noted above well-known macroeconomic models. It was confirmed by CMI-model testing within a 40-year period of time for the US economy (1970–2010). To

additionally prove that CMI-model is general, it will be empirically tested here by the example of Ukrainian economy since 1996 till 2016, and the US economy testing period will be expanded by 6 years. Both theoretical and empirical evidence of CMI-model will ground a new fundamental relationship between the efficiency of use of production resources, money supply, inflation, and economic growth rate that will help to explain the neutrality of money in the general case, for all kinds of market conditions.

Research results. Figure 1 presents a theoretical scheme of the CMI-model of a business cycle that explains its main principles. The gap (ΔP) between natural (P_o) and actual market price (P) levels is considered as the initial driving force of the business cycle under all possible market conditions and in the real time. Macroequilibrium points (E-type) are intersection points between the curves of the market and natural price levels or between their GDP deflators. Real markets are always imperfect, but they have different imperfection rates. Macroequilibrium is reached if the sum of negative ($-\Delta P_i$) and positive ($+\Delta P_i$) market imperfections for all markets are balanced.

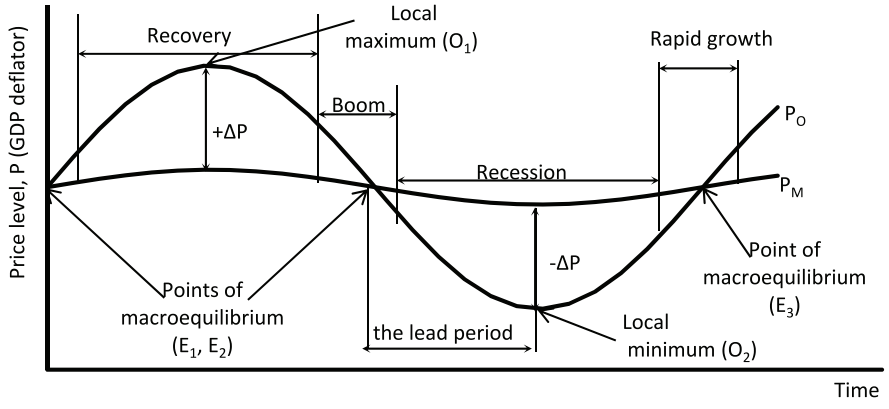

Fig. 1. The author's CMI-model of economic cycle (theoretical scheme)
Critical points: E_1, E_2, E_3 – macroequilibrium points, turning points of the cycle or recession starting and ending points;
O_1, O_2 – local maximum and minimum points, changing in economic growth trends, growth accelerating (decelerating);
E_1, E_2, E_3, O_1, O_2 – five critical points per business cycle

The macroequilibrium points (where $\Delta P = 0$) divide a business cycle in two phases: recovery and recession. These points are the points of the incipient recession or recovery. At the local [1] maximum and local minimum, the cumulative market imperfections reach the maximum value ($\Delta P \rightarrow max$). This maximum is a fundamental force behind the change in the trend of the cycle. *In part it provides natural limits for the recession and recovery depth and duration, as well as it returns economy to equilibrium once it is disturbed.*

According to the CMI-model, the cumulative market imperfections (ΔP) distort the economic structure and lead to increasing inefficiency in the usage of capital and labor in GDP production which, in its turn, decreases economic growth. Therefore, around the points of macroequilibrium (where $\Delta P \rightarrow 0$) we should see the *maximum economic growth rate over the business cycle* (boom or rapid growth, Fig. 1). Since the cumulative market imperfections are the biggest ($\pm\Delta P \rightarrow max$) both at the local maximum and at the local minimum points, we should see the minimum economic growth rate in these points. Moreover, we can see some slowdown in the economic growth rate just before the local maximum (minimum) point and its acceleration immediately after it.

The "lead period" is an outstanding feature of the CMI-model. This is a period between the model's recession signal and the financial (and commodity) markets crashes that make the recession evident for everybody. Usually an official dating of the recession starting point by the U.S. National Bureau of Economic Research (NBER) is made after such crashes. The *lead period* is characterized by high economic growth (boom) and formation of various bubbles in different markets of an economy. As ΔP decreases further into the negative, the potential for recession increases and businesses start to feel the pressure of lower than normal revenues. At this period, statistical data usually generate mixed signals, and speculations on financial and commodity markets accelerate. Even as the real growth rates decline, this does not limit speculations that are fueled by Ponzi finance.

If the natural prices level (Po) is higher (lower) than the actual market price level (P), then the latter price is underestimated (overestimated) as compared with the natural price. It makes potential for growth (recession) as the market production expenditures are higher (lower) than the natural ones, and the

[1] The word "local" means that we can see several maximum (minimum) points during recovery (recession).

potential profit is higher (lower) than the natural one. The gap (±ΔP) causes the rise of cumulative market imperfections. Thus, if **ΔP** > 0, the recovery is observed. If **ΔP** < 0, the recession has happened. The points where **ΔP** = 0 are the turning points of the business cycle. While **ΔP** > 0, an economy absorbs external shocks without recession.

Thus, according to the CMI-model the general driving force of macroeconomic dynamics can be presented as follows [7]:

General driving force of macroeconomic dynamics (economic cycles) = = change in value of cumulative market imperfections = = gap between GDP deflators for natural and market prices (ΔP) =

$$= \frac{\Delta(\text{potential efficiency of use of production resources}) * \Delta(\text{money supply})}{\Delta(\text{sum of natural resources at input of an economy})} - \Delta(\text{inflation rate}) \quad (1)$$

Economic growth rate reaches its maximum under available technologies when ΔP = 0, i.e.:

$$= \frac{\Delta(\text{potential efficiency of use of production resources}) * \Delta(\text{money supply})}{\Delta(\text{sum of natural resources at input of an economy})} = \Delta(\text{inflation rate}) \quad (2)$$

Theoretically, formulas (1) and (2) are valid under all kinds of market conditions and for any country. Therefore, as money supply is included in these formulas, it may allow us ***to explain the neutrality of money in the general case****.* However, beforehand let us consider the sources of the generality of the CMI model both theoretically and empirically.

In theory, the generality of the CMI-model is provided by exogeneity of the actual market price that is included in the value of ΔP, and it reflects the results of all kinds of market conditions for every moment of time. Particularly, this price reflects all information that is available to economic agents (including non-public ones). Independent and simultaneous determination of the natural and actual market prices allows us to consider macroeconomic dynamics in the real (not abstract) time that is a competitive advantage as compared with any of the well-known theories (structural models). From this point of view, the CMI-model may be considered as *synthesis* of macroeconomic theories and macroeconometric models, the main advantage of which is the ability to analyze macroeconomic dynamics in the real time.

The CMI-model is a neo-Keynesian one according to the nature of the initial driving force of economic cycles. However, a possibility to regulate the money supply (that is included in the market imperfection figure in (1)) to accelerate the economic growth rate makes this model neoclassical; in part, a monetarist one. Thus, the main principles of the well-known macroeconomic models are realized in the CMI-model under certain market conditions. The fact is that since 1970, six consecutive business cycles in the U.S. economy were explained by changes in the cumulative market imperfections according to the CMI-model, and in due time each of these cycles was explained by one or another of the well-known models (Keynesians, monetarist, real business cycles, etc.). Therefore, we can conclude that the local driving force of cycles according to any of these models (changes in interest rates, money supply, investments, capital, etc.) is a local observed occurrence of the cumulative market imperfections under certain market conditions.

Besides, contradictions between the deterministic and random fluctuations views on the business cycle nature is resolved within the CMI-model: in default of objective fundamentals; for a recession (when ΔP > 0) any external (random) shock will be absorbed without economic crisis; if these fundamentals are formed (when ΔP < 0), any external (random) shock will initiate a recession.

To empirically prove the CMI-model to be general, i.e. that it can be applied under any market conditions and for any country, we tested the model by using two completely different economies (the U.S. and Ukrainian ones) as the patterns, considering several real business cycles in a raw for each of these economies. The period of consideration for the U.S. economy is since 1970 till 2016 (or six real cycles in a raw). The testing period for Ukrainian economy is since 1997 till 2016 (or three real cycles in a raw).

In Fig. 2 and 4, a theoretical scheme of the CMI-model (Fig. 1) has been built up in the real time for the U.S. and Ukrainian economies, correspondingly. Both figures present the dynamics of the actual market price (P_i) and the "natural" price (P_0) levels (GDP deflators). Fig. 2 and 4 show the critical points of the model (the macroequilibrium points and the local maximum or minimum ones) that are then laid over the dynamics of the growth rates of the U.S. economy in Fig. 3 and of Ukrainian economy in Fig. 5. Fig. 3 and 5 presents the dynamics of the real GDP growth rates (%) [8; 9], which are marked by the CMI-model critical points taken from Fig. 2 and 4, correspondingly. The grayed areas in Fig. 3

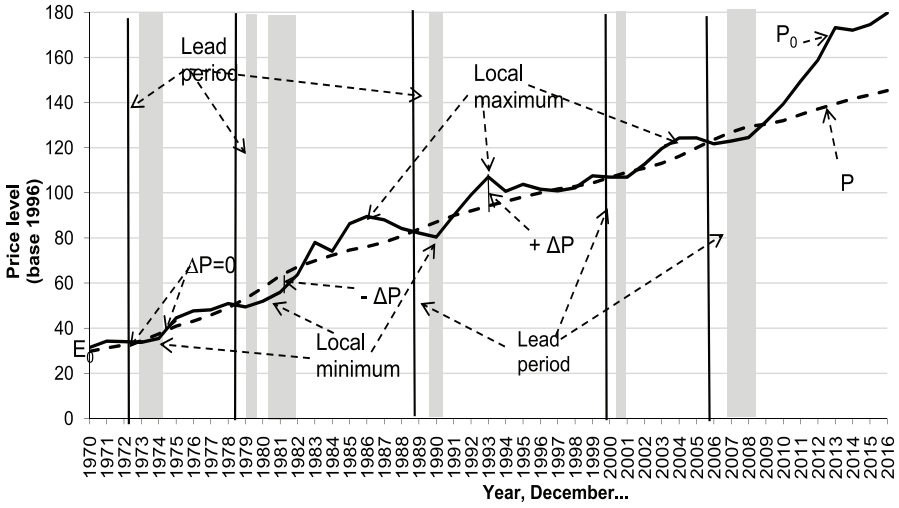

Fig. 2. The author's CMI-model of the economic cycles built for the U.S. natural (Po) (the author's calculation) and market (P) [8] price levels for the U.S. economy (ΔP-cumulative market imperfection); ΔP = 0 – recession starting (ending) points; ΔP > 0 – economic growth; ΔP < 0 – recession

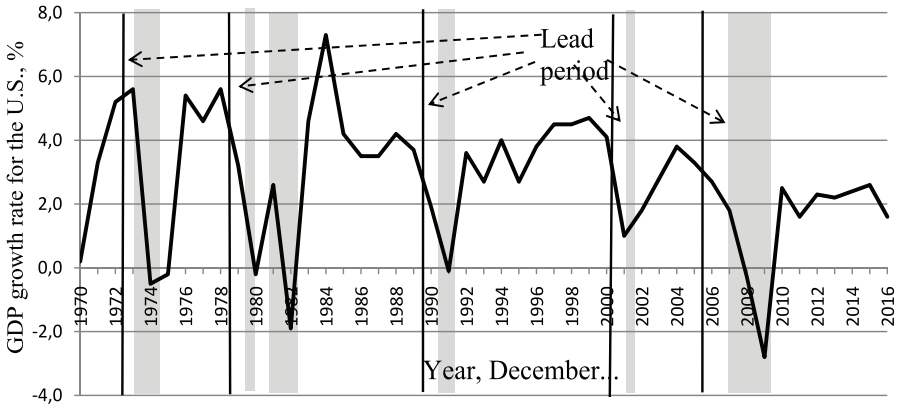

Fig. 3. The US real GDP growth rate dynamics dated by the CMI-model critical points and given from Fig. 2

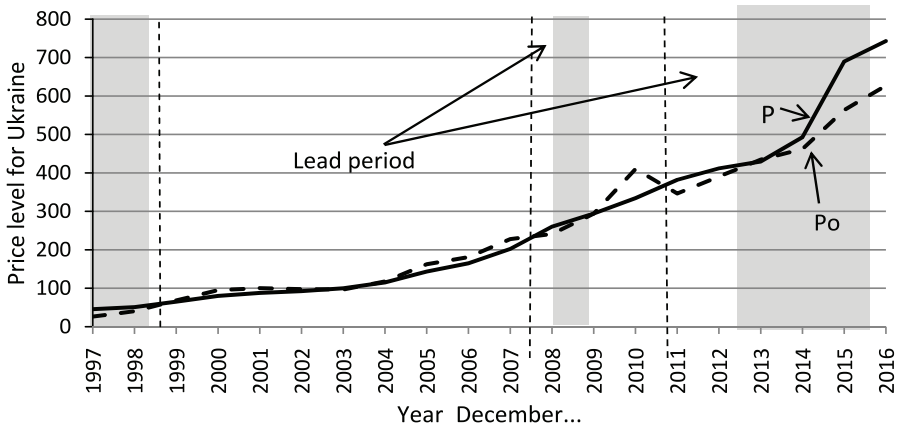

Fig. 4. The author's CMI-model of the economic cycles built for Ukraine. The natural (Po) (the author's calculation) and market (P) [9] price levels for the U.S. economy

Notes: ΔP-cumulative market imperfection; ΔP = 0 – recession starting (ending) points; ΔP > 0 – economic growth; ΔP < 0 – recession; grey area – the recession duration

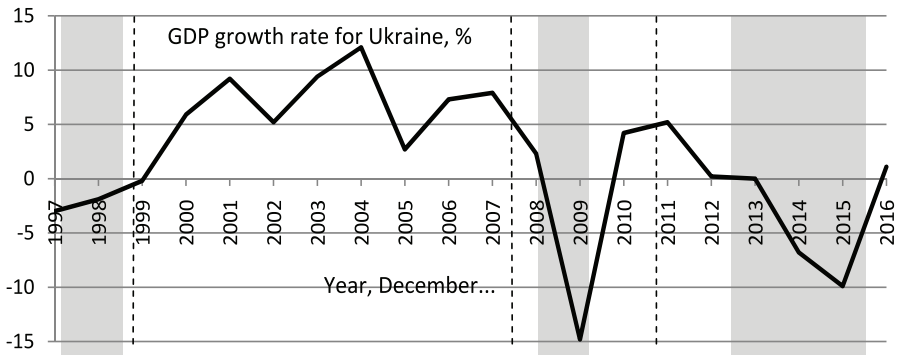

Fig. 5. The real GDP growth rate dynamics for Ukraine [9] dated by the CMI-model critical points and given from Fig. 4

Note: the recession starting points dated as two quarters of the negative real GDP growth rate (the GDP growth rate for 2013 = -0,04 %)

represent the periods of recessions according to the official data (by the U.S. NBER).

Recessions in Fig. 5 dated by the author according to the well-known but rough rule (when two consecutive quarterly growth rates become negative).

The comparison of Fig. 2 and 3 and Fig. 4 and 5 demonstrates that, if $\Delta P > 0$ (the actual market price level (P) is less than the "natural" (P_0) one), the economy is in the phase of recovery. If $\Delta P < 0$ (the actual market price level (P) is higher than the "natural" (P_0) one), then the economy is in the phase of recession. The intersection points of these price level curves ($\Delta P = 0$) or points of the optimal macroequilibrium are the turning points of the business cycles (of macroeconomic dynamics). Besides, these figures show that the model allows us to identify all the recessions long before GDP turns negative with *the lead period* of about 8–18 months.

Moreover, this comparison has shown that empirically we can see the *maximum economic growth rate* near the macroequilibrium points ($\Delta P = 0$), which is *according to theoretical formula (2)*. *Empirical validation of the economic growth rate maximization around the macroequilibrium point opens new potentials for its regulation.* The greater is the *cumulative market imperfections* (ΔP), the smaller is the average economic growth rate. The U.S. and Ukrainian statistic data support this claim. Comparing Fig. 2 and 3 to Fig. 4 and 5, we can see the maximum economic growth rates (4–7 % for the U.S. and 8–12 % for Ukrainian economies) around the macro-equilibrium points (where $\Delta P = 0$), which is in direct compliance with the CMI-model theory. Also these figures show that the CMI-model does not generate false or missed recession signals neither for the U.S. nor for Ukrainian economy.

Besides, according to the CMI-model we should see generating fundamentals for a short-termed economic growth acceleration within the recession immediately after the local minimum caused by the ΔP gap starting to decrease. If this fundamental is boosted by external factors and regulation policy [11], we may see the economic growth rate to become positive for a quarter or two in recession, even if that happened in 1980 (Fig. 2 and 3). At the same time, this temporary growth acceleration of 1980 was interpreted by the NBER as the end of the recession. However, the NBER was constrained to declare new recession in six months after the end of the recession of 1980 that caused talks about "double-deep" recession.

Clearly, we can consider this collision as different ways of dating of recessions. However, this example demonstrates advantages if the dating of recessions is made on the base of the CMI-model. In this case, the next recession of 1981–82 would not be unexpected both for the investor and for the regulator, and they would take an effective anti-crisis action, since they would have a recession's signal some months before its real start.

Finally, as the best test for the adequacy of any model is its ability to forecast future events before statistics would be able to prove them, six accurate forecasts for the U.S. economy made on the basis of the CMI-model were published with a significant period of advance, much before the corresponding real events [7].

Thus, all these empirical data confirm the CMI-model theory (Fig. 1). The initial driving force of the business cycles is the cumulative market imperfections determined by formula (1) which is common for all the economic cycles. *Despite the single driving force of economic cycles (1), the configuration of every real economic cycle is unique*.

Formula (1) contains the money supply (M) that to the maximum extent fits the CMI-model. ***According to (1), it is the value of M that affects the GDP growth rate. Therefore, the value of M is a non-neutral one***. Figures 6 and 7 present the dynamics of this money supply value (M), as well as the dynamics of monetary aggregates M1 and M2 for the U.S. and Ukrainian economies [12; 13] so that $M1 < M < M2$.

As we can see from Fig. 6 and 7, the value of M2 consists of a *neutral* part (between M and M2) and a *non-neutral* part (from M and less) at every moment

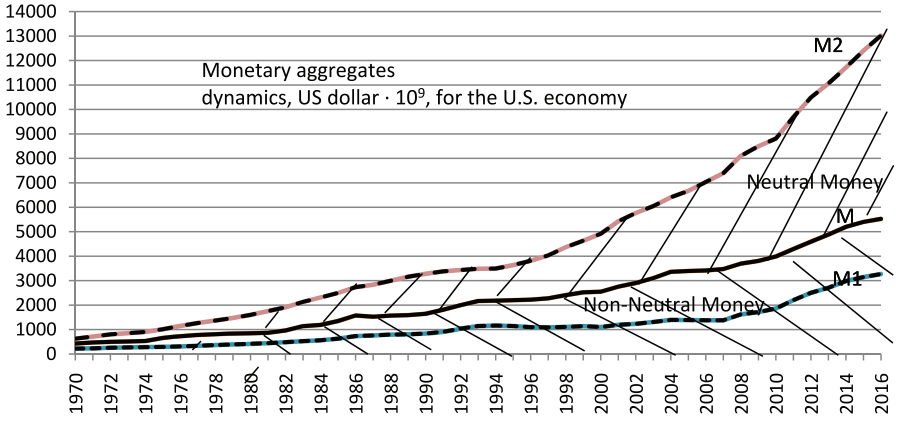

Fig. 6. The money supply dynamics for the U.S. economy presented as the sum of neutral (> M) and non-neutral (< M) money. M – monetary aggregate that fits with a maximum extent the CMI-model (the author's calculation)

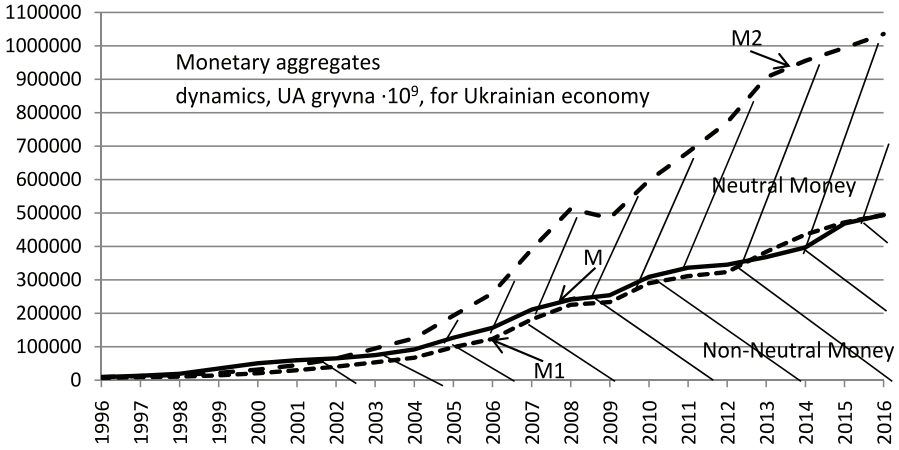

Fig. 7. Money supply dynamics for Ukrainian economy presented as the sum of neutral (> M) and non-neutral (< M) money. M – monetary aggregate that fits with a maximum extent for the CMI-model (the author's calculation)

of time. Thus, some part of money is non-neutral, and some part is neutral both in the short run and in the long run.

Explaining the neutrality of money on the base of the CMI-model, we eliminate the inevitable period of uncertainty (when it is unclear whether the money supply is neutral or not) that is inherent for the classical macroeconomic hypothesis assuming that the change in the money supply does not affect the level of the real output in the long run, but affects the real output in the short run.

Conclusions. In the general case, some part of the money supply is always non-neutral, and some part is always neutral both in the short run and in the long run period. The money supply (M) that is included in formula (1) of the CMI-model provides the boundary between the neutral and non-neutral money in every period of time.

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НОВИЙ ПІДХІД ДО ПОЯСНЕННЯ НЕЙТРАЛЬНОСТІ ГРОШЕЙ

У цій праці подано нове пояснення нейтральності грошей у загальному випадку, незалежно від тривалості періоду часу. Воно базується на CMI-моделі макроекономічної динаміки, в рамках якої пропонується фундаментальна взаємозалежність між ефективністю використання виробничих ресурсів, грошовою масою, інфляцією та темпами економічного зростання. Ця взаємозалежність доводиться емпірично її тестуванням на прикладах економік двох принципово різних країн (США та України). Період тестування охоплює декілька реальних бізнес-циклів для кожної з економік. Відповідно до цієї взаємозалежності величина грошової маси впливає на темпи росту ВВП у будь-який період часу. Таким чином, монетарний агрегат M2 можна розділити на дві частини: одна частина є завжди не нейтральною, а інша є завжди нейтральною як у короткостроковий, так і в довгостроковий періоди.

Ключові слова: нейтральність грошей, грошова маса, монетарні агрегати, бізнес-цикл, економічне зростання, макроекономічна динаміка.

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