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Essay on Monetary Policy and Economic Growth

Abstract: The global economic crisis has led to the global reduction in credit activity, a fall of domestic product as well as the level of foreign direct investments, and has imposed the sources of economic growth as one of the key problems. Therefore, the objective of this paper is the monetary policy review and the task is to research the circumstances when it is possible for the money supply to become the source of economic growth without inflationary consequences. The paper analyzes the demand and supply functions for money, the quantity theory of money, velocity of circulation and instruments of monetary policy and strives to propose such a combination of measures of a new economic policy based on theoretical arguments that will stimulate economic growth. This aim requires a completely new approach to the mechanism of money creation and selection of monetary instruments, proposing the money supply connection to the growth of real GDP, the money supply control as the key instrument, and a low and stable long-term interest rate as the factor for maintaining stability of velocity. In such case, monetary policy will have a real impact on economic growth, even in the long run.

Keywords: quantity theory of money, velocity of money, deposit multiplication, interest rate, new monetary policy.

JEL classification number: E51, E52, E58

1. Introduction

Economic theory, as well as laws and practices in most countries, assumes a low inflation rate and a stable domestic currency as the most important objectives
of a central bank. Majority of countries also indicate economic growth (GDP growth) as a goal of their monetary policies, however, in the hierarchy of goals it is lower than monetary and financial stability. Monetary theory gives an absolute priority to the stability goals and low inflation rate, and almost all economists agree that the use of monetary policy for economic growth usually leads to higher inflation, with no real impact on growth. This is known as the concept of long-term monetary neutrality, although most of the monetary policy theorists and practitioners (representatives of the dominant schools of economics), do not challenge the short-term impact of monetary policy on economic growth.

The aim of this paper is to investigate whether it is possible to use monetary policy and credit activity as the means of long-term economic growth, and if so, under which conditions. In other words, is there such a combination of monetary policy instruments that ensures a long-term economic growth, while not accelerating inflationary growth at the same time? This question is additionally significant in terms of the global economic crisis, with the consequent reduction in money supply and credit activity, restrictive monetary policy and the reduction of foreign direct investments for small and open economies, like Serbia. The usage of money supply without inflationary effects on growth and development is important for two reasons: 1) it provides relatively cheap sources of growth and development in underdeveloped countries; 2) it reduces the need for expensive foreign loans or direct investments whose impacts for the host country are, as a rule, repatriation of profits and reduced employment in the long run.1

To answer the question above we must analyze the key segments of monetary theory concerning money supply and demand, the impact of interest rate as the instrument of monetary policy and monetary rules, as well as the velocity of money and its relationship with interest rates. This analysis will show the necessity for a new, different mix of measures and instruments of monetary policy which can provide economic growth without any significant inflation increase.

The paper is divided into five chapters - sections. The second chapter (after Introduction) analyzes issues related to the quantity theory of money, demand for money, and the Friedman’s Money Growth Rule. The third chapter deals with

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1 Examples of direct foreign investments in Serbia show that the promised effects in terms of employment growth, efficient technology, knowledge and management transfer are missing. The medium term results are profit extraction, redundancy, resource control and withdrawals, as in the case of Smederevo steelworks. Economists increasingly criticize the long-term effects of FDIs, which have been specifically anticipated by a famous Slovenian economist Joze Mencinger. More about Mencinger’s statements can be found in the book by B. J. Dušanić, “The Destruction of Economy,” Nova srpska politička misao, Beograd, 2010.
money supply, its connection with demand for money, bank credit activities and monetary policy instruments chosen by most central banks today. It is shown that the choice of monetary policy instruments is the direct consequence of the credit multiplication process as the main mechanism for the creation of money supply that includes three long-term negative consequences: 1) a rise in interest rates, 2) a rise of inflation, and 3) business cycles, together with economic and financial crisis of different intensity and duration. The fourth chapter proposes a new combination of economic policy and monetary rules based on an attempt to control the velocity of money supported by some empirical arguments which could have long-term effects on economic growth without significant inflationary pressures. To strengthen these arguments, the analogy is made with some laws of physics, which we believe are applicable to economy. To make that scenario real, it is necessary to abandon some inherent traditional dogmas of monetary theory and practice that currently represent untouchable rules and theoretical principles serving as the foundation of modern economic practices. The paper ends with concluding remarks.

2. Demand for money and the Friedman rule

Demand for money determines which factors are basic for the money supply-demand, as well as the amount of money that can ensure the normal economic reproduction course without inflationary consequences. It is known as the Quantity Theory of Money (QTM) and comes in two basic forms:

\[ Mv = py \]  
\[ M = kpy \]

The equation (1) shows QTM income version, where: \( M \) is money supply, \( v \) is the velocity of money; \( p \) is the general price level, and \( y \) is physical volume of production (gross domestic product).

QTM income version is based on the following two assumptions: 1) in the short term, \( v \) and \( y \) are constant and dependable on real factors; 2) causation runs from money to prices - a rise in the money amount, with unchanged \( v \) and \( y \), leads to the proportional growth rate.

In equation (2) the so-called Cambridge approach to QTM is shown, where the real demand for money (money with constant purchasing power \( \frac{M}{p} \)), is proportional to the real national product expressed by coefficient \( k \), equal to the recipro-
cal value of income velocity of money \((k = \frac{1}{v})\). The Cambridge approach to QTM can be transformed into a functional form in which the demand for money depends on real GDP and inflation rate \((\pi)\), being the opportunity cost of holding money:

\[
\frac{Md}{p} = f(y, \pi)
\]

(3)

If the starting point is the expression (2), it is possible to show that the logarithmic transformation and differentiation according to time, (assuming \(v = 0\)), can obtain the following expression:

\[
\pi = m^S - y_r.
\]

(4)

The equation now expresses all sizes as growth rates, and taking into account the fact that the supply and demand for money are equal and in balance, \(\frac{Ms}{p} = \frac{Md}{p}\), then we get the Friedman's Monetary Rule that inflation rate is equal to the difference between growth rate of the money supply (which is equal to the demand for money) and rate of growth of the physical volume of production. In other words, if \(m^s = y_r \rightarrow \pi = 0\), i.e. if the growth rate of the money supply rises in the same proportion as the rate of growth of the physical volume of production, then there is no price increase, which occurs only if the money supply grows faster than the growth of the physical volume of production. This rule and the coefficient \(k\), maintain the ratio of stock of goods to money market funds, thus providing long-term price stability. However, this involves the obligation of a central bank to be guided by the demand for money and the proportional growth of real GDP. The most famous Monetarist of the 20th century, Friedman, suggested the thesis and persistently defended it, that the central bank in a market economy

\[\text{The equation (2) is followed by } k = \frac{M}{py} = \text{const. If the log is taken, we get: } \ln M - \ln p - \ln y = 0. \text{ Differentiating according to time scale for } M, \text{ for example, we get: } \frac{d\ln M}{dt} - \frac{dM}{dt} \frac{1}{M} = m^s \text{ and that is exactly the rate of growth of money supply, in continuous time version (while the discrete time equation is: } \frac{\Delta M}{M} = \frac{M_t - M_{t-1}}{M_{t-1}}, \text{ in percentage). So: } m^s - \pi - y_r = 0, \text{ which is followed by equation (4) which is given in the paper.}\]
should be determined for long-term constant rate of monetary growth that will eventually follow the long-term rate of real economic growth.

Do central banks back up this “golden” rule of monetary policy nowadays? Is the growth rate of real GDP the key determinant of the money supply? Does the money supply basically follow the demand for money, defined by the Quantity Theory of Money? Is the money supply the main instrument of monetary policy? The answers to all these questions are generally negative, and why this is so can be explained on the basis of the analysis of the money supply and the process of making money, which are subjects of the second chapter of this paper. Also, it will be shown that it is difficult to accept the most important QTM postulate on constant velocity of money.

3. Money supply and the process of creating the money stock

In macroeconomic theory, the money supply is treated as exogenous size managed by the central bank. Supply function of money is usually given as a relation between the amount of money that is the dependent variable, and the level of income (gross domestic product) and the interest rate as independent values. The relationship with income \(Y\) is directly proportional and that with the interest rate \(i\) is inversely proportional, which is shown below as the sign under the variables in the following equation:

\[
\frac{M}{p} = f(Y, i)
\]

Such a functional relationship of money stock on one side, and income and interest rate on the other, is given in a well-known IS-LM model where the relation between money supply and demand for money are presented in Figure 2.

It should be noted that the central bank actually controls base money (MB - monetary base), and the money supply is the result of base money multiplied by mon-

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3 The relation of monetary policy and economic growth has already been discussed in one of the former papers by the same author, where it is shown that if the inflation is not wanted, there must be proportion between the stock of commodities and money funds, and the growth rate of money funds should be accompanied by the growth rate of stock of goods. The paper embraces the Friedman’s formula of the money supply as the basic target of monetary policy. See: Dimitrijević, B. – Ivović, M. (2008.) „Tržište i privredna ravnoteža. Slučaj kvantitativne teorije novca“, Poslovna ekonomija, br. 2, godina II, Sremska Kamenica
etary multiplier, which is equal to the reciprocal value of the required reserve ratio of banks: $Ms = MB \times mm$.

The process of money multiplication and creation of money supply takes place through the banking system; the central bank can control it only indirectly. The following equations show this mechanism:

$$MB = C + R$$  
$$R = (r \times D) + ER$$  
$$M = mm \times MB$$  
$$c = \frac{C}{D}$$  
$$e = \frac{ER}{D}$$  
$$R = RR + ER$$  
$$mm = \frac{1 + c}{r + e + c}$$

The symbols from the equations have the following meanings: $MB$ is monetary base or base money; $C$ is cash; $R$ is the total amount of reserves in the banking system; $D$ represents transaction deposits in banks; $ER$ represents excess reserves in the banking system; $r$ is the rate of compulsory reserves obtained as the ratio of required reserves banks $RR$ and the total amount of transaction deposits ($r = \frac{RR}{D}$); $mm$ is the monetary multiplier as the ratio of the money supply to the monetary base; $c$ is the share of cash in deposits; $e$ is the share of excess reserves in deposits, $R$ represents total reserves, the sum of required reserves, $RR$, and excess reserves $ER$.

The point is that central bank controls the base money primarily as a sum of cash and reserves in the banking system. The base money (monetary base) then goes through the system of credit-monetary multiplication, creating the supply of money, which is given in the equation (8). The central bank can affect the money stock primarily through the impact on the monetary multiplier, i.e. through determination of the required reserve rate, and it affects the parameters $c$ and $e$ only indirectly. It is easy to show that the rise of parameters $e$ and $c$ decrease the multiplier, of
course, if other circumstances remain unchanged\(^4\). Also, an increase of the required reserves rate and interest rate reduce the monetary multiplier, and thus reduce the money supply! Are central banks in the world today guided by the Quantity Theory of Money and the rule regarding rates of growth of GDP and money supply? **The answer is no!** The only central bank guided by this rule before the formation of the European Central Bank (ECB), was the Deutsche Bundesbank. Since World War II, this bank has been characterized by a high degree of independence from the Parliament and the government, and it has attained remarkable credibility in controlling inflation. The Bundesbank’s reputation and its success in controlling inflation has been built on strict application of targeted monetary aggregates in accordance with the QTM formula that is given in the equation (4) as well as the equation (15) and German inflation has almost never exceeded the annual amount of 3-4%. This fact is the indisputable confirmation of the attitude that this instrument should have the priority in modern monetary policy of central banks.

**The process of credit multiplication in banks has nothing to do with demand for money;** money supply and demand for money are equated indirectly, as illustrated in the following chart:

**Figure 1: Equating money supply and demand for money**

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\(^4\) If we make a numerical simulation with specific values for the parameters \(e\) and \(c\) in the expression (12), it can be seen that the value of the fraction \(\frac{mm}{e}\) decreases as the values of \(e\) and \(c\) rise. It is economically obvious as well because the growth of \(c\) increases the share of cash and reduces assets available for multiplication, and also, the rise of \(e\) increases the amount of reserves in the banking system. The negative correlation of these parameters with the monetary multiplier further confirms that the control of money supply is possible only in an indirect way.
What are macroeconomic consequences of such monetary policy? How to equate money supply and demand for money? As the Figure demonstrates, supply and demand are equalized by a reduction of money value and rise of prices (money supply growth to the level of MS2 leads to an increase of prices, i.e. to a decreased value of money at point B with respect to the initial equilibrium point A)! In other words, the first consequence of the process of money creation that does not supervene the basic rule and logic of QTM is general rise of prices. Empirical data in most countries show that the price level has increased dozens of times over the last 80 years and this fact is a direct consequence of the way of creation of money supply, which has been formed independently from the demand for money and the movement of real GDP.

The second major consequence of such creation of money supply is that the key operating instrument of monetary policy becomes the interest rate, not the money supply. In fact, the most important instrument in the U.S. monetary policy are open market operations from which the operative instrument of interest rate on federal funds is derived, being defined at a certain level, and the money supply is adjusted to it. It is basically the policy pursued by the European Central Bank, the Bank of England, and the National Bank of Serbia (so-called reference interest rate), although most of these banks define inflation as their basic target, the final monetary policy objective to be achieved. This mechanism is provided in the IS-LM model framework where the supply and demand for money are equated by the level of interest rates, which stems from the Keynes’ Theory of Liquidity Preference:

**Figure 2: Equating money supply and demand for money - LM curve**

![Diagram](attachment:LM_curve.png)
When a central bank targets interest rate to reduce inflationary pressures due to excessive expansion of the money supply, interest rates must rise. Having an unchanged demand for money, the rise of interest rates (Figure 2), leads to the reduction of the amount of money that is passively adjusted with the target interest rate (the interest rate rises to the level of $i_A$, and the money supply is reduced to the level of $M_2/P$). What are the main consequences of the rise in interest rates or a high level of interest rates? The main consequences are: a decline in economic activity, a low level of investments, and a slowdown in economic growth, which are characteristic for the global economy, especially since the late 1960s and early 1970s. Examining the time series of interest rates and GDP (for the U.S. economy), it is easily noticed that a slowdown in GDP growth is correlated with an increase in interest rates (and inflationary pressures in late 1960s when the war in Vietnam escalated) and leaving the Bretton Woods system of fixed exchange rates linked to the dollar and gold, which led to the new phenomenon of stagflation as a simultaneous rise in prices and a decline in employment.

The third major consequence of such monetary policy (and theory) is that open market operations become the prevailing mechanism of base money creation by the central bank, and that the money creation mechanism based on the discount policy is left. Money creation on the basis of the discount policy and discounting of securities is directly related to the needs of economy and Friedman’s rule regarding the money supply and the physical volume of production. Mechanism of open market operations has eventually led to the expansion of securities and financial markets that have occasionally been used as the means of neutralization (sterilization) of excess money supply in order to prevent inflationary pressures. The expansion of financial markets has gradually led to excessive and hypertrophic financial sector in relation to the real sector and produced speculative bubbles, which is written in detail by the Nobel laureate Krugman (2008). Nevertheless, the securities market and weak regulation by the Fed, has led to the global financial and economic crisis that began in the U.S. and overflowing to the rest of the world, today mostly “shaking” the euro area and the EU countries. Business cycles are a direct consequence of the monetary policy based on the credit multiplication; periodic bank bankruptcies and jeopardized deposits cause distrust, long duration of the crisis (the so-called “liquidity trap”), and mass bankruptcies not only of firms and banks, but also of states, leading to growing poverty and unemployment.

Determination of the interest rate is derived based on the famous Taylor rule with the main formula (with modifications depending on central banks), as follows:
\[ i_n = i_r + \alpha(p - \pi^*) + \beta(Y - Y^*) \]  

The Taylor rule suggests that a central bank is governed by targeting nominal interest rates \( (i_n) \), which is equal to the sum of the real interest rate \( (i_r) \) and two gaps: between the actual and expected inflation \( (\pi - \pi^*) \) and between actual and potentially equilibrium domestic product \( (Y - Y^*) \). Instead of establishing a relation between the money supply and real GDP, the relation is indirect, through interest rates, which may result in higher interest rates, reducing the level of economic activity and falling into the so-called liquidity trap, in conditions of depression (this happened during the Great Depression and now, during the Great Recession).

Analyzing the exceptional effects of the Greenspan’s government of the Fed in the 1990s when the U.S. economy showed a remarkable performance in terms of growth and low inflation, Mankiw says that monetary policy was adhered to the following versions of the Taylor rule: \( i_n = 8.5 + 1.4 \times (\pi, \text{where } i_n \text{ is the nominal interest rate on federal funds, and } \pi \text{ is the inflation rate under the Fed control (core inflation)} \) (Mankiw, 2001). Mankiw graphically demonstrates that this formula is a good approximation of the real interest rate movements. This analysis shows that during the Greenspan era, the Fed adhered to the Taylor rule and interest rates as the key operational (intermediate) targets of monetary policy. The image convincingly shows that periods of good performance of the U.S. economy were correlated with low interest rates (which ranged from 3 to 7 %). Additionally, L. Summers, the head of the U.S. Treasury at the time, advocated inflation less than 3% as a stimulus to economic growth which, together with low nominal interest rates, could bring the real interest rate to the negative value (this was the economic policy of Japan once). These are also the primary lessons of this paper.

A number of articles have been published on monetary policy analysis and the Taylor rule, and all of them, more or less, conclude that, in practice, monetary authorities have adhered to this rule and have had good results in inflation control. Taylor himself analyzes the effects of as many as 18 varieties of monetary policy in his paper, and he points to the fact that monetary policy and credit activities can have significant effects on real GDP (Taylor, 2000). The following graph illustrates the relationship between the level of money supply and the level of economic activity in the United States:
A strong argument in favour of the real impact of money supply on the domestic product and economic cycles is provided by Mishkin (2006), showing that the growth of the money supply precedes by a half a cycle the growth decline of the real GDP, which undoubtedly confirms two facts: first, the money supply trend is the most responsible factor for the creation of business cycles, and second, the money supply has real effects on changes in production. Statistical data documented by Friedman and Schwartz in their book “A Monetary History of the United States,” and the data accumulated during the 20th century show that reduced money supply always precedes decreased economic activity. There is no doubt that there is a correlation and causality between money supply and the level of economic activity coming from the money supply and that the periods of reduced money supply were followed by a decline in economic activity. This is confirmed by the current economic crisis, but also by the experience and lessons of the Great Depression of the 1929-1933. In the aforementioned book, Friedman himself convincingly empirically demonstrates that the Fed’s reduction in the money supply was the basic cause of the production decline and the deep economic crisis at the beginning of 1930s. The Fed, which was created to prevent instability of the monetary-financial system, only further strengthened and deepened the intensity of the downward trend in economic activity. If monetary policy can result in a long-term decline in the level of real economic activity, it seems reasonable that it can cause long-term economic growth without inflation-
ary consequences, which implies the rejection of the postulate of long-term neutrality of money. However, the rejection of this postulate implies a different way of money creation and a new combination of policy instruments.

4. New combination of monetary policy instruments towards economic growth

4.1. Reconsideration of the role and importance of velocity of money and some analogies with concepts of physics

In the QTM equation, the velocity of money plays the key role. The basic premise for QTM is the constant velocity of money determined by real factors. Based on this assumption, it is possible to formulate a rule on the relation between the money supply and the real GDP. However, there are various theoretical aspects on this issue:

1. The Classical school represents the view of the constant velocity of money; then, it is possible to manage the demand function;

2. The Keynesian school assumes that velocity of money circulation is not constant and that it is proportional to interest rates. Here is the basic formula that expresses this relationship:

   \[ \nu = \frac{py}{M} = \frac{Y}{f(i,Y)} \]  

   (14)

   Of key importance for our analysis are the claims that velocity of money circulation depends on interest rates and that a rise in interest rates leads to the velocity change in the same direction. In other words, if the interest rate is the main determinant of the velocity of money and their relationship directly proportional, it is possible to keep the velocity of money under control with the policy of stable and low interest rates in long term, and stabilize it further by adjusting the money supply in the opposite direction of the movement of velocity of money circulation.

3. The Monetary theory argues that the function of the demand for money (with velocity of money as its integral part) is stable over time and such sta-
bility is retained even under conditions of hyperinflation, as Cagan⁵ shows in his famous work as of 1956. Money demand and velocity of money circulation are actually the functions of permanent income \((Y_p)\), which is stable in size over a longer period of time.

4. Many other authors (Laidler and Parkin, Mishkin, etc.), cite a number of empirical studies which confirm that the velocity of money has been unstable and variable value over time, which can be illustrated by the following figures:

**Figure 4: Change of the velocity of M1 and M2 in the period from 1915 to 2002**

![Figure 4: Change of the velocity of M1 and M2 in the period from 1915 to 2002](image)

Our conclusion in this debate is that the velocity of money is unstable, not constant value, which must be taken into account while defining monetary policy. The most important consequence of this attitude is related to the supply of money and the Friedman rule. If we go back to equation (4), and assume that \(v \neq 0\), then the equation (where all terms are given as growth rates), becomes:

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⁵ Cagan, P. "The Monetary Dynamics of Hyperinflation." Cagan shows that inflation is caused by excessive monetary expansion, that the money supply is exogenous and equal to the demand for money through price increases. Also, Cagan concludes (by developing an empirical model and testing it) that a function of the demand for money was stable under conditions of hyperinflation because the conditions of dynamic stability were not affected even with the explosive rise of prices. Cagan's inflationary expectations are modeled by adaptive scheme. In addition to Cagan's work, details of this can be seen in the book "Hyperinflation" by B. Dimitrijevic, p. 48-57.
Namely, during the recession and downturn in economic activity, velocity of money slows down relative to the equilibrium level of the period of stability, which means that an additional amount of money should be printed because the reduced velocity acts to further reduce the money supply. Expansionary monetary policy in this case does not act inflationary, but only compensates the reduction of the money stock and prevents recession deepening. As it is known, back in 1930s, during the Great Depression, the Fed acted completely opposite and the level of economic activity in the four-year period fell by almost 40 percent. The fact of the velocity reduction is best illustrated by the remonetization phenomenon that occurs after major hyperinflations, such as the one in the FRY in 1992-1993. With the stabilization of the dinar and its pegging to the Deutschmark (so-called Avramović Stability Programme), the quantity of money is multiplied without raising prices because of the slowing down of the velocity of money, to its equilibrium value (between 6 and 7) before the hyperinflation outbreak (Dimitrijević & Pitić, 1994). Also, under conditions of high inflation and hyperinflation, velocity of money increases significantly due to high opportunity costs of cash holding. In such circumstances, the money supply is further multiplied by the effect of velocity growth, so the monetary policy should be extremely restrictive in an attempt to stabilize prices. The current monetary theory, as a rule, does not take into account the phenomenon of velocity rise and fall, which deepens the business cycles, and makes control of the prices difficult and monetary policy considerably less efficient. Therefore, the monetary rule in this case is very simple: the rate of money supply must rise or fall in the same percentage as the rate of change in velocity of money increases or decreases!

Now we will try to establish the analogy with physics, to demonstrate further importance of velocity of money. This analysis should prove that the velocity of money management done indirectly through interest rates, sterilizing monetary policy and discounting may, in the long term, lead not only to a greater monetary stability (and hence, to decreased intensity of business cycles), but could have some effects on the real economy. In other words, if we were able to keep velocity of money constant, then monetary policy and money supply could have real effects on economic growth (as sources of growth financing) even in the long run, provided the money supply grew at the same rate as the real sector.

Let us begin with the well-known relation between time, distance and speed:

\[ g = \frac{s}{t} \]
From this equation it is clear that the distance (s) and speed (ϑ) are directly proportional and that the velocity growth rate also means increase of the distance, i.e. increase of the spatial component. The famous Einstein’s equation on the relationship of matter and energy: \( E = mc^2 \) shows the ratio between matter and energy, as well. Mass is nothing but condensed energy, and energy is the mass that can be accelerated by squared speed of light. Thus, mass and energy become interchangeable and proportional categories. Fluid mechanics explains that increasing the amount of fluid in the same volume increases either pressure or density. If the amount of fluid increases proportionally together with the internal volume, the density will remain constant and the ratio between the volume and the amount of energy will not increase. Energy (thicken fluids) creates matter or mass (this process creates stars, too), providing that there is no spatial increase, otherwise, the density will remain unchanged.

This can now be applied to QTM in order to notice analogies. Let us start again from the expression for QTM:

\[ M \nu = py \]  (17)

Money in this example is analogous to energy, physical volume of production to matter, velocity of money to speed of the body in movement, and the price level corresponds to physical space. If energy (money) is added, without changing speed, with the amount of matter unchanged, either pressure or volume (the spatial component) increases. In economy, this is analogous to inflation - spreading, because that word means expanding, inflating. If the physical volume of production and money supply grow at the same rate, the ratio between matter and energy (ν, or k is constant) is maintained, and there is no inflation. The increase of velocity of money is the same as the growth of the spatial component (prices) and must be compensated by reducing the amount of energy (money), as pointed out earlier, to avoid inflation. The same happens in reverse direction if there is a decrease in velocity of money. Under what conditions energy - money can affect the physical volume of production? The expression (17) can be represented with the following proportion:

\[ \frac{M}{y} = \frac{\Delta M}{\Delta y} = \frac{p}{\nu} \]  (18)

The ratio of the money supply to the physical volume of production must be equal to the price level to the velocity of money ratio, or \( k \times p \), since \( k \) is equal to the reciprocal value of velocity of money. Also, the ratio of quantity of money to the stock of goods must be maintained in terms of growth of the money supply (\( \Delta M \)) and an increase of the amount of goods (\( \Delta y \)) i.e. commodity and money
market funds must grow at the same rate. If the right-hand side of this expression remains unchanged (i.e. if the velocity of money is held steady), it is possible to maintain the ratio by adding energy (money) gradually, but due to the increased quantity of money, only the production volume (the effect of condensing matter into energy) increases, and the expression on the right-hand side will remain unchanged. In other words, if we are able to keep the velocity of money under control, the amount of money will have a real effect on the growth of production, without any inflationary effects. Using the language of physics, within a closed system, the increase of energy (the amount of fluid), under constant velocity and constant volume, will lead either to the thickening of the existing or the creation of new matter and not to the expansion of space (inflation). Therefore, it can be concluded that the crucial issue for monetary policy management with real effects in the long term is the managing of the velocity of money and keeping it under control. If we are able to manage the velocity of money, money can affect the growth of production with no impact on prices. Since the printing of money is basically free for every central bank (it is, of course, paper money - fiat money), it means that many developing countries will be able to reach almost free resources for their rapid economic growth without inflation, expensive loans on the international financial market or foreign direct investments, which in times of crisis usually dry up, otherwise they would have the predominantly negative effects on the host countries in the long run!

4.2. Transmission mechanisms of monetary policy

One of the most important issues to discuss is whether it is possible, and if so, how should one control the velocity of money. If we start from the expression (14), we can see that the velocity of money increases with the rise of interest rate and income. Therefore, it is possible to perform several inter-dependencies in the context of money supply and demand that have an impact on the velocity of money. Namely, the supply of money is equal to the demand for money:

\[ \frac{Ms}{p} = \frac{Md}{p} = f(i, Y) \Rightarrow M = P \times f(i, Y) \]  

(19)

Since the velocity of money is given by expression \( v = \frac{py}{M} = \frac{Y_n}{M} \) it is possible to show:

\[ v = \frac{Y_n}{M} = \frac{Y_n}{Pyf(i, Y)} = \frac{py}{Pyf(i, Y)} = \frac{y}{f(i, Y)} \]  

(20)

Income velocity of money equals to the quotient between the real income \( (Y) \) and the demand for real money, as shown in the expression (20). It is clear that
growth of production volume and inflation accelerates $v$. If the money supply is tied to the growth of real GDP, inflation will be under control. Possible acceleration of $v$ due to the increase of $Y$ can be neutralized by reducing the money supply! On the other hand, a stable and low interest rate, could have additional impact on slowing velocity of money, and thus keep it under control.

Friedman himself tries to find a compromise between the classical and Keynesian approach in his economy model (a dilemma whether domestic product is fixed at the equilibrium level of $Y=Y$, or fixed prices $P=P*$), decomposing the rise of nominal gross domestic product $Y_n$ into price and quantity components. He establishes the relation between the nominal and real interest rates, nominal and real gross domestic product growths and the inflation rate. This is shown in the following equations:

\[
\begin{align*}
\hat{i}_N &= \hat{i}_R + \pi^e \\
y_N^e &= y^*_R + \pi^e i \\ y_N^e - y^*_R &= \pi^e \\
\hat{i}_N &= \hat{i}_R - y_R + y_N^e \\ i_R - y^*_R &= \lambda_0 \\
S &= \frac{\lambda s}{1 - \lambda s} = (m^* - y_N^*)
\end{align*}
\]

The expression (21) shows the standard relationship between nominal, real interest rate and inflation rate. In the equation (22), inflation occurs as the difference between the expected rate of growth of nominal income and the growth rate of real income (according to the Phillips curve), and the coefficient $k_0$ represents the difference between nominal interest rate and the rate of growth of nominal gross domestic product. Finally, the most important expression for our analysis is the equation (24) in which the coefficient $s$, which is defined as the dependence between the velocity of money and the level of interest rate: $S = \frac{1}{v \frac{di}{dt}}$, while connected with the ratio of the money supply and gross domestic product (by Friedman’s rule), with the parameter $\lambda$ as the coefficient of adaptation. Thus, the velocity of money, the interest rate, the rate of growth of money supply and the rate of growth of nominal gross domestic product are interrelated. The velocity of money increases whenever the rate of the money supply rises faster than the growth of GDP. In other words, velocity can be kept under control in two ways: 1) with the long-term rule of constant rate of monetary growth, which is linked to the GDP growth, 2) with the interest rate that will have less variability for a long period of time. Then the chances for monetary policy to achieve a realistic effect on production increase. Friedman intercedes for the idea of low interest
rate in a model in which he analyzes the optimal amount of money for individuals and companies. He concludes that the nominal interest rate close to zero eliminates the opportunity costs of holding money and therefore is highly desirable. Then, even if inflation exists, the real interest rate is negative, which can be an incentive for investment activities. It will be seen later that this phenomenon occurred in the U.S. economy in the period from 1933 to mid-1960s and it was economically most favourable period for the United States.

The classical school of economic thought (which is basically accepted by the Monetarists and the New Classical Macroeconomics although with the difference relative to the short and long terms) advocates the neutrality of money in the long run. Aggregate supply is determined only by real factors in the long term (expression 26), and the effect of money on economic activity is only temporary. This can be represented as follows:

\[
Y = Y^* + a(P-P*) \quad (25)
\]

\[
Y^* = f(L, K, T) \quad (26)
\]

Deviation between the actual and the equilibrium social product may be only temporary, when actual inflation deviates from its expectations, due to unanticipated monetary shocks (sudden increase in the money supply). However, monetary policy, which will follow the two rules: a) stable velocity and b) money supply adjusted to the rate of growth of GDP, will have real effects in the long run and then it will be adequate to include a variable in the money supply in the equation (27):

\[
Y^* = f(L, K, T, M^S) \quad (27)
\]

This means that the aggregate supply depends on labour, capital, and residuals, which include factors of technology and education, as well as the money supply generated on the basis of these two assumptions.

Now, the transmission effects of monetary policy, namely, the way it transmits its effect on economy, will be briefly analyzed since this issue is important for our analysis. Basically, there are Pigou and Keynes sequences out of the crisis (Dimitrijević et al., 2001):

1. Pigou sequence: \( P \downarrow \Rightarrow \frac{M}{P} \uparrow W \uparrow (C \uparrow, AD \uparrow) \Rightarrow IS \uparrow (to \ the \ right) \Rightarrow Y \uparrow \)
2. Keynes sequence: \( M \uparrow \Rightarrow \frac{M}{P} \uparrow LM \ to \ the \ right \Rightarrow i \downarrow \Rightarrow I \uparrow \Rightarrow Y \uparrow \)
3. Friedman sequence: \( M \uparrow \Rightarrow black \ box \Rightarrow ?? \Rightarrow Y_n \uparrow \)
The **Pigou sequence** is based on the price elasticity and it claims that price reduction leads to increase of real wages during depression, which encourages the increase of consumption, employment, aggregate demand and gross domestic product. The economy has self-balancing mechanism, and the money does not have an active role, although real money stock increases due to lower prices. The **Keynes sequence** means that the money supply must increase in a crisis, which then decreases the interest rate and activates the sequence of growth of investments and aggregate demand. The **Friedman sequence** is the variant of the Pigou sequence in terms of belief in liberal principles, but it is not exactly recognized how the money leads to the growth of nominal gross domestic product in the short term. Our understanding of the real effect of money is close to the Keynesian sequence. Money injected into the economy with the constant velocity, leads to the reduction in interest rates, as well as to the real GDP growth, provided that the money supply in the long term is adjusted to the real GDP growth.

Judd and Scadding (1982) and Fisher (1986) give arguments in the IS-LM framework which target of monetary policy to choose, depending on the disorder cause. If the causes of disorder are on the IS-curve side (real sector), it is better to target the money supply. If the causes of disorder are on the LM-curve side (monetary sector), it is better to target the interest rate. This can be illustrated by the following chart:

**Figure 5: The money supply and interest rate as monetary policy targets**

It is clear from the charts that if the disorder cause is on the IS-curve side, fluctuations of GDP are less if the money supply is targeted (LM is fixed and fluctua-
tions are between points D and F). If the causes are on the side of the LM-curve, then fixed interest rate means less fluctuation of GDP (point B). Since the crisis is now manifested as a delay in the real sector (as a consequence of the “liquidity trap,” although it has started in the monetary sector), it is an additional argument for monetary policy to pass onto the money supply as the key tool in overcoming the crisis.

4.3. Some empirical arguments

The Federal Reserve System was established in 1913 with the aim to prevent the occurrence of business cycles. For our topic it is important that the main instrument until 1920 was the Fed’s discount policy, which was based on the so-called “Real Bills Doctrine”. It is the doctrine contrary to the so-called paper money (fiat money), because it implies that the quantity of money in circulation must have coverage: 1) in gold - the gold standard, or 2) in the quantity of goods - the production of goods and services. As opposed to it, the amount of paper money is not strictly related to the coverage of commodities, or gold. The fact that paper money won, in our opinion, had several consequences: a) long-term inflation growth, b) debt increased in all countries that adopted paper money, and c) converting the interest rate to the dominant instrument of monetary policy, which decreased motivation for production in the long term because interest rates were relatively high. Discounting and re-discounting were based on drafts issued by commercial banks to credit the production, and then the central bank purchased eligible bills and issued base money, crediting the banks. This instrument was abandoned in 1920 on the grounds that it had inflationary consequences, but the terms discount policy and discount rate remained in use, as a regulatory central bank interest rate (Mishkin, 2006). This mechanism, provided that it is not abused, is much closer to the money supply and the rate of growth of real GDP. The fact that it was in use, shows that it can be used effectively in practice, and is a strong empirical argument for the reintroduction of such an instrument. Its advantage will be connecting the money supply to production and contribution to the growth of the real economic sector.

The chart of movement of nominal and real interest rates in the U.S. economy, given by Mishkin in his book “The Economics of Money, Banking, and Financial Markets” p. 610 (Mishkin, 2006), is very interesting for our analysis:
The period from 1934 to the beginning of the 1960s is particularly interesting (the new economic policy leads to a structural break in the time series), which can be regarded as the “golden age” of the U.S. economy. As it can be seen in the chart, it is a period of extremely low nominal interest rate and even a negative real interest rate. In this period, however, there was no significant inflation, but real GDP significantly increased. The low interest rate and stability of the nominal interest rate, favouring not only economic growth but also the stability of the velocity of money, resulted, according to our arguments, in the fact that money had the real impact on the economy for more than 30 years!

Indirect recognition of the real effect of money on the economy is provided by a mechanism called *bank-lending channel*. It is a phenomenon that has been used now, too. All key banks in Europe and the United States (ECB, Bank of England, Fed), have not only reduced the interest rates, but have also increased crediting of their economies. This is a lesson from 1929-1933, which significantly mitigated production decline, which would be much more dramatic without these measures. The increase in credit activity in the recession-depression stimulates the growth of consumption, aggregate demand and production, which means that it has the real impact. The effect of these measures is reduced by the ability of banks to come up with the money through the issue of securities, but the crisis in the financial markets has emphasized again the importance of this banking instrument. The crisis has affected the liquidity of households as well (partly due to the growth of debt in relation to income level, as pointed out by the Nobel laureate Krugman), so they prefer not to take loans and invest in consumer durables.
Stimulus measures in this direction, such as subsidies for loans and lower interest rates, would undoubtedly boost the liquidity of households, individual consumption and aggregate demand.

Very intensive studies on the relationship of the financial and the real sectors, as well as the impact of real sector on economic growth have been recently conducted (in 2011 and 2012) by the BIS (Bank for International Settlements) in Switzerland. A particularly interesting work in the context of this topic written by Cecchetti and Kharroubi (2012) explores the impact of the size and scope of the financial sector on economic growth in developed OECD countries. Given in the form of econometric model, empirical testing, and graphical interpretation for the period 1980-2009, this work analyzes two groups of countries: 50 developed world countries and 21 OECD countries, reaching some interesting conclusions (which could not be expected among the influential economists of the mainstream, until recently): 1) the relationship between the size of the financial sector and the growth of GDP shows the typical form of reverse (convex) U-curve, meaning that GDP rises to a certain extent with the growth of financial sector, but after certain limit (as in the case of the Laffer curve), oversized financial sector begins to “choke” economy and becomes an obstacle that slows the economic growth; 2) econometric analysis and graphs show that there is an inverse correlation between GDP per worker and the financial sector per worker, in other words, **the growth of the financial sector per worker, reduces GDP per worker**! 3) the interdependence of private loans given as a percentage participation in GDP, in relation to the GDP per worker, also shows the shape of U-curve, after a certain amount of private loans, their growth reduces the GDP, instead of increasing it; 4) finally, there is a statistic fact, which, though very simple, convincingly corroborates these theses, namely, the share of private loans in GDPs of the European Union countries that are in crisis is: -160% for Portugal, the UK - 180%, almost 200% in Denmark, but for India that is not in crisis, it is only 50%! As it is stated at the beginning of the Introduction, the financial sector “has sucked” the real sector into itself and remains a kind of parasitic plant that lives at the expense of creating new value in production. Therefore, it seems that the return to the real sector and industrial production in the future is inevitable if we want to overcome the crisis in a reasonable time.

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6 http://www.bis.org/list/papers/index.htm
4.4. Proposals for a new monetary policy

Is there such a combination of economic policy instruments that can keep the velocity of money under control? It is not easy to answer this question because there is a lack of experience with this kind of handling monetary policy. The change of economic mechanism for money creation means a radical change in the functioning of modern banking and the loss of many privileges modern banks get from the mechanism of credit multiplication. The previous analysis shows that there is a positive correlation between the movement of interest rates and the velocity of money. This can be illustrated by comparing the time series of these two values in the following chart:

**Figure 7: Trends in velocity of money and interest rates in Germany**

The Figure shows the changes in the velocity of money and interest rate (expressed in percentages), in Germany (where the Bundesbank has previously targeted the money supply and the GDP growth rate) that is a part of the European Monetary Union. It is interesting that there was no correlation until the global financial crisis appearance because the ECB conducted extremely expansionary monetary policy during the economic conjunction. From the beginning of 2008,
economic environment and the ECB monetary policy have changed. In this period, the correlation between the interest rate time series and velocity of money can be noticed because monetary authorities pursue prudent monetary policy. The graph above shows the correlation corresponding to our expectations, although detailed research will be required in the future, both empirical and statistical, in order to test this hypothesis and possibly prove it.

**The first condition** for the stability of the velocity of money is that interest rate is long-term stable and low. Low interest rate means less entropy of the economic system and it has a stimulating effect on the growth of investments and gross domestic product. That is exactly what Keynes advocates in his book “The General Theory of Employment, Interest and Money” but also in his other works that deal with economic policy, as well as in his public appearances (Keynes, 1936). Low and stable interest rates reduce fluctuations and stabilize the velocity of money in the long term, but some corrections of GDP growth are necessary because it also increases the velocity of money. It is interesting that in the United States, during World War II, as shown by Mishkin, the money supply had no inflationary consequences although it contributed to the production growth. This was possible due to the low interest rate.

**The second condition** for velocity control is that the process of creating the money supply should be related to the rule: \( m + v = y + \pi \), (as it has been done by the Bundesbank after the Second World War). Then the money supply and the rate of growth of the money stock would be followed by a growth of the physical volume of production (with anticyclical correction in case of changed velocity), which would eliminate the pressure on the rise of prices whilst contributing to greater stability of the velocity of circulation. Changing the mechanism of the money creation means the reducing of the credit multiplication process to the required level. Corporate loans will be provided with a mechanism of discount windows in which banks offer business loans on the basis of securities, and a central bank buys them out with the base money and thus indirectly creates the money stock according to the growth of the physical volume of production.

**The third condition** arises from the second one and it means the return to the discounting mechanism as the basic instrument of monetary policy, and reducing the importance of open market operations as the way of the base money creation. The important implication of this rule is the reduction of credit multiplication and the creation of the money supply primarily based on banking deposits and discount credits. This means that the reserve requirement ratio for banks will probably be higher than 50% and the difference between the monetary base and the money supply will be relatively small (\( mm \) less than 2). This allows the
central bank to manage the money supply with more ease, and it prevents the so-called friction banking, leading to periodic banking panics, bank bankruptcies and business cycles. A part of bank deposits will remain for credit activities with individuals, but it is certainly a small part of the deposit potential because the dominant part of the potential is used for business loans. Neither will bank loans create artificial demand, as hitherto, nor should excess of the money supply have to be sterilized by securities (which has occasionally led to speculative bubbles in financial markets as on the real estate market in the USA in 2007, which has been just a disguised form of inflation caused by the issue of excess money in relation to the actual production needs). Such a mechanism certainly reduces hypertrophic and oversized banking and financial sector and restores the importance of the real economy. The risk of outbreak of economic cycles is reduced because the monetary sphere follows the real sector, without production of excess money, excess demand and creation of overproduction crises, or loss of confidence in investing.

There are several open issues regarding the proposal for a new monetary policy. First, it is uncertain if economy can function only on the basis of discounting securities with lower credit multiplication rate, which will support economy and encourage the growth of aggregate demand. Only practice can give the final answer. Second, the discounting of securities as the main form of support for the production growth can also be misused for financing unsuccessful and miscarried investment enterprises and can go to consumption with no effects on real economic growth. Therefore, this model requires a strict financial discipline. There are some indications that China applies this model of providing cheap sources of funding and high growth rates, but it is accompanied by a remarkable financial discipline, together with the large central authority of the communist government. Third, the important question is whether interest rates can remain relatively low and stable in practice in the long term and whether the central bank will be able to keep it under control regarding market disruptions, money supply and demand, inflation rates and policy of economic relations with the world, including international interest rates, trends and fluctuations in capital markets and exchange rate policy. Fourth, banks will be able to maintain certain credit activities with individuals, so some “fine tuning” will be necessary to avoid jeopardizing the financial system stability. Fifth, the transition from the model of creating demand through credit expansion to generate production, which is the hallmark of capitalism that enables dynamic economic growth (but also periodic business cycles), to the model of money creation based on production, can lead to deceleration of credit activities, possible “shortages” of money, and the pressure to return to the former, presently dominant model of monetary policy.
5. Conclusion

In economics, neutrality of money is considered consensual in the long run. It sounds utopian that it is possible to get something (output growth) for nothing (costless money issue), but it is applied now by the United States, using the dollar as the global reserve currency and switching its issue costs as inflation tax to the rest of the international community that uses it). Also, the amount of money will not be arbitrary, but monetary equivalent to the flow of goods and services, which is, in fact, its main function according to the Real Bills Doctrine. Any deviation from this rule is still punished by inflation, business cycles, and bank bankruptcies and the bursting of speculative bubbles which occasionally hit some developed countries; it was the case with the Asian crisis of late 1990s when the economies of Japan, South Korea, Indonesia, Thailand and Malaysia were affected. (This can be found in detail in “The Return of Depression Economics” by Paul Krugman) Therefore, this system is theoretically and economically possible, but political economy of the modern world requires caution while concluding that it is possible. In the short term, such a system would jeopardize the interests of major international banks and big businesses, reduce the need for borrowing (if implemented consistently and with discipline), decrease profits of large corporations, lead to more equitable distribution of wealth at the international level and possibly speed up the development of less developed and the so-called Third World countries. Large interests of international corporations, as well as wealthy countries (which behave in the neo-colonial manner) and the banking cartels, in conjunction with the military industrial complex, can be the real obstacle for the attempt to establish a new system of monetary policy capable of jeopardizing their interests. Therefore, it seems that the key issue is not whether the system is theoretically and practically possible from the standpoint of economic policy, but if it is really applicable from the standpoint of interests of the global economy. This world is ruled by monetary policy and international relations, which are presented as if they have no alternative in economic theory, and are conducive to the interests of the rich and powerful. So it seems logical that they will try to prevent its practical implementation.
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