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MONEY SUPPLY AS THE TARGET OF THE CENTRAL BANK

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Abstract

The main purpose of the article is a critical analysis of the monetary policy strategy that is based on the adoption of money supply as an intermediate target. The analysis is conducted from the perspective of the theory of the Austrian school. The first part of the article presents an influence of the supply of money on changes of categories in economy according to mainstream theories of economics. The second part discusses the essence of the strategy of monetary policy using money supply as an intermediate target from the point of view of the main trend in economics. It is demonstrated that in order to use it, two elementary conditions must be met: the function of demand for money must be at least relatively stable and the central bank must practically shape changes in the money supply at the planned level. The third part is of key importance for the purpose of this article. It involves the criticism of Friedman's principle, i.e. a constant increase in money supply as a monetary strategy. According to the Austrian theory, an increase in the quantity of money which is not financed by voluntary savings separates the time structure of production and consumption. Thus, after the period of prosperity there a collapse in production must take place. It is also pointed out that the crisis can be postponed only when the quantity of money increases at an ever faster rate.

Keywords: money supply, monetary policy, Austrian school, business cycle.

JEL classification: E32, E51, E58.

Introduction

Contemporary central banks of the most developed countries follow the monetary policy setting its main target at low inflation by using the strategy of direct inflation target. This policy assumes that there are no formal intermediate targets. Central banks do not focus on the control of a single parameter determining the final target. They take into account each available piece of information on factors that endanger the execution of the inflation target adopted for a given period. This strategy has substituted the strategy of intermediate realisation of the inflation target. The most frequently adopted intermediate target was the money supply. Then, a central bank was obliged to shape the increase in the quantity of money in a way that would correspond with the expected increase in prices. M. Friedman proposed fixed increases of money supply which would correspond with the increase in the potential output in a long term. The Austrian school of economics has a critical attitude to both strategies. The economists of this school argue that the current operation of central banks contributes to the greatest extent to the occurrence of cyclical fluctuations.

This is a theoretical paper the purpose of which is a critical analysis of the monetary policy based on the adoption of money supply for the intermediate target. The analysis is conducted from the perspective of the Austrian school. The paper also contains the discussion of the role of money supply as an intermediate target seen from the point of view of the main trend in economics.

1. Money Supply and Prices and Production in Mainstream Theories

The money supply influence on prices as well as production and employment in economy has been the elementary issue in the theories of variousschools of economics. They fundamentally differ in the evaluation of whether changes in the quantity of money inspire changes only in the sphere of money or also in the real sphere[1]. The problem of money's neutrality is thus an issue significantly affecting the targets of the monetary policy[2].

The most popular theory on the effects of changes in the money supply is the quantity theory of money. In its basic version, it was presented by I. Fisher from the mathematical perspective[3]. Monetarism is a contemporary school whose theory is based on it. M. Friedman treated the quantity theory as the theory of the demand for money, arguing that previous versions should not be understood differently. In his research, he substituted the velocity of money with the function of the demand for money[4]. According to him, this demand is stable from the real

perspective as it depends on the real permanent income. It is determined by the society's income expected in a long term. It does not change as often as the current income[5].

When analysing an increase of inflation and unemployment in the United States in the 1960s and 1970s, the monetarists negated the existence of the Keynesian Philips curve in a long term. They stated that there is no choice between low unemployment and high inflation or *vice versa*. For a long term, prices and wages are flexible, so there is an equilibrium in the labour market with a certain level of unemployment. This is the famous Friedman's natural rate of unemployment where unemployment is voluntary. Short-term deviations of the actual unemployment rate from the natural one determine the deviations of the actual output from the potential level. This means that inflation does not depend on the unemployment rate that will oscillate around the natural level[6]. Economists consider it to be variable and dependent on many factors, e.g. the mobility of labour force[7].

Friedman begins his analysis of the impact of the changes in the quantity of money on the economy at the moment of long-term balance. Expansionary monetary policy leads to an increase in the global demand. In a short term, it reduces the unemployment rate and increases the inflation rate. However, an increase in prices reduces the actual wages which are more important for an employee in wage-setting behaviour than a nominal wage. It means that an employee will include inflation expectations in his or her demands. In case of monetarists, these expectations are adaptive, i.e. the current inflation and the past inflation are taken into consideration[8]. An increase in inflation entails greater inflation expectations. Therefore, in their pay negotiations employees will demand an increase in nominal salaries higher than the current inflation. This will result in the increase in the production costs and in the accelerated increase of prices. Inflation higher than the rate of increase of the money supply leads to the reduction of the real quantity of money in circulation. Thus, the production and unemployment rise. This causes greater pressure on salary increase, which suggests lower inflation and decreasing inflation expectations. Adaptation will be continued as long as the inflation rate becomes equal to the rate of increase in the money supply with the natural unemployment rate. Friedman explains that the long-term Philips curve finally takes the shape of a vertical line.

By treating inflation as a purely monetary phenomenon, monetarists argue that its level is affected only by the quality of the central bank's monetary policy[9]. A considerably increased money supply in a long-term causes an increase in prices as the velocity of money is constant, there is a natural unemployment rate and non-monetary factors are decisive for the level of production capacities. Therefore, Friedman recommends using the monetary policy only to keep the level of the previously assumed inflation. Contrary to the Keynesians, he does not use it to

stimulate the economic situation or to reduce unemployment. It is considered that the monetary policy should not have a countercyclical character but be totally passive. The will to constantly stimulate employment requires constant increase of the growth rate of the money supply. This would lead to a constant increase in the inflation rate and hyperinflation.

Another argument against the active role of monetary policy is the problem of delays in disclosing the consequences of the undertaken activities. Monetarists strongly believe in market powers that automatically restore balance in the economy. Fluctuations in the economic situation are only short-term deviations from the long-term trend and depend on many various factors. Thus, the expansionary economic policy aimed at being ahead of the forecast recession may destabilise the economy, leading to the emergence of consequences in the period of prosperity. Then it will be stimulated even further, which may bear the fruit of faster inflation. In order to fight with it, the central bank will push the economy into depression with its restrictive policy. Changes in the economy are too dynamic in order to predict exactly the time when the consequences of the decisions made will appear.

Even though the principle of proportionality functions for a long term, monetarists admit that in a short term an expansionary monetary policy affects the unemployment rate. But the problem lies in the fact that the determination of the actual natural unemployment rate in a specific economy is extremely difficult. Even if authorities did this, they should not reduce the monetary policy. They can do it by following the policy of increased economic liberty that will ensure greater functioning of market powers and will improve the functioning of the labour market and enterprises.

A new classical school is more radical than monetarism in the assessment of the consequences of using the money supply in the policy of controlling output. Reasonable expectations, constant balancing of markets and errors in the perception of business entities are hypotheses that enabled new classics to formulate their elementary thesis of the ineffective traditional economic policy, including the monetary policy, even in the short-term[10]. They are the greatest defenders of the quantity theory of money and emphasise that money is super-neutral in economy[11].

When increasing the money supply, the central bank may: 1) inform entities of its activities; 2) surprise entities with its activities. The new classical school divides the monetary policy into the predictable and unpredictable one[12]. In the former case, rationally functioning entities take this information into account in their expectations and fully predict its consequences. An increase in the supply of money does not lead to increased output as employees who want to maintain the real wage at the constant level demand the increase of wage at the beginning of

the next period by the amount of the general increase in prices. The only and immediate effect of stimulating the economic situation with such a monetary policy will be inflation. In the latter case, in turn, the unexpected changes to the quantity of money, so changes which are surprising for private entities, have an influence on the real social product and employment. Increased global demand causes an increase in the prices of goods and services. The erroneous evaluation of the economic situation by businesses (they mistake the increase in the general level of prices with the increase in relative prices) leads to the initial reaction involving greater total supply. The generated output deviates from the potential one while the actual unemployment rate diverges from the natural one. Yet such changes are only temporary. Businesses and employees quickly realise that they have misinterpreted the impulse and they change their expectations. Only the level of prices is increased permanently. Output and unemployment quickly return to their natural levels. Also the level of prices constantly grows. Therefore the central bank should not follow a discretionary monetary policy but rather focus on the stabilisation of prices[13].

Dynamic incoherence in time and credibility of the central bank are important issues raised by the new classical school. Economists argue that the monetary policy should consider the expectations of business entities in its decisions, so it should not conduct policy other than the declared one. Acting differently, it puts itself in the position of losing credibility which is of key importance to the monetary policy. Short-term benefits resulting from the discretionary policy are much less considerable than losses connected with the costs of inflation and disinflation arising from the lack of rules of conduct[14]. The anti-inflation policy may be credible and as such also effective only when the central bank has full independence[15].

The best-known critics of the quantity theory of money are the continuators of J.M. Keynes's theory. The new Keynesian school aims at demonstrating that the monetary policy is fit for effective use to influence the level of business activity, i.e. to justify non-neutrality of money in a short- and long-term[16]. By assuming rational expectations and imperfect information, they decide that the economy's deviations from the state of balance constitute a wide-scale market defect. Effective expansionary policy of the central bank relies on sticky prices and wages[17]. Thus, R. Gordon clearly formulated a goal of new Keynesianism: "searching for rigorous and persuasive models of sticky salaries and/or prices based on maximising behaviours and rational expectations"[18].

Some economists of the new Keynesian school concentrate on explaining the rigid prices and nominal pays, while some focus on real ones. An advantage of the new-Keynesian approach is the abandoning of the conditions of perfect competition and the assumption that enterprises function in the conditions of monopoly competition and oligopoly. Nominal sticky prices are

explained on the basis of high costs of changes, i.e. menu costs. Enterprises change prices non-simultaneously, according to the Calvo model[19]. But the elementary argument justifying the rigid nominal wages is the conclusion of long-term pay contracts. Even though they increase the instability of the economy, they also reduce losses as constant salary negotiations are costly and time-consuming, and limit the rotation of staff.

Real rigidity of prices occurs when we observe the rigidness of one price in relation to the other. The new-Keynesian analysis refers to relations of the change of prices of goods in relation to the change of nominal wages. D. Romer reaches a conclusion that the rigidity of the real price is higher if the cyclical sensitivity of the flexibility of demand is higher and the cyclical sensitivity of the final cost affected by wages is lower[20]. Other sources of the rigid character of prices: external effects of "fat markets", consumer markets, chart of enterprise's expenditures and results, imperfect capital market and the quality assessment based on the price[21]. Theories justifying the existence of rigid real prices, in turn, are the models of implicit contracts, efficiency wages (model of negative selection, model of staff rotation, model of a shirking worker, model of honesty) and relation between a participant and an outsider[22].

Rigid prices and wages are decisive for the monetary policy being non-neutral even when entities have rational expectations. Its effectiveness in stimulating non-inflation output increase depends on the degree of synchronisation of prices and wages. In case there is no synchronisation and there are long terms of contracts, with the increased money supply one observes greater fluctuations in output and the simultaneous lower inflation. According to new Keynesians, this shows that the monetary policy causes real consequences even when it is predicted. They point at the superiority of discretionary activities over rules.

2. Money Supply as an Intermediate Target in the Strategy of the Central Bank

The stability of prices is the final goal of the monetary policy predominant now in the theories of mainstream schools of economics and in the practices of central banks. It is understood as low inflation, i.e. inflation that does not exceed 5% per year. It is most often argued that optimal is the target in the range of 2–3%. Economists consider low inflation as optimal for the increased welfare as both high inflation and too low inflation cause greater costs than benefits to the economy[23].

The main target determined in this way may be realised through various strategies. One possibility is the strategy of indirect realisation of the inflation target. The central bank must have an intermediate target, the development of which guarantees influence on the degree of the

final target achievement. Targets determined at the operational level should facilitate the control of the parameter adopted as an intermediate target. The role of short-term operational targets consists in the transmission of the effects of operations conducted in the monetary market and in this way affecting the shaping of values taken as intermediate targets that should, in turn, ensure the achievement of the final target. This kind of the monetary policy concept is defined as a triad of targets[24].

"Inflation is always and everywhere a monetary phenomenon in the sense that it is and can be produced only by a more rapid increase in the quantity of money than in output. The greater the increase in the quantity of money per a production unit, the higher the inflation rate. Probably there is no other statement with an equally established position in economy"[25]. Therefore, money supply is practically the most important intermediate target that the central bank is obliged to follow[26]. The control over the quantity of money as a strategy of the monetary policy is justified when the relation between the monetary aggregate and inflation is stable and the central bank using its instruments is able to sufficiently shape the increase in money supply. Thus, in order to use monetary aggregates to stabilise prices, two elementary conditions must be met simultaneously[27]:

- the function of demand for money must be at least relatively stable, which means in practice that money demand justified by needs of the (non-inflation) economic development must be at least approximately forecast,
- in practice the central bank must be able to control the development of money supply at the planned level (requirement of "controllability").

The theoretical basis of shaping the money supply as an intermediate target in order to control the inflation rate is the quantity theory of money. It was rediscovered in economics after a period of being forgotten in consequence of increased interest in Friedman's theory. As this theory states, an increase in prices results from the increased money supply, i.e. adopts the cause-effect dependence between these categories. The quantity theory demonstrates that inflation has a monetary character, so it is caused only by demand factors. *Ceteris paribus,* the inflation rate corresponds with the rate of increasing the quantity of money in economy. However, in practice the *ceteris paribus* assumption is not possible to be fulfilled. Also, the influence of other factors, apart from changes in monetary aggregates, should be considered. These include economic and non-economic factors affecting changes in the money supply, e.g. changes in the profitability of financial instruments, resulting from the variable expectations of entities or technical development of the banking system. Supply factors, such as technical progress, escalation of pay demands or changes in the prices of raw materials, are also important.

The monetary policy has no direct influence on these factors. However, their impact must be also taken into account when estimating the demand for money. If these factors are considered, it means that the increase in the real demand for money does not totally result from an increase in the real GDP.

With the aim of achieving a given level of inflation, the central bank must determine the aggregate intermediate target of a proper size. It is often specified with certain tolerance. The concept of the so-called price gap is the basis for estimating the required level of money supply. It uses the Fisher equation (MV = PY). The potential level of prices P^*, i.e. level of prices for the long-term macroeconomic balance, is derived from this equation by substituting Y with potential GDP and V with the estimated long-term velocity of money. Therefore, the potential level of prices P^* determines the balance between the demand for money and the supply of goods and services. In these conditions, additional money supply which is not reflected in the additional quantity of goods and services must cause an increase in prices if also the tendency to maintain the monetary resources remains unchanged. The deviation of the potential level of prices from the present level constitutes an inflation (positive) or deflation (negative) price gap. The change of this deviation suggests the acceleration or slow-down of inflation in the future period. The period of estimations may not be too long due to the variability of economic processes. In practice, the optimum level of the money supply is most frequently determined annually by specifying the GDP, the velocity of money and assuming the inflation level.

When determining the stability of the function of demand for money, the estimation of the velocity of money plays a considerable role. It is important due to the required precision in adopting the future range of the increase of monetary aggregate. If a specific value V is taken, one can use complicated econometric models that consider many elements. However, this parameter is most frequently determined on the basis of observations made in the past.

If one wants to control the quantity of money sufficiently, an operational target must be introduced. It must have a direct and considerable influence on the intermediate target. Another elementary issue is the simultaneous possibility of exact impact on it through monetary policy instruments. This influence must be also fast. Therefore, the operational target should be selected in such a way to react almost instantaneously to the bank's activities according to its intentions. Additionally, its changes should be easily measurable. This enables the confirmation that the undertaken acts or the bank's reaction to undesired deviations from the planned value are right without unnecessary and often socially-costly delay. The operational targets most frequently include: reserve money (monetary base) or short-term interest rates.

The key question for the money supply as an intermediate target is: can the central bank independently shape the money supply? Friedman proposed reforms of the banking system in such a way that monetary aggregates were exogenous. However, most economists are convinced that the money supply is an endogenous category. It is claimed that the values totally controlled by the central bank are only the instruments of the monetary policy. Therefore, the key issue is to get to know the influence of exogenous parameters on endogenous values. Even though various kinds of models are constructed for determining the money supply, the exact mechanism is still unknown. This results from its complexity and variability.

The strength of the relation between the quantity of money and inflation depends on the adopted measure of the monetary aggregate. With the aim of increasing the effectiveness of its activities, when using the quantity theory of money the central bank must construct this measure in such a way that it will reflect the reality it functions in. The development of financial instruments enforces the introduction of even wider aggregates. An additional difficulty lies in blurring the legibility of money categories. A rapid development and liberalisation of financial markets caused the appearance of money substitutes that combine the characteristics of various monetary aggregates. Both monetary market instruments and various certificates of deposit, commercial papers and shares of investment funds, especially in money market funds, have gained this character. The development of derivatives contributed to a much greater extent to further blurring of boundaries between individual measures of money and the money and capital market. With the use of derivatives, one can modify capital market instruments so that they gain the features of bank deposits[28].

The monitoring of ever wider monetary aggregates does not solve problems connected with the emergence of new money substitutes as: 1) a considerable part of both bank deposits and other financial instruments fulfils the saving and investment function rather than the transactional one; 2) the development of financial markets enabled the popularisation of derivative off balance sheet instruments that may function as instruments of the money or capital market. They are not included in balance sheets of banks or are only partly included but they may play the role of a bank deposit[29]. For this reason, the central bank should continuously adapt appropriate measures of money supply to the development of financial market instruments so that they can be a reliable source of information on the amount of money available in an economy.

An important criterion of selecting intermediate targets is the kind of shocks appearing in economy proposed by W. Pool[30]. The central bank uses the money supply to restore the initial condition when there are disturbances: 1) demand shock involving unexpected changes in the global demand; in such conditions, the decrease of the money supply to the original level is

appropriate; 2) negative supply shock involving, for example, unexpected increase in the prices of raw materials or crop failures in agriculture; the appearance of such a shock brings short-term conflict of final targets (inflation or income); this affects the choice of the proper set of intermediate targets; the control of money supply is maintained if low inflation is the goal of the central bank; the global demand will be limited, which reduces income, at the same time eliminating the pressure on prices; 3) disturbances in the money supply consist in changes on the side of its creation sources; the liquidation of these disturbances may take place both by adjusting the money supply and changing interest rates.

The proponents of the strategy based on the intermediate target, so also the money supply, emphasise its main advantage. It ties the hands of the central bank and does not allow for a free anti-cyclical policy which finally leads to inflation and the loss of credibility[31]. Critics, in turn, point at its numerous drawbacks. Mainstream economists enumerate its weaknesses: lack of strong correlation between the intermediate target and the inflation in a short-term, little possibility to react promptly to shocks in economy without the loss of credibility and considering only monetary information when analysing an increase in prices.

3. Strategy of Money Supply According to the Austrian School Theory

After the period of the dominance of the Keynesian approach that recommended the use of the monetary policy to stimulate the increase of production and employment, as a supplement to the fiscal policy, the monetarists brought back the opinion that the only target of the functioning of the central bank is the maintenance of the stable level of prices. This target was predominant when the monetary policy was most strongly based on the quantity theory of money, i.e. in the 1920s,the period before the Great Depression[32]. Friedman was the last important economist to recommend keeping inflation low by shaping the money supply by the central bank. In the contemporary world this is achieved with interest rates. He proposed that the monetary policy should be based on a strong principle. It is the principle of constant increase of the quantity of money[33]. It means that the money supply should increase at the same rate as long-term production capacities of the economy. According to Friedman, due to the actually frequent and considerable fluctuations as well as imperfect calculations of output changes, an increase in the money supply should stay at a constant level which is independent of changes to the domestic product in short terms. The adoption of this rule eliminates the main source of economic instability which involves discretionary monetary policy.

According to the Austrian school of economics, Friedman's proposal concerning the control of money supply is better than the present concept based on changes in interest rates. But both strategies are ways of achieving the realisation of the same superior target of the monetary policy, i.e. low inflation. This goal is criticised by the theory of the Austrian school that agrees with the mainstream theory that high inflation creates considerable economic and social costs[34]. However, representatives of the Austrian school hold that enforcement of a low level of price increase by the monetary policy is also harmful to the economy. The main result of this policy is the appearance of cyclical fluctuations with all negative consequences. "Contrary to the underconsumption theory, a stable price level is not the norm, and inflating money and credit in order to keep the 'price level' from falling can only lead to the disasters of the business cycle"[35].

An impulse initiating the growth phase, and along with it the whole business cycle, is first and foremost the expansionary monetary policy[36]. Currently, it is alleviated by the reductions of interest rates of the central bank, the most important of which is the referential rate. Thus, the beginning of the cycle is the same in the Austrian theory and in mainstream theories of economics. A lower rate of the central bank also leads to the reduction of commercial credit rates through the international market. According to the elementary law of economics, this results in increased demand for credits. Currently, increasing credits is not a great problem for the bank system. Firstly, this results from the application of fiat money in its policy; the quantity of this fiat money may be increased freely as it does not constitute the security of the commercial value with goods, as it was in the past, especially in the system of gold currency. Secondly, it results from the fact that the system of commercial banks is based on fractional reserves. This enables the creation of non-cash money, so practically free creation of money.

Central banks focus on the interest rate and resign from shaping the money supply, accepting the free adaptation of the demand to the market. According to the economists of the Austrian school, increase in the money supply is a key cause that finally leads to the crisis[37]. The greater an increase in the growth phase, the greater will be the collapse. However, the very increase in the quantity of money is not sufficient for the good explanation of phenomena occurring during individual stages of the cycle. Also the place where new money appears in economy is important. This is referred to as the *Cantillon effect*[38]. It means that the consequences of the emergence of new money depend on the place where it enters the economy. The effect will be different when an increase in the money supply occurs as investment credits and when these are consumer credits. Mainstream schools omit this problem in their analyses, assuming

that it is scattered proportionately. According to the Austrian school of economics, new money is not distributed equally throughout the economy.

Additional money changes the time structure of the production of goods intended for consumers. It means production stages arranged according to the order of the technological process of production and sale of the final good. This production process must last and must always be analysed in the time context. This brings huge consequences for the course of the business cycle. The analysis of changes in the production structure is based on E. von Böhm-Bawerk's theory of capital[39]. According to this theory, capital goods are heterogeneous contrary to mainstream economy. They include all goods used to produce consumption goods. They are used at each stage of production. Therefore, they are equally distanced from the final product. The quantity used is decisive for the length of the production structure. The capital-intensive structure is longer than the structure where fewer capital goods are used. The adoption of capital-consuming production methods means that production effects are greater and the time of producing consumption goods is longer. "That roundabout methods lead to greater results than direct methods is one of the most important and fundamental propositions in the whole theory of production"[40]. In the theory of capital, voluntary savings are the condition of increasing the quantity of capital goods[41]. In the free market conditions, people characterised by entrepreneurial spirit use it in such a way as to create the production structure that would correspond with the expectations of consumers.

The initial increase in credits is observed in all stages of the time structure of production. Yet it is not even but focused on some places in economy. Some credits are granted to consumers who spend them on the purchase of durable goods and non-durable goods. Credits intended for non-durable goods have a slight share in all new credits. It is a rare phenomenon that people incur huge credits to buy food or cinema tickets. Consumer's durable goods, in turn, are treated by the economists of the Austrian school as production goods[42]. The number of credits incurred on these goods may be considerable. New money goes to the market mainly as investment credits. The greatest increase is observed at the stages most distant from the final consumer goods. This results from the fact that according to the entire technical process of producing the final good, at first the raw material industry and the machinery industry must be expanded as they supply capital goods for successive stages. Goods produced at these stages will also be useful in the entire production process for the longest term. Increases in production and prices at individual stages are proportional to the degree of their distancing from the consumer. There are relative changes taking places and the importance of them is emphasised by the Austran school[43].

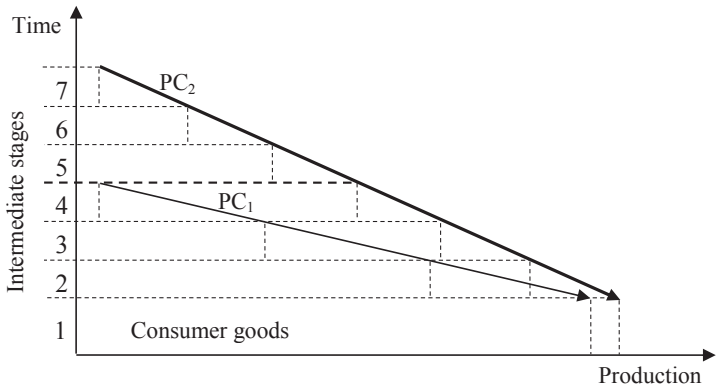


Fig. 1. Changes in the production structure and increase in the money supply

Source: own study based on Skousen (2007).

An increase in the money supply prolongs and expands the time structure of production. This is demonstrated in Figure 1. The prolongation of the structure is a technical process that relies on adding by enterprises new stages that did not exist earlier in the hitherto structure of consumer good production, e.g. modernisation of equipment and machinery, research on innovations. Then, the production curve PC_1 that measures the annual value of production at all its stages (from raw materials to final goods) becomes more vertical. Companies add new stages 5–7 to the existing ones 1–4. The expansion of the production structure involves an increase in the value of production at all stages occurring so far. The curve PC_1 moves to the right then. Both processes caused by an increase in the money supply create a new structure of production shown by the curve of production PC_2.

The prolongation of the production structure resulting from the discretionary monetary policy based on changes in interest rates is relatively dynamic (the rate depends on the values of new credits) and short-term. The consequences taking the form of crisis appear quite quickly and are usually abrupt. Friedman's rule of constant several-percent increases of money supply does not change the essence of the process. But it makes the prolongation of the structure slower. Therefore, the inevitable period of recession is more postponed and quite mild. An increase in the quantity of money compliant with the increase in production capacities should, according to monetarists, maintain prices at the same level. This would not cause a decrease in the real money supply and would eliminate crises. The problems related with this approach include: 1) lack of analysis of the sectors of economy in which new money appears; 2) failure to consider

time in the process of producing consumer goods; 3) using capital consisting of homogeneous capital goods; 4) using aggregated and average values, e.g. general level of prices.

New investments appear without voluntary savings, so without voluntary decrease of consumption as is the case with constant money supply[44]. The prolongation of the production time and financing with artificial money is not connected with a longer time of waiting for the future consumption. The consumers' waiting time has not changed. The created money „drives a wedge between savings and investments"[45].

When receiving income, consumer divides it according to the pattern used so far. The relation of consumption to savings does not change. Therefore, in the last stage of the growth phase, i.e. in the period of boom, the prices of these consumer goods begin to increase at a rate faster than the prices of original production factors, that is labour and land, and the prices of goods produced in stages further from consumption[46]. This arises from several simultaneous causes: 1) increased income of owners of land and labour; 2) periodic decrease of the production rate of new consumer goods; 3) increase in accounting profits of enterprises at the initial stages of production, part of which are spent on consumption. A relative increase in prices at stages closest to the consumer causes four key changes that end the growth phase of the business cycle[47]:

- relative increase of the profitability of companies from the production stages that are closest to consumption,
- greater profitability of employing staff, i.e. the Ricardo effect,
- increased interest rate,
- appearance of accounting losses of companies producing at initial stages.

These processes lead to decreased demand for production goods at the stages most distant from the consumer. The fall phase of the cycle begins. The economy observes the shortening (shallowing) and narrowing of the time structure of production. The shortening of the production structure involves the liquidation of some stages in the production of consumption goods. Its narrowing means reducing the production value at stages that have remained and form a new structure of production. The fall in production and prices at individual stages is proportional to the degree of their distancing from final consumption. This can be demonstrated on Figure 1 as flattening and relocating the production curve PC_2 to the left. In the simplified version, it returns to the location of curve PC_1.

The basic cause of crisis is artificial prolongation of the time structure of production in isolation from the time structure of consumption. The policy of the central bank induces entrepreneurs to mass investment errors[48]. Therefore, an important question arises: is there any

chance to avoid the crisis when the central bank follows Friedman's principle concerning an increase in the money supply? Economists from the Austrian school respond: in theory – yes, in practice – no. The condition for avoiding the collapse is for entrepreneurs to obtain extra time to finish the initiated investments[49]. This is only possible when consumers receiving income as owners of labour and land save the value equal to an increase in the money supply. This means that they voluntarily agree to wait for higher consumption. The probability of such behaviour of people is close to zero in practice. It is hard to believe that consumers having higher income will not spend more on purchasing final goods.

The inevitable crisis can only be postponed. "as the boom begins to peter out from an injection of credit expansion, the banks inject a further dose. (…) For only continual doses of new money on the credit market will keep the boom going and the new stages profitable. Furthermore, only ever increasing doses can step up the boom, can lower interest rates further, and expand the production structure, (…) But it is clear that prolonging the boom by ever larger doses of credit expansion will have only one result: to make the inevitably ensuing depression longer and more gruelling"[50]. Accelerated growth rate of money supply is necessary when the increase in the prices of production goods must exceed the increase in prices of consumption goods. This will guarantee further growth of demand in the initial stages of the production structure, leading to it being prolonged, so to a further rise in production and employment. However, the process cannot be continued forever[51]. Friedman's principle does not envisage increasing the growth rate of the quantity of money. Thus, the inevitable crisis resulting from the monetary policy followed on the basis of this principle will not be artificially delayed.

Compared to other mainstream economics schools, in the Austrian school there is a shortage of empirical studies related to the causes and development of the business cycle. This follows from the fact that the Austrian school economists are critical of the employment of mathematical methods in economic studies. In particular, they oppose the use of complex econometric models. They point out that a huge number of decisions made by people, the purpose of which is to meet some subjective goals, creates a substantial complexity and interdependency of phenomena. Their mathematical formalization usually involves the omission of so many decision-making processes that the created models have little relevance to the real economy.

Nevertheless, there are works in which the authors, in the spirit of the Austrian school, based on figures tried to verify hypotheses concerning the influence of money supply changes on the changes in the real and monetary sphere of the economy. There are numerous studies concerning the changes in the amount of money in the 1920s and the consequences of those changes, that is, the Great Depression. The main works include those by L. Robbins, F.C. Mills,

B.M. Anderson and M.N. Rothbard[52]. C.E. Wainhouse's doctoral thesis[53] dealt with a later period and was the first work to include a statistical verification of several hypotheses concerning the Austrian theory of the business cycle. Also today economists conduct empirical studies aimed at assessing whether the changes in money supply influence the category changes in the economy, in accordance with the principles of the Austrian business cycle theory. Such studies were published among others by W.N. Butos, A.M. Hughes, M. Skousen, H. Bjerkenes, H. Kiil, P. Anker-Nilssen, A. Jędruchniewicz, E.A. Fisher[54]. The obtained empirical results indicate that the changes in the amount of money allow a good explanation of cyclical fluctuations in the economy.

Conclusions

According to the proponents of the quantity theory of money, in spite of its drawbacks the strategy based on money supply as an intermediate target is the proper strategy for realising the inflation target. They point out that the relation between these categories is simple and legible for business entities and directly connected with the monetary policy implemented. Furthermore, the shaping of money supply does not allow for the central bank's free anti-cyclical policy. This advantage was emphasised by M. Friedman who proposed the rule of constant increase in the quantity of money in economy.

Economists of the Austrian school claim that none strategy, including that based on the money supply, aimed at ensuring the stability of prices leads to the stable economic development. It results in cyclical fluctuations in economy. The contemporary monetary policy is based on fiat and non-cash money. Increased money supply initially improves the economic situation: production, employment and prices rise. Yet the increased quantity of money does not result from the voluntary increase in savings. The production structure is artificially prolonged. The process does not take place in the consumption structure. People do not want to wait any longer to buy consumer goods that are in production. If the time structure of production is not adjusted to consumption, this leads to the economic breakdown. Friedman's principle does not change this as it concentrates on the general increase in the money supply. It does not analyse places where new money appears at the beginning.

Notes

[1] McCandless, Weber (1995); Belka (1996).
[2] Brzoza-Brzezina et. al (2002).
[3] Fisher (1911).
[4] Friedman (1956).
[5] Friedman (1957).
[6] Belka (1986).
[7] Kwiatkowski (2009).
[8] Kowalski (1990).
[9] Friedman, Schwarz (1963).
[10] Sargent, Wallace (1975).
[11] Garbicz (2000).
[12] Lucas (1981).
[13] Barro (1995).
[14] Polański (1998).
[15] Przybylska-Kapuścińska (2003); Wojtyna (1998).
[16] Mankiw, Romer (1991).
[17] Keynes (2003).
[18] Wojtyna (2000), p. 148.
[19] Calvo (1983).
[20] Romer (1993).
[21] Snowdon, Vane, Wynarczyk (2002).
[22] Wojtyna (2000).
[23] Błaszczyk (2010).
[24] Szpunar (2000).
[25] Friedman, Friedman (2009), p. 263.
[26] Jędruchniewicz (2009).
[27] Polański (1998).
[28] Sławiński (1997).
[29] Szpunar (2000).
[30] Pool (1970).
[31] Kaźmierczak (1998).
[32] Hawtrey (1932).
[33] Friedman (1969).
[34] Ciżkowicz, Rzońca (2009).
[35] Rothbard (2000), pp. 46–47.
[36] Mises (2007).
[37] Hülsmann (2011); Machaj (2012).
[38] Cantillon (1938); Rothbard (2006).
[39] Böhm-Bawerk (1891).
[40] Ibidem, p. 20.
[41] Ravier (2011).
[42] Skousen (2007).
[43] Garrison (2001).
[44] Anderson (2009).

[45] Garrison (1986), p. 440.

[46] Hayek (1967).

[47] Huerta de Soto (2009).

[48] Zahringer (2012).

[49] Skousen (2007).

[50] Rothbard (2008), pp. 412–413.

[51] Huerta de Soto (2009).

[52] Robbins (1934); Mills (1936); Anderson (1979); Rothbard (2000).

[53] Wainhouse (1982).

[54] Butos (1993); Hughes (1997); Skousen (2007); Bjerkenes, Kiil, Anker-Nilssen (2010); Jędruchniewicz (2012, 2013); Fisher (2013).

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