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CENTRAL BANK BEHAVIOR IN MODERN MONETARY THEORY

Abstract

The gnosiological base of modern monetary theories is revealed on the basis of the maintenance analysis and rational expectations. The author confirms that praciologal conclusions of time inconsistency model have not found wide approval at monetary policy theoretical and fundamental levels. It is proved that the further development of monetary theories depends on optimum institutional mechanisms of trust to the central banks and flexibility of their reactions to macroeconomic shocks maintenance. On its basis the adaptability of models which are methodologicalally connected with a new macroeconomic paradigm to monetary policy institutional and functional requirements is substantiated.

Key words:

Central banks, discrete decision, monetary policy, monetary rule, time inconsistency, transparency.

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Development of monetary policy in XX century is characterized by a number of paradigmatic crises. Subsequent to the problem of macroeconomic management influenced by Keynesian and neo-Keynesian views on the problem of macroeconomic regulation, the conclusions of classical quantitative theory on the character of monetary policy, its practicability and gnoseological fundamentals were radically reconsidered. Orientation to domination of regulating sources in organization of monetary policy considered to be a part of instruments for anti-cyclical leveling and fine tuning towards inflationary rate accepted for a target rate of unemployment was essentially reconsidered and such foundation of Keynesian monetary policy as Phillips' curve was drastically revised within the monetary premise. M. Friedman and E. Felps formulated the so-called monetary approach to the Phillips' curve proving its realism in the short-time period alone and neutrality of the monetary policy in long-term period. Apparently, it was a gnoseologic return to traditional quantitative theory with an adequate re-orientation of central banks towards the problem of combat against inflation through control over monetary stock. Nevertheless, monetarism as the leading macroeconomic paradigm and theory on which the functional framework of monetary policy is based, was inferior to the concept of rational expectations.

As far as the analysis of the concept of monetary theory is concerned, single sporadic references to the works of famous representatives exist in specialized literature, but they lack manifestation of general methodological, functional and analytical preconditions for the system framework designed for central banks' activity on the ground of neoclassical inversion of rational expectations. Moreover, the very monetary theories built on the basis of this methodological approach were significantly modified during the last 10–15 years. This paper analyses transformations of neoclassical monetary theories in perspective of functionality enhancement while implementation and substantiation of concrete macroeconomic solutions of the central banks and increasing significance of institutional factor in their gnosiologic etymology and practicability.

**General theoretical background
of the modern monetary theories within
the macroeconomic paradigm
of neo-classic authors**

Monetary macroeconomic version was refuted within the theory of rational expectations in late 1970's that predestined the development of modern monetary theory and, in accordance with the findings, reorientation of central banks' activity. Thus, in 1973 R. Lucas proved economic agents to form rational expectations (i. e. those formed with respect to the forecast of the future situation and

behavior of other economic players) rather than adaptive ones (i.e. based on previous experience). Therefore, it would be not reasonable enough to consider prices and wages to be non-flexible even in the short-term perspective [4, C. 326–334]. Hence there are a number of regularities of principal importance for monetary policy.

First of all, the individuals more often are not able to distinguish between the variance of absolute and relative price rate. Thus, economic agents will not always differentiate between the variance of absolute and relative price rate in full in countries where considerable swings of cumulative demand and coherent fluctuations of the price rate take place. As a result, the possibilities to stimulate production by means of expansive measures become more restrained. With respect to the countries having stable cumulative demand and its correlative stable demand, the change of market price for a certain good would be interpreted by economic agent as relative prices variance since this would enable him to increase production and labor demand and till the labor markets are unaware of difference between nominal wages, will have a certain recovery in production and rise of employment. Hence, due to insufficient information coverage on the dynamics of future prices, a possibility to choose between inflation and unemployment appears in the short-time period. Although, Lucas denied the feasibility of a high-cost adjustment to new equilibrium conditions by variance in elasticity of prices and wages, while L. Boll, Gr. Mankiw and D. Romer argue the possibility to increase production and employment by monetary stimulation in the short-time period as it is fairly appropriate to countries with low inflation since in this case economic agents are less ready to express money supply in the future. Due to this fact, main expectations regarding future monetary policy secure less flexibility of prices and wages as compared to the case when such expectations are negative [5; C. 1–65].

Secondly, within the assumption on rational expectations and flexibility of prices and wages along with non-alternative monetary policy aimed at rise of inflation intended for growth of employment, the preconditions for macroeconomic measures became totally neutral with respect to the macroeconomic path, are created. Thus, while determining the prices and wages, economic agents take the anticipated inflation into consideration, therefore following the announced actions of central bank on nominal money supply. In case the money supply is not allowed for, involving rise in prices, the labor supply would also not be increased. As a consequence, when the monetary policy is not systematical and not foreseeable, the preconditions for increasing of production and employment in the short-time period are created, which would not lead to price rise in the long-time period though. Formally, Lucas' production function would be the following:

$$y = \pi - \pi^e, \quad (1)$$

In which y is the GDP, π and π^e are the factual and anticipated inflation respectfully.

Maintaining the case in favor of it is only the unforeseen monetary policy that cannot be neutral, famous Cambridge neoclassical scientist R. Barro studied the interrelation of GDP with alternative monetary supply indicators. The first indicator demonstrated actual dynamics of money supply on the part of Federal Reserve System while the second one was estimated on the basis of expert decisions on the System's level anticipated in economy firstly, adjusted to the way FRS follows the announced rate, secondly with an allowance for the expected rate. As a result, actual growth of GDP is given by the variance between the actual rate of money supply and the anticipated one [6, C. 137–169]. Thus, it is always invitingly to lead active monetary policy oriented on settlement of unemployment problem. Accordingly, St. Fischer emphasized: «the existence of alternative between inflation and unemployment in the short-time period is a central dilemma of monetary policy developers in day-to-day decision-making.

Theory of inflationary deviation and dynamic inconsistency: source links of the analysis of modern monetary processes

In chronological sense the long-term period, i.e. in which the monetary policy is neutral, consists of the short-time periods in which the policy foreseen by economic agents is neutral only. Taking this point into consideration, the behavior of central banks in different world countries during 60–70's of XX century aimed at provocation of unanticipated inflation and settling of the problems of unemployment and GDP growth which is in excess of the natural one, led to essential rise of price background and recovery of the world inflationary tendencies, the monetary authorities generally lost explicit time frames of macroeconomic solutions. The phenomenon of inflationary rates increase in all over the world and in developed countries primarily was named as inflationary deviation of the macroeconomic policy. For instance, Fischer mentions: «In late 70's the inflationary rates in United States as well as in France, Great Britain, Italy, Canada were higher than any other assumptive rates which could be accounted by analysis of advantages and disadvantages of inflation. Economists appropriately called these phenomena as inflationary deviation of economic policy». [7, C. 29]. Fischer points out three determinants of inflationary deviation: seignorage, interest rate targeting and time inconsistency of monetary policy; while well-known American scientist A. Zuccerman also puts in the problem of the fixed currency rates maintenance within the Bretonwood currency pattern. The very theory of time inconsistency in monetary policy came about as crucial breakthrough or else gnociologic vector of all the monetary theory.

The very theory of time inconsistency in monetary policy occurred to be the crucial breakthrough otherwise gnociologic vector of the whole modern monetary theory.

The studies of F. Kydland and E. Prescott [9, C. 473–492] as well as R. Barro and D. Gordon were fundamental for the problem of inconsistency. The essence of the mentioned problem lies in the following: firstly, economic agents keep up with the intentions of central bank on the future inflation and conclude the contracts accordingly, orienting at the correspondence of the announced inflation to the anticipated one, therefore wages and employment will be balanced, representing the long-term timeframe of the natural level of capacity utilization; secondly, they realize the possibility of central bank to provoke unanticipated inflation since it can affect the increase in production and employment in the short-term period, thirdly, negative interpretation of the central bank's guarantees on future inflation allow them to take into account the uncreated future inflation, so to devalue the rate guaranteed by bank; fourthly, due to incredibility of monetary policy when its developers assure in a certain rate of inflation and then increase it to resolve the problem of unemployment, equilibrium inflationary rates become higher as compared to the possible ones stipulated by the credibility of central bank and consistency of its policy in the long-term period with the policy in the short-term period. Furthermore, monetary authorities are aware of being followed as well, so they will assure the parts of the labor negotiations in following of the strategy of announced inflation until the parties believe. Merely after the agreements are made on the basis of credibility, the motives to break the guarantees come out. With regard of inability of central bank to affect the formed anticipations, the lack for credibility of policy will constantly make the prices rise. As a result – the rate of inflation will be higher than that representing the possible marginal losses from unanticipated inflation balanced by marginal benefits from diminishment of unemployment.

Phenomenon of time inconsistency in monetary policy has a significant impact on the process of search for the ways to combat against it. The suggested variants of the combat were related to significant modernization of the central bank's behavior and requirements on its institutional organization. On one hand, the central bank that is to a certain extend independent, is considered to be unable to implement the policy due to the political pressure on its actions aimed at leveling of business cycle. Thus, it necessitates additional instruments to secure anti-inflationary policy, implementation of more severe restrictions on its possibilities to create an unexpected inflation in particular. On the other hand, the problem of trust in monetary policy is generated by the market agents so within the monetary authorities execution, a selection of appropriate institutional instruments would settle it. Explicitly, for such policy became trustworthy, monetary authorities should act on the basis of certain rules making it impossible for central bank to make discrete steps, whatever they would be provoked by.

It is worthy noting that nobody else but M. Friedman initiated discussion on the problem of discrete policy effectiveness and its better alternative by way of following of a certain empirical rule by the central bank. He was the first to observe the fact that empirical measures first of all are preconditioned by intentions of monetary authorities to set the problem of business cycle by means of change

in money supply which is symmetrical to market fluctuations and the very discrete steps are ineffective because of the lags problem [11].

As regards the theory of time inconsistency of monetary policy, the suggested approach to settle the problem of attractiveness to provoke unanticipated inflation is different from that by Friedman and is based on a number of other assumptions. Inflationary deviation, which was mentioned before, is a result of variance between *ex ante* and *ex post* inflations and economic agents have the full information covering attraction to follow the deviation-oriented policy for monetary authorities. Accordingly, following Kidland's and Prescott's logics, the ability of central bank to diverge from the announced intentions lies in capability of monetary policy to function in discrete status. Hence, orientation towards its behavior will enable to solve the problem of dynamic inconsistency seeing that a requirement to implement the policy on the basis of certain regulations will mean unfeasibility to act discrete for banks. Moreover, economic agents will understand this and will also be aware of its consequence – variance between *ex ante* and *ex post* inflation that would allow to conclude contracts covering the wages with the rate which would represent the long-time balance in real under partial employment. Main requirement for this monetary rule involves (preferable) simplicity and explicitness implying impossibility for any macroeconomic payer not to follow it.

With reference to Barro's and Gordon's study, the famous scientists demonstrated the non-existence of alternative between inflation and unemployment in the short-time period since economic agents make absolutely rational expectations and realize the possible behavior of macroeconomic authorities within the pattern of economic agents' unawareness of it. That is to say, a possibility of central bank to provoke unexpected inflation is not taken into consideration. Nevertheless, the long-time natural balance of employment together with GDP within such outline does not mean alternativeless for balance paths of inflation. First of all, exceedingly high inflation and money supply are defined according to the preferences of central bank in unemployment rather than inflation in the damage function (equality (3)). If the value of inflation is higher than the value of unemployment, then apparently the balance of inflation will be lower as compared to the pattern when the value coefficient of unemployment is higher than correspondent inflation. Therefore, these are the preferences of central bank that predestine the nature of inflationary paths. Apparently, variability of its behavior is allowed similar to any combination of these coefficients will be considered to be optimal in the context of countries. Secondly, the rate of inflation will depend on the character of the monetary policy implemented as well. If it is regulation-based, the balance of inflation will be lower than the balance of inflation within the discrete pattern. Taking this point into account, the balance achieved by regulation-oriented policy will regularly be superior to discrete balance since both in first and in second cases the coefficient of unemployment would be normal while inflationary coefficient would be higher than discrete policy. This can be substantiated by minimization of loss function of central banks

allowing for the restrictions imposed by Phillips' curve towards the monetary policy.

For instance, let the curve be expressed by equation:

$$u = u^n - \alpha(\pi - \pi^e), \quad (2)$$

where u is unemployment rate, u^n is natural rate of unemployment, π is inflation rate and π^e is anticipated rate of inflation.

Loss function of central bank is illustrated by the following equation:

$$L(u, \pi) = u + \gamma \pi^2, \quad (3)$$

where γ is a coefficient determining preferences in inflation as compared to unemployment.

In case of the regulation-based policy, anticipated inflation will be equal to factual one ($\pi - \pi^e$), subsequently. Due to this fact the unemployment rate will not diverge from its natural rate. Provided the latter condition is proved to be true, there will be no sense in maintaining of a certain rate of inflation so the central bank will announce the policy of orientation towards the zero inflation. Given the case of discrete policy when anticipated inflation is not equal to actual, economic agents form anticipated inflation and central bank is not able to control it. As a result, inflationary anticipations of economic agents are considered to be exogenous. Once central bank is oriented towards the optimal policy, the preferred rate of inflation will practically come to economic agents' inflationary rate yet in this case it will not be able to affect the increase in natural rate of unemployment. Having reduction of unemployment for the object, central bank will deviate from the announced inflation and under any indices of anticipated inflation will carry out the policy, which would secure minimization of its loss function.

The substitution of equation (2) into the equation (3) will give us the following:

$$L(u, \pi) = u^n - \alpha(\pi - \pi^e) + \gamma \pi^2. \quad (4)$$

To determine the index of inflation ensuring minimization of the above function, we should differentiate it through inflationary index so the index of inflation will be represented by the following equation:

$$\pi = \alpha / 2\gamma. \quad (5)$$

Equation (5) will demonstrate the rate of inflation within Barro's and Gordon's model which is optimal with regard to the loss function of central bank. Naturally, this inflationary rate will be higher than that formed by regulation-based monetary policy. If such policy is true within equation ($\pi = \pi^e = 0$) then the inflationary rate estimated by equation (5) will perpetually be higher since it will result in positive number.

Starting from the fact that balance in regulation-based monetary policy is better than discrete balance, Barro and Gordon pointed out the implementational aspect of this problem. The efficiency and advantages of regulation-based policy

is founded on the assumption concerning economic agents giving no credence to the intentions of central bank. To be precise, the equality between actual and anticipated inflations is a precondition for the discrete balance was less effective. As a consequence, factor of monetary policy credibility turns out to be its independent element therefore requiring corresponding actions from the central bank.

To be exact, in this perspective the above economists carried on the positive analysis of the policy and status of central bank introducing the principle of reputation of monetary decisions [12, C. 101–120]. The tendency of this analysis is specified by consideration of the central bank's behavior within inter-time selection of losses and gains from inflation. Thus, exceedingly high money supply in present (unless it was anticipated) causes a certain recovery of GDP. However, one can observe negative outcomes of this in the future period, to be precise – an inflationary deviation occurs. Therefore, monetary authorities should keep the balance of short-time benefits emerging from generation of unanticipated inflation with losses related to growth of inflation generated by private sector in the future. The problem of central banks' reputation in this case will be examined as regards to the occurrence the better it is (i.e. it represents less inclination of central bank to provoke unanticipated inflation as a result of discrete steps), to the greater extend economic agents will be inclined to form their anticipations according to the announced intentions of central banks. Moreover, even if monetary authorities provoke unanticipated inflation, their established reputation will serve as the factor reducing welfare losses caused by inflationary deviation of the policy since economic agents will less react the inclination of monetary authorities to behave inconsistent and so will less devaluate the announced intentions on inflation when determining equilibrium prices. That is to say, while the first models of dynamic inconsistency of the monetary policy established a higher inflationary rate in consequence of distrust of economic agents about the monetary authorities, the variability of this higher inflationary rate in the future subjecting to its reputation established in the previous period is proved within reputation approach to the central bank's behavior. As long as higher reputation cannot be established except by performance in the course of dynamic consistency secured by orientation of monetary policy towards a certain rule, accordingly the latter is an optimal alternative in favor of prevention of negative outcomes caused by discrete behavior of central banks.

Since representation of positivistic interpretation of monetary authorities' behavior within the models methodologically supported by the theory of dynamic inconsistency and based on theory of role-play, discussions around the «regulation-discreteness» problem happen to be prevailing in the scientific literature in issues of political economy in the monetary policy. Partly recognizing the problem of the short-time Phillips' curve most research works started orienting at search of optimal regulation for monetary policy. In case in question optimality means the variant of policy ensuring maximization of society's welfare based on rates of unemployment, inflation and inflationary preferences towards unem-

ployment (or vice versa: unemployment towards inflation) being arguments for the welfare function.

Although, rigid regulations of the policy however they prevent deviation of inflation within theoretical interpretations of the monetary decisions and their outcomes were criticized rigorously from the position of central banks functioning in practice and position of monetary theory. For instance, Ed. Dolan insists: «Members of FRS' in effect are aware of the existence of negative moments related to implementation of «free» monetary policy but nevertheless consider strict regulations related to the circulation of money to be more risky. Figuratively speaking, their situation can be compared with behavior of airliner commander who realizes all the advantages of ordinary flight yet takes command over the aircraft in case of necessity of unexpected maneuvering» [13, C. 400]. As regards theoretical interpretation of the regulation problem insisted by developers of theory time inconsistency, then for instance British economist P. Westaway cast doubt on adequacy of assumptions about such inconsistency within its negative impact on the macroeconomic situation in general [14, C. 145–152). As he believes, if economy experiences a considerable (pressing) shift of a positive macroeconomic variable then optimal *ex ante* rule is actually inferior to discreteness. That is to say substantial structural economic transformations such as transformation of factors defining changes in productivity of labor will make the established regulations inefficient and inadequate since the outcoming information for optimal rule estimation was noticeably smaller than *ex post* one. Therefore, discrete policy can solve the problem of monetary rate adjustment to new structural environment. As a result, prevention of potential losses due to inadequacy of *ex ante* rule will keep the balance of benefits from following of legibly predetermined rule by central bank.

Subsequent researches on the problem of monetary policy and status of central bank were made in the following trends:

- Theoretical search for the possibilities to liberalize the optimal regulations also calling forth the optimal variance;
- Introduction of institutional factors into macroeconomic coordinates, which would allow solving the problems of central banks' monetary behavior in accordance with legitimate restrictions that at the same time are modeled as optimal or their derivatives;
- Exploring of additional factors defining central bank's behavior within interpretation of its policy by markets, which ensure strengthening of credibility in anticipated inflationary rates due to increase of monetary decisions transparency.

Search for «optimal» deviation from optimal regulations and attempt to increase functionality of classical scholars' monetary theories

Unfeasibility of absolute transformation of the monetary policy compliant with the requirements of authors of the theory of time inconsistency set the problem of liberalization of its framework, initially with the aim to increase its functionality. Thus, Ali. Nowaihi and P. Lewine suggested theoretical approach in reference to which they put forward «penalty» for monetary authorities through increasing of equilibrium prices by private sector resulting in anticipation of central bank's behavior as discrete one is differentiated [15, C. 355–380]. Hence, should central bank be inclined to carry out the policy oriented towards maintaining of high reputation, accordingly – regulation-based policy, then inessential deviations from this regulation will not cause any negative impact as in case with implementation of discrete policy. Such state of affairs is conditioned by the fact that in case of regulation-approximated policy causing no shifts of macroeconomic values when responding to either one or another shock such «penalty» intended for monetary authorities would not be profitable for private sector. As a result, the period of «penalty» i.e. the period of increase of equilibrium prices and therefore deviation of inflation will be decreasing in accordance with the extent of credibility in central bank's behavior and policy.

Nevertheless, as the practice shows, any rules of monetary policy will be infringed regardless of their efficiency in whichever time frames. For example, the practice of analysis of behavior encompasses such phenomenon as «Гудхарт's Law» implying infringement of any monetary rules in case of necessity. For this reason, the problem of search for alternative ways to solve the problem of dynamic inconsistency towards their relevancy with the real aspects of institutional arrangement of macroeconomic decisions emerges.

The K. Rogoff's model can be found among the first models involving resolving of this problem. It is founded on the principle that no other central banker, except the one having stronger inflationary averse than that the society has in general can be empowered to carry out the monetary policy [16, C. 1169–1190] (that's why the Rogoff's model is called delegation approach to the monetary policy). The main point of this theoretical approach can be brought to the following: firstly, orientation of central bank towards solving of inflationary problem only causes increase of GDP variation. Thus, orientation of monetary policy towards the combat with inflation only will probably be infeasible for the society; secondly, active actions lead to inflationary deviation as a result of distrust in monetary policy along with destabilization of cycling processes; thirdly, this dilemma can be only solved by the variant when the problem of inflationary deviation and the problem of decline in society's welfare because of implementation of non-flexible and severe anti-inflationary policy would be solved immediately and central bank would have a high extent of credibility irrespective of its possible

anti-cyclical responds on macroeconomic shocks. Accordingly, such variant can be achieved by appointment of conservative central banker, so the level of preferences in low inflation in comparison with the preferences in high employment would be higher as compared to the overall society.

Owing to this the overall society benefits since conservative central banker carries out steady policy within ordinary environment and is not inclined to take unanticipated discrete actions to raise the actual rates of GDP and employment over their natural points. Moreover, his flexible responds on macroeconomic shocks allow reducing of monetary rate for temporal settling of unemployment problem so it is possible to keep on steady policy.

The probability of this scenario proved by Rogoff was based on assumption that, within minimization of standard quadratic loss function in society, production for the period of t described by simple Lucas' function (equation (1)) will result in: growth of natural GDP will be equal to zero; anticipated inflation will be defined as product of anticipated rise of GDP multiplied by weighting coefficient of superiority of production over inflation in society (λ) and variation of inflation will always be higher than variation of GDP since:

$$\text{Var}(\pi) = [\lambda / (1 + \lambda)]^2 \sigma_\epsilon^2, \quad (6)$$

$$\text{Var}(y) = [1 / (1 + \lambda)]^2 \sigma_\epsilon^2, \quad (7)$$

where is σ_ϵ^2 a root-mean-square deviation of the index ϵ_t , permitting to estimate a GDP shock.

Furthermore, the λ index directly affects estimation of index of inflationary variance and production variance. On the assumption of λ^c – weighting coefficient of superiority of production over inflation in central banker's preferences – is lower than λ , the index (6) will be lower with reference to the alternative situation as well, while index (7) would be slightly higher. However, diminishing of inflationary variance by appointment of a person with low inflationary preferences as central banker will not amplify variation of production to a large extent in comparison with case of monetary policy strongly oriented at regulation. As a consequence, society will normally benefit.

Rogoff's model demonstrates a number of principle theoretical deductions. First of all, appointment of a conservative central banker will not decline the problem of alternativeness between inflation and its flexibility yet will precondition the choice between reduction of average inflation and increase of GDP variance. Secondly, Rogoff's model clears the way for new understanding of central banks' independence. Subsequently, once central bank implements regulation-based monetary policy the monetary authorities happen to be dependent: it is impossible to choose between the monetary objects since the rule is already a predetermined object. In the given case the central bank actually obtains independence and the prospect is to define the monetary objects by alone. For its turn, it facilitates implementation of active stabilization policy restricted only by low rates of inflation. Thirdly, relativity of criteria for implementation of restriction measures, meant for stabilization of inflationary increase, and expan-

sion ones – intended for stabilization of production on whichever time intervals precondition transfiguration of the character of concrete central bank's independence inducing anti-inflation into the relative category as no one knows what may cause either strict measures or less strict measures on the part of central bank. Thus, the extent of the very independence within the combat against production shocks is actually calibrated in the practical course of monetary measures implementation within the political environment.

A broader inference can be derived out of the Rogoff's model on the problem of central banks' independency. In fact, within this case it is not constructed by political system (or civil society) *a priori* to the problem of inflation. That is to say it isn't completely based on intellectual representation of the necessity to strive against it, positivistic interpretation of such a representation, deductions on correspondence of such independence with the price dynamics. It is raised on communications with the parliament government, political groups etc., bringing about evolutional estimation of its optimal rate, character of its implementation for combat against inflation and the very inflationary policy develops into the object for dynamic compromise, although limited by the preferences of central bank management.

C. Waller demonstrates the relative character of empirical behavior of central bank that is optimal in reference to the Rogoff's modal and causality of monetary decisions that are made within this pattern. Although, the latter has expanded the framework of analysis of macroeconomic decisions in implementation of optimal, as maintained by the Rogoff's model, monetary policy. Waller made the basic assumption on two-sectoral economy consisting of classical and non-classical sectors [17, C. 1006–1012]. At the same time, wages and salary in the first sector while in the second they are not (the movement of goods between sectors is considered to be flexible while movement of labor between sectors is considered to be non-existent). Accordingly, the respond of each different sector to monetary decisions will be different as well; decisions analyzed in respect to appointment of conservative central banker (Rogoff's model), in particular. Naturally, subjecting to flexibility of prices and wages the monetary decisions will be neutral while variability of production under any shocks is marginal: employment rate will be balanced due to flexibility of prices on goods and factors towards new equilibrium conditions. Although, should the sectors be different in the nature of flexibility of prices and wages, then different reactions on monetary decisions or any macroeconomic shocks will be natural as well, regardless the matter that the preferences in both sectors as to inflation and unemployment would be the same. In non-classical sector variation of production along with employment losses per unit of disinflation would be higher while in classical sector – lower as well as employment losses per unit of disinflation – lower. This results in emergence of new preconditions for formulation of different requirements on conservatism of appointive central banker in every sector. It would be preferentially for non-classical sector if the head of the monetary authorities had negligible preferences on inflation towards unemployment and more conservative developer of monetary policy would be appropriate for classical sector since under

the discrete policy losses in the first sector would be lower as compared to the possible losses from minimization of inflationary variation due to lack of stimuli for discreteness. Furthermore, Waller assumes that if there were two parties representing interests of certain sector, the appointment of relatively conservative central banker would be a fortuity or else a consequence of certain favor, politically- and market-determined (the so-called partisanism). Immanence of partisanism before the political choice makes anti-inflationary policy quite relative and does not settle the problem of discreteness completely.

American scientist S. Lohmann makes some other emphasizes on the problem of possible rate of discreteness. She underlines that optimal policy according to Rogoff's model comes upon dilemma of credibility versus flexibility. Moreover, she draws the conclusion on the necessity to combine both patterns of central banks' behavior [18, C. 273–286]. Balanced would be the policy implemented with favor to positive regulation except for certain exclusions. Eventually, when a rather stable development of economy takes place in certain time intervals, the central bank should implement the policy, most regulation-approximated or no less than having more conservative approach to inflation than rest of the society. Although, when macroeconomic shocks are insignificant while expenditures of monetary policy oriented at inflationary minimization are considerable (within Waken Law concerning disinflationary losses), the central bank should be controlled by the government to settle the problem of employment. Evidently, the independence of monetary authorities will be restricted in this way by pragmatic orientation towards stabilization of production and employment whereupon it will be adequately guaranteed for trustworthy policy. Therefore, Lohmann suggested implementation of intervals representing supply shocks value involving control of central bank. It is the author's opinion that width of such intervals is supposed to depend on losses from inflationary rise resulted from interference of monetary authorities into the monetary process.

Nevertheless, search for the variants to solve the problem of credibility into the monetary policy at concurrent reservation of its flexibility in the behaviorist tendency relates the possible variants of monetary decisions. After all there is no way to foresee the ex post macroeconomic variables and the way they would correlate with anticipated dynamics within monetary decisions effective according to the Barro-Gordon's reputation model, models by Nowaighi and Lewan's, Rogoff or Lohmann etc. Moreover, the presented studies are not concentrated on the search for institutional parameters meant for the system framework of the central bank enabling to solve the dilemma of «credibility versus flexibility» at the level of legitimate organizational forms.

Reinforcement of the institutional aspect of neo-classical monetary theories

Redirection of studies on the problem of monetary autonomy towards the institutional trend is concerned with the so-called contractual approach of C. Walsh. Once a high independency of central bank or its orientation towards certain empirical rule is needed to solve the problem of dynamic inconsistency and inflationary deviation of the policy, then slackening of negative effects of increase of GDP variance, determined by stabilization of inflationary rate alone could be achieved through impediment of certain restrictions on preferences in inflation versus unemployment. Accordingly, Walsh proposed segmentation of macroeconomic authorities according to the principle «principal agent». For example, the government will appear as a principal, i. e. a part that prefers certain inflationary rate accepted for society with regard to the alternativeness between unemployment and inflation and central bank – as an agent implementing the policy stipulated by the agreement. Institutional innovation of the given model as compared to the previous ones is in ability of principal and agent to conclude legal contracts in which the favorable inflationary rate would be explicitly specified otherwise another variable, being the official commitment of central bank, is predetermined [19, C. 150–167]. In addition, the autonomy of monetary decisions is absolutely guaranteed since the contract appears to be a kind of government's indulgence on the monopole mandate of central bank about trends and instruments to accomplish stipulated rate of contract variable. Consecutively, this solves the problem of government interference or other political pressure relating to the central bank on the formal, and accordingly, institutional level. Other institutional aspect of the given model is that conclusion of a contract implies liability for its performance. In order to motivate the monetary policy developers to attain their objectives, Wash stipulated the necessity to stimulate or penalize the central bankers. They should be identified as transfer that is linearly related to the contract index.

Thus, consistent with the given model, it is possible to accomplish the optimal policy, which would estimate the preferences on inflation under corresponding stimulation to prevent avoidance or deviation of such policy. The specific feature of such model is that it does not allow deviation from the anticipated and natural rate of production from zero while in relation to the classical production function y Lucas the latter represents deviation of actual inflation from anticipated one and its natural increase is equal to zero. Accordingly, the loss function is modified in the following way:

$$L_t = 1/2 \{ \pi_t^2 + \lambda (y_t - y^*)^2 \}, \quad (8)$$

Where y^* is natural level of production which is higher than 0 while all the other parameters are the same as in previous cases.

In a similar way, mathematical presentation of Lucas function and function of rational inflationary anticipations remains to be actual.

The optimal policy in accordance with the Walsh' model will be carried out only if central bank maximizes the following function:

$$U_t = t - L_t, \quad (9)$$

Where t is transfer to agent for the effected policy and L_t – is an equation (8).

Principal's inclination to reserve identity of $t - L_t > / = U_0$ may appear as additional restriction for optimization of function (9). As for parameter representing transfer to the central banker, it is estimated according to the following formula:

$$t(\pi) = t_0 - \lambda y^* \pi, \quad (10)$$

where parameter λy^* means inflationary variation of the policy. Value of this parameter directly affects the decrease in transfer to the central banker therefore inclining him to prevent unanticipated inflation.

T. Persson and G. Tabellini suggested more radical approach to the problem of central banks' independence within contractual method that is to establish explicit nominal anchors for the monetary policy [20, C. 53–89]. The Walsh's model (actually as well as other models) is not based on immediate establishment of explicit anchors; target inflation is meant to be achieved through achievement of intermediary objectives (for instance, through targeting of money supply, popularized since predominance of monetarism). This is a peculiar tribute to the actual practice in carrying out of the monetary in accordance with three-level hierarchy of its objectives (operational, intermediate, final (strategic)). However, it is the possibility to send signals to the markets and to carry out the policy based on achievement of implicit (intermediary) objectives that can cause deviation of actual decisions from optimal ones, resulting in a certain problem for the principal. On the other hand, implicit objectives cause a positive problem for an agent as well, viz: the markets may inadequately interpret the signal sent by central bank or achievement of implicit objectives will not always guarantee effective settlement of the problem of inflation that will have a negative impact on credibility to monetary authorities, therefore causing an inflationary shift.

The above problems can also arise in another perspective within the contract model in general. In case positive information is not verified, thus not specified by a contract, while achievement of implicit objective appearing in the contract causes no preferable result, the efficiency of contract approach happen to be hypothetically doubtful. It is the Persson's and Tabellini's opinion that it can be resolved by means of switch to explicit nominal objectives, which would immediately solve the problem of relation between inflationary situation and dynamics of monetary objective. In fact, these economists can be referred to the first apologists who directly targeted inflation, which became predominant among the tendencies of central banks development throughout the recent decade.

The similar approach was suggested by Sweden economist L. Svensson who presupposed that central bank and society might differ in loss function while the preferred rate of inflation for monetary authorities might be lower than that of the society. Modification of loss function by Swenson brings about increase of optimal target inflationary rate above zero and higher than that in the Persson's and Tabellini's model. As regards the inflationary objective of the central bank, it should be lower than the objective chosen by society as optimal since such level would be higher than its average indices [21, C. 98–114].

Setting of explicit direct inflationary objectives has both theoretical and empirical background. As to the first one: targeting of inflation enhances the efficiency of communications between central bank and private sector as the latter can clearly see the obvious necessity in achievement of the objectives set and the results of inflation for a certain country; a specified and, as a rule, legal inflationary objective increases the possibility of central bank to carry out independent policy aimed at achievement of this objective; quantitative expression of inflationary objective permit instantaneously to solve the problem of central bank's accountability both within general logics of contract approach and within the problem of asymmetric information between principal and agent, i.e. the problem of signaling. As to the second one, it should be noted that argumentation in favor of immediate targeting of inflation concurred with the first attempts to implement such strategy by banks of New Zealand (1989), Canada (1991), UK (1992) which argued this by inefficient targeting of money aggregation when relation between money basis with money supply and money supply with inflation were considerably slackened.

However, contract approach will not completely solve a number of problems concerned with the inflationary deviation and credibility of the monetary authorities. In this case these problems can be distinguished as those emerging on the agents' part and those appearing on the principal's part. The lags are most ambiguous issue in the contract approach for central bank.

If monetary decisions affect the macroeconomic variables with a positive lag as shown by the classical monetary theory, then why rational expectations are not adjusted to the probable results of central bank's behavior? Furthermore, lag can be more long-drawn than time necessary to renew the contracts on wages and prices. Hence, factor of price flexibility and production factors will not have that crucial impact on determination of macroeconomic trends. By this reason, the policy according to Walsh's contract approach will be neither optimal nor effective.

In respect of problems on the principal's part, their essence is represented in ability to secure credibility of policy once there is a need to change conditions of inflationary contracts *ex post*, for example, exceedingly high losses due to the policy of inflationary stabilization. In case the market agents realize this suggestive possibility, their credibility of government and the monetary policy induced, accordingly (since its target function is estimated by the principal), would decrease immediately. As a consequence, the problem of inflationary deviation

remains. Thus, the principal-agent relation within coordinates grows to be the factor of actual macroeconomic results. One might assume that within the case when the government represents social preferences on inflation in full, there are no motives to change inflationary contracts. The society will not behave in provocative way to make the government change the conditions of the contract to penalize by inflationary deviation. Nonetheless, this problem cannot be ignored, for example, with reference to studying of this phenomenon. A. Nowaihi and P. Levine in their studies argue the existence of motives for amendment of inflationary contract within the timeframes since the society will not benefit from this because of the problem of dynamic inconsistency. In case of limited timeframes there are real reasons for amendment of inflationary contracts *ex post*. This can be explained by the production cycle as well as by end of the authoritative period [22]. Another aspect of this problem is related the countries with high inflationary rate when a potential inefficiency of contracts shown by Walsh is observed. In case certain countries experience a high inflation provoked by the fiscal problems and lack for independency of central banks, then the principal cannot support policy of stabilization. Provided greater GDP losses under deflationary measures *ex post* in respect of those anticipated *ex ante*, an incentive to change the conditions of a contract will always exist. Incredibility of fiscal policy will cause time-inconsistent behavior of the government. As a consequence, nothing will motivate to restrain from renewal of inflationary contracts while the very contracts become inefficient instrument for anti-inflationary policy, as they will not guarantee independence of the central bank.

In case the government makes no efforts to maximize social welfare and acts in favor of private interests, the Walsh contracts become efficient equally due to distrust in policy when there is a possibility to change the conditions of a contract and sue to the fact that the anticipated rate of inflation is considered to be an instrument for achievement of other objectives. More expansive fiscal and distributional context (attempt to decrease nominal cost of national debt at the expense of its depreciation) of motivation of the principal *a priori* defines variance between legitimate contract on inflationary course of central bank and rates of inflation that are necessary for society or feasible for macroeconomics. That involves the problem into political liability of the government and democratic supervision over the executive power that goes beyond the coordinates of principal-agent relationship. Thus, it is likely to suppose that the effectiveness of Walsh contracts directly depends on democratic supervision of society over the government along with responsiveness of government to reduce social requests on liberalization of monetary policy with the intention to solve short-term structural and cyclic problems of economy.

Transparency and liability of central banks as functional instrument to enhance institutionalism of monetary decisions

Both theoretical and empirical problems related to the institutional forms meant for legalization of explicit objectives of central bank meanwhile are solved within the concept of monetary policy transparency. The latter implies directness and understandability of central bank's objectives and behavior. For that reason, the economic agents' awareness of them enables to form rational anticipations according to the signals given by central bank which allow creation of particular market control over the monetary authorities. Once there is a lack for institutional and legal control over the principal or agent in society (as shown above, inflationary deviation can not only be resulted by incredibility of central bank), it is enough to implement transparent system for monetary authorities and the markets will correct macroeconomic parameters in most favorable way. Since the transparency settles the problem of informational asymmetry between markets and central banks, credibility of the latter improves as the monetary authorities' actions aimed at formation of unanticipated inflation, will be neutralized by the market agents' behavior.

M. Goodfriend, a functionary of Richmond Federal Reserve Bank was among the first ones revealing the transparency of monetary policy. K. Nolan and E. Shaling developed his inferences. Subsequent studies of such economists as O. Issing, A. Cukiermann, P. Geraats etc on transparency leading to rise of liability of central bank as a result of control over it on the part of markets, leads to increase of credibility as well therefore making the monetary policy more flexible (since it grows to be trustworthy) gained a final foothold¹.

The major advantages of the monetary policy transparency are: first of all, liability of monetary authorities for the policy carried out is enhances, secondly, transparency secures credibility of central bank. Should it be not interested in openness and longed for inconsistency of its behavior, the transparency would be pointless, and economic agents would realize that; thirdly, the policy that is credible happen to be less restrictive since as soon as central bank announces about intentions to enhance the control over the growth of money supply, the markets will surpass by increasing of interest rates that will limit expansion of the cumulative supply; fourthly, the flexibility of reactions on macroeconomic shocks will be increased as well as credibility confines possible range of inflationary deviation resulting in tolerance of probable inconsistent steps of central bank by the rise of equilibrium prices; the transparency permits to improve the structure of interest rates since the capability of central bank to control mostly short-term interest rates of the money market will not secure an adequate control over long-term rates which serve as orientation for economic agents while taking invest-

¹ Please, refer to [23, C 2–6] for details.

ment decisions. Accordingly, the information on future behavior of monetary authorities will decrease vagueness on such long-term rates resulting in reduction of risk premiums due to vagueness etc.

Transition to direct targeting of inflation and theoretical background for the principal role of institutional framework used for organization of central bank to solve the problem of inflationary deviation and time inconsistency made the factor of liability of monetary authorities for the policy implemented more important. The very liability began to be considered as one of the aspects of central banks' independency.

Nevertheless, assumption on restriction of central banks' independency as a consequence of specific objectives and regulation-based policy performance, not substantiated on the level of implementation², are partly disavowed within liability of central banks, even if shortage of explicit objectives and inflationary contracts permits to increase efficiency of monetary decisions in the context of elimination of inflationary deviation and enhancement of their credibility. In this case the question is in the subject of central bank's liability and which of the functionary should be legally responsible. At best, well-informed elective authority is in charge for the liability (to be exact, not necessary the authority which is part of a contract) while the very liability should be carried out when legibly specified. Therefore the role of transparency becomes more important as long as it turns out to be a form of liability accomplishment and a precondition for impossibility to manipulate the central bank by rigid liability.

Conclusions

Main western trends of modern monetary theories are formed under significant influence of their functional necessity within concrete macroeconomic conditions. It is no wonder that L. Meyer [25] believed only systematic monetary policy to be effective. Neoclassical macroeconomic inversion of the monetary processes based on criticism of monetarism and rejection of the Keynesian theory, while demonstrating the necessity in doctrinal rule-orientation of central banks developed into new, institutional prospect of search for optimal methods of implementation of money and credit policy. The very factor of recommendation functionality determined mollification of the first inferences drawn from the concept of time inconsistency and preconditioned development of such trends in monetary theory that represent implementability of gnoseologic arguments. These trends involve search for «optimal» variance within optimal rules and establishment of macroeconomic decisions at transparent institutional background. Development of institutional factors in monetary decisions is representation of theoretical recognition of positive macroeconomic effects resulted from direct

² For instance, B. Bernark and F. Mushkin demonstrated that inflationary targeting does not influence the decline of operational capability of central banks. Ref [24, C. 97–116].

targeting of inflation and establishment of transparent mode for monetary authorities operation, having concrete institutional forms of implementation. Notwithstanding, modern models of monetary policy (for example, models of Rogoff, Walsh, Persson-Tabellini, Svensson) befall under paradigmatic matrix of neoclassical macroeconomics that verifies its flexibility towards evolution, determined by the current practice of modern central banks that function in democratic politico-economic area. Moreover, the processes of globalization and the resulting mobility of capitals make it possible to state that enlargement of economy's openness only enhances the urgency of ideas of the monetary theories on these central banks' effectiveness, oriented at stabilization of prices and have a relevant institutional background for this

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