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Challenges for Modern Monetary Policy[1]

Abstract: The first central banks were founded in the XVII century and monetary policy has been evolving ever since. Knowledge on monetary economy has improved significantly over the last couple of decades and a consensus has been reached in a number of areas. As a result, hyperinflations have been extremely rare over the past decades.

The global financial crisis challenged traditional monetary policy that was based on the approach involving one instrument (reference interest rate) and one goal (price stability). It is obvious that we need a new approach to monetary policy and I believe that changes will happen gradually in the future.

This paper consists of two parts. The first part covers the traditional monetary policy and deals with issues where consensus has been reached, as well as with issues on monetary policy objectives, transparency, and macroprudential policy.

The second part addresses the issues that pose a challenge for monetary policy and for which there is no complete consensus. This part elaborates on the dilemma involving rules versus discretions, a new approach to banking supervision, monetary policy during a crisis, the role of econometric models, and the need for international coordination of monetary policy.

Key words: Monetary Policy, Challenges, Financial Stability, Unconventional Monetary Policy Instruments.

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1. Introduction

Unfortunately, in today's macroeconomics there is no consensus on how to pursue macroeconomic policy (Fabris & Galić, 2015, p. 124). Technology development, market expansion and rapid changes, as well as increasingly stringent regulations at regional and international levels are the reasons behind the appearance of diverse, complex, and growing risks faced by modern organizations (Luburić 2017, p. 30). Monetary policymakers also face these challenges.

Monetary policy is conservative, but it is subject of evolution. Our knowledge about monetary policy has significantly improved compared to just few decades ago. Many of our interest in monetary economics, however, arise because of the need to understand how monetary policy affects macroeconomic behavior over time. There is still a lot unknown in both monetary policy and theory but there is a consensus on many issues:

1. *Negative rate of inflation is not a monetary policy objective*. Today, most economists agree that the optimal inflation rate for developed countries is between 1% and 3% (Fisher 1996, Crockett 2002). Krugman (1996), however, prefers a slightly higher rate and believes that the preferred inflation is between 3% and 4%. The IMF believes that the inflation rate of 2% is a socially acceptable optimum that does not pose a threat to economic growth. A large number of economists and central bankers in developing countries prefer inflation to range between 4% and 6%.
   A zero or a negative inflation rate is not the goal of monetary policy. Thus, Crockett (2002) points out that there are at least three reasons why a zero inflation rate is not optimal for developed countries. The first reason is the fact that the existing statistics overestimate the current inflation rate. For example, statistics have difficulty in calculating the price index when it comes to improving product quality. Also, if buyers switch to buying cheaper products, a certain period of time is needed for the statistics to register the change in the consumer basket structure. The other reason is the fact that the zero inflation rate will lead to problems with interest rates and this would mean that they would have to fall below zero in the period of recession. Finally, the practice of central banks has proved that central banks tend strive towards low but not zero rate of inflation.
2. *High level of central bank independence leads to a low rate of inflation* – It was not that long ago when central banks did not have a high degree of independence and when there was no prevailing opinion that they should be given a higher degree of independence. At that time, the ruling paradigm was that fiscal and monetary policy should be coordinated and that this would be easier

to achieve if the government controlled both fiscal and monetary policy. Also, the prevailing political view was that it was not justified to confer full independence to the pursuit of such an important function to officials who had not gone through the electoral process. However, with rising inflation at the end of the 1970s, this view has experienced a radical shift. An additional argument is that a central bank with a higher degree of independence has a higher degree of credibility, which leads to a faster decline in inflation and lower costs (Dimitrijević& Fabris, 2009).There are numerous studies that confirm the correlation between central bank independence and the level of inflation. In all cases of hyperinflation in the world there was the same pattern: a high budget deficit that was covered by printing money in the situation of low central bank independence.

3. *There are no trade-offs between inflation and unemployment*. In the 1960s, the Keynesian theory used the Philips curve that assumed trade-offs between inflation and unemployment rate. Such policies resulted in increased inflation. There is no longer theoretical or empirical evidence nowadays to confirm the existence of a long term trade-off between inflation and economic growth. Any potential use of trade-offs could only bring more uncertainty regarding inflation in the future.
4. *Long term inflation is always linked to increased money supply*. Long term inflation is always connected with increased money supply. In short term many factors can influence inflation, like increase of wages, tax increase, oil prices increase, etc. But, if you implement proper monetary policy this factors will influence the inflation only in the short term. Many studies found that the in the long term correlation between inflation and the growth rate of money supply is almost one (Walsh, 2010).
5. *Long-term neutrality of money* - There is a consensus in economic theory today that, in the long run, after the completion of the process of adjusting changes in money supply, there will be a change in the level of prices, but there will be no permanent changes in the level of production and employment. It is the principle of long-term neutrality of money that has been taken from monetary theory. It implies that long-term real variables are determined by real factors (technological progress, investments, population growth, preferences of economic subjects, etc.), and nominal variables are determined by nominal factors. This means that, in the long run, central bank cannot affect economic growth through changes in money supply (Fabris, 2006).
6. *Fiscal policy is also responsible for price stability* – Fiscal policy objective is not price stability but fiscal policy measures like tax increase or public consumption increase can directly influence price stability. It is important that there is coordination between monetary and fiscal policies and this can increase credibility of monetary policy.

7. *Central bank should not react to all shocks* – There is a prevailing view in monetary theory that a central bank should not promptly react to all types of shocks. For example, the common belief is that the central bank should not react to external shocks such as the rise in global oil prices until they begin to influence growth of inflationary expectations. This assumption is in line with the monetarist theory that if a "rigid" monetary policy is pursued, a rise in the prices in one product group will lead to a decline in prices in another product group. A central bank should respond to those shocks that have a large potential to influence inflation expectation. It is usually that central banks conduct surveys about inflation expectations and if there are signs inflation expectations are increasing that is a signal for reaction.
8. *Central banks are interested in unemployment rate and GDP* – There is an ongoing debate about central bank objectives and it is mostly due to disagreements about what monetary policy can and cannot do. The main dilemma is whether monetary policy should only be concerned with price stability or it should use its instruments and tools to support other objectives as well, such as employment and economic growth. Namely, if low rate of inflation would be the sole objective, then such a defined goal could be achieved through a relatively high interest rate which, in turn, could negatively affect employment and economic growth. M. Fry proposes (2000) the solution to this dilemma where monetary policy supports price stability and economic growth as long as it does not jeopardize price stability. Today, there is a consensus that central banks can contribute to this goal by creating a stable and predictive environment and that implies low inflation and financial stability.
9. *Time lags are long and unpredictable* –Time lags in case of monetary policy are long and unpredictable. This means that changes made to monetary policy today will affect the level of prices after several quarters or years, that is, monetary policy can neutralize shocks over time but due to long time lags it cannot neutralize them at the moment they occur. That is why monetary policy should answer the question of which monetary policy changes need to be made today to ensure price stability in the future.
10. *Nominal anchors can increase credibility of monetary policy* - Good selection of nominal anchors can increase credibility of monetary policy. This implies that credible monetary policy to reduce inflation should succeed without causing recession. Sometimes credibility of monetary policy can be even more important than measures that will be implemented. The concrete anchors should be selected based on the individual specific features of a country. For one country this can be fixed exchange rate, for some other that would be monetary aggregates, and so on.

However, central banks also face numerous challenges that will call for adequate response. Therefore, a new way of thinking is needed to create new behaviors and improved business culture as a safe path to establishing sustained success of central banks (Luburić 2015, p 119).

2. Challenges for Monetary Policy

2.1 Financial Stability as a New Paradigm

The global financial crisis has opened a new chapter in considering the central banks' objectives. To wit, it has raised the issue of central banks` role in crisis prevention, management and resolution. The recent crisis has shown that inflation (unless it turns into hyperinflation) is less of a threat to the functioning of an economy and a financial system than financial instability. Real economy and financial system may function with minor or major difficulties in inflation conditions, while financial instability completely "paralyzes" real and financial flows. Moreover, resolving a financial instability is more time and money consuming than disinflation itself (Žugić & Fabris, 2014).

Financial stability does not have generally accepted definition and, unlike inflation, it cannot be numerically expressed. Financial stability usually implies the absence of banking crises or large financial market fluctuations. The Bundesbank (2003) defined financial stability as a steady state in which the financial system efficiently performs its key economic functions and is able to do so even in the event of shocks, stress situations and periods of profound structural change.

On the other hand, there are authors who claim that financial stability cannot be defined, but only financial instability. Thus, Mishkin (1999) points out that financial instability occurs when shocks to the financial system interfere with information flows so that the financial system can no longer do its job of channelling funds to those with productive investment opportunities.

Some central banks still refrain from recognizing financial stability as their objective because central bank cannot cover all financial stability aspects. To wit, even those central banks with the widest supervisory powers do not supervise the capital market, hedge funds, and only few of them supervise insurance companies and pension funds. However, the crisis aftermath brought about rising expectations that central banks should be responsible for early warnings of crises, diminishing weaknesses and vulnerabilities in the financial system, and continuously take actions on preserving financial stability. Additionally, the objectives of

financial stability and price stability may be in conflict. For example, if inflationary expectations are growing, a central bank will apply restrictive monetary policy measures. However, such measures could have negative impact on the banking system liquidity which, in turn, could adversely affect financial stability.

In most countries, the issue of financial stability is not exclusively within the central bank's authority but individual responsibilities are delegated to the central bank, the ministry of finance and supervisory agencies. Since a central bank cannot be the institution solely responsible for financial stability, the question is why financial stability is discussed as the central bank objective. The answer lies in the fact that there are many pieces of evidence supporting the hypothesis that a predictor of future systemic financial crises is the rate of expansion of broad money and bank lending (Goodhart, 2005). Simultaneously, monetary cycles may intensify real cycles.

To achieve financial stability, it is necessary to identify potential risks before they appear and lead to a crisis or problems in the financial market functioning. This includes pursuing preventive and well-timed policies. Surely, the objective cannot be the prevention of all potential problems in the financial market since all risks and uncertainties cannot be managed, and there is no single market that has not undergone fluctuations or turbulences. Therefore, the objective should be to strive towards minimising the largest risks and ensuring the system vitality during crisis situations. Financial crises have shown that such a framework cannot rely on regulation and market discipline alone (Hannoun, 2010), that is, the framework for preserving financial stability is necessary.

Therefore, it is reasonable to expect that there will be a growing number of central banks in the future that will have financial stability as a secondary objective or which will take account of it through participation in financial stability council that will involve several institutions.

2.2. Challenges for Supervision

Nowadays, there is a wide consensus on supervision objectives, standards and methodology. However, the supervision process largely varies among countries in relation to their size, financial system development, background, judicial system, and the like.

Banking supervision has three main objectives – to determine whether the financial situation in a bank is good, whether it is well-managed, and whether there is any danger to its depositors. Supervisors should assess the extent to which banks

are exposed to risk, funds they have at their disposal for risk management, and their sufficiency. In addition, the supervision process should ensure the existence of early warning signs if there is something that could jeopardize a bank`s business.

Cross-border activities of banks are becoming increasingly important. For instance, over 70 percent of banking capital, on average, in new EU Member States is controlled by foreign banks mostly from other EU Member States. The supervision process has simultaneously hindered and facilitated this trend over the past years (increase in the share of foreign banks in the banking sector). This process is easier if there are foreign banks with high credibility that are used to observing regulations in their respective domestic markets and to meeting all international standards, but the supervision process may be hindered when it comes to offshore banks or banks of suspicious credibility connected with money laundering, tax evasion, and the like.

Caprio and Klingebiel (1996) studied banking crises using the sample of 29 countries and found that inadequate banking supervision was present in 90 percent of the banking crises. However, supervision is not the only cause that resulted in the banking crises, but its role in preventing banking crises is undisputable. Poor supervision itself cannot be the originator of a crisis if problems in the banking system have not already existed.

The global financial crisis clearly showed that the current supervision techniques and methodologies were not adequate and that changes were needed.

The first dilemma was which institution should be responsible for the supervision process, either a central bank or an independent agency. Since 1990s, a large number of countries moved supervision to an independent agency, but the impression nowadays is made that this was not the best decision. Arguments in favour of moving supervision from central banks refer to a potential conflict of interests and the concentration of excessive power within central banks. At the same time, the number of participants in the financial market has been continuously growing (insurance companies, investment funds), and there is a growing call for a single authority that would supervise their activities. If a central bank would supervise activities of all of them, this would draw too much attention from its core role –monetary policy pursuit. Bankruptcy of a bank may indicate a decline in a central bank's credibility. Moreover, the concentration on the supervision process could limit the central bank focus to the pursuit of monetary policy.

Arguments that support the idea of keeping supervision under the auspices of central bank refer to the complementarity with the lender of last resort mandate, and the importance of gathering information from the banking system aimed at maintaining adequate monetary policy. The latter was also confirmed by the empirical research of Healey (2001), which showed that supervisory data are the most important source indicating possible occurrence of financial instability, and as such, they are extremely important for pursuing monetary policy. In addition, if supervision is within the central bank, it will almost certainly have a higher level of independence. This is confirmed by empirical study made by Hüpkes (2006) that supervisory agencies do not have a sufficient level of independence in their process of work. The ECB has recently passed a decision prescribing the supervision of systemically important banks in the euro area to be under the authority of the ECB. The impression is that the arguments are strongly in favour of keeping supervision within the central bank are stronger.

During examination, supervisors run various stress tests to identify the level of resilience of banks to shocks. These are usually assumptions of a bank run, bank run by large clients, a change in the level of FX rates, change in the level of interest rate, and the like. Since a significant number of banks that had done well in stress tests failed after the global financial crisis, it is clear that stress test scenarios should be altered and/or they should become more rigid.

One of the weaknesses of the supervision process is that supervision is usually based on the individual bank level, without taking adequate consideration for the entire system. One of such assumptions is that a credible bank can always provide liquid assets. Such an assumption is acceptable in normal times, but it proved to be a wrong assumption in a crisis when many banks need liquid funds. That is why the implementation of Basel III is important as it increases capital requirement, introduces contra cyclical capital and liquidity buffer. But, we also have to be aware that the occurring of risks is more frequent than changes in regulation. That is the reason that we had Basel I, II, III and I am quite sure that in the future we will have Basel IV, as a result of some new risks and crisis. The lesson from the global financial crises is that we have to be proactive in anticipating new risks and amending regulations accordingly.

Banking activity has become global over the past several decades. Banks expand their activities to increasing number of countries. However, here we have another challenge as supervision is national and banking has become a global industry. Supervisors in this way do not have a real insight in a bank's situation as they supervise only a domicile bank. It is likely that all parameters of the bank are good at the national market, but it will not mean anything if a parent bank expe-

riences difficulties in another country. Therefore, the global connection between supervisors from various countries is important, which means that home-host supervision needs to be strengthened.

The occurrence of financial conglomerates covering numerous financial activities also poses a challenge to supervision. It is not surprising any more that a bank, an insurance company, a leasing company, and a factoring company are all parts of the same group. In most cases they are supervised by different institutions so there is no comprehensive picture of the risk profile of the entire group. A special challenge is to create consolidated supervision that would cover all segments of financial conglomerates.

2.3. Monetary Policy during Crises

The primary objective of a central bank is to act preventively on preclude the appearance of a crisis, i.e. to preserve the financial system stability. Or, as Iwata (2006) said, central bank has to react in the situation where the probability of event is low, yet the damage to economy could be quite large if it materializes. A central bank becomes the key institution during a financial crisis and working in such conditions represents one of the main challenges that central banks face.

Traditional monetary policy is based on the approach involving one instrument (reference interest rate) and one goal (price stability). Such framework is efficient when you have to combat inflation. However, during a crisis, solvency and liquidity of the financial sector are bigger problems and they call for different approaches to the implementation of monetary policy.

During a crisis, a central bank should enable commercial banks the access to "cheap" liquid funds, with a view to preserving the banking system stability. In such conditions, additional liquidity facilities are necessary, since classical approach from regular circumstances is not adequate.

Usually, the first step during the crisis is decreasing reference interest rates and introducing new liquidity "lines". Thus, at the beginning of the global financial crisis, many central banks reacted with decreasing reference interest rates to the historical minimum. Moreover, countries with significant amount of funds allocated by commercial banks as required reserves should review the possibility for decreasing them, thus increasing available liquid funds in banks.

The activation of the lender of last resort function would be necessary if classic liquidity loans are insufficient to solve problems. Preventively reacting, a central

bank should transfer a portion of its reserves into liquid form, in order to timely make available to the banking sector.

Conventionally, the role of lender of last resort includes ensuring liquidity support only to high-quality collateral. However, there are few high-quality collaterals during the crisis, because if they banks possess them, they can themselves cash them (Kozarić & Fabris, 2012). Thus, low-quality collaterals have to be accepted during the crisis. Many central banks have done it during the global financial crisis, and the table below shows how it was done.

Table 1: Collaterals in Selected Central Banks during Global Financial Crises

Eligible Asset Classes of Selected Central Banks[1]

	Public securities[3]		Private assets			
	Domestic currency	Foreign currency	Corporate bond	ABS[4]	Short-term bank debt	Bank Loans
Fed						
OMO[2]	eligible	added	added	added	added	added
Standing facility	eligible	eligible	eligible	eligible	eligible	eligible
ECB	eligible	added	expanded	eligible	expanded	eligible
BoE	eligible	expanded	added	added	not eligible	not eligible
BoJ	expanded	added	expanded	expanded	not eligible	expanded
BoC						
OMO	expanded	added	added	not eligible	added	added
Standing facility	eligible	added	eligible	not eligible	eligible	added
RBA	eligible	not eligible	added	added	expanded	not eligible

[1] "Eligible" indicates that the asset class has been eligible since the pre-crisis and no change has been made. "Added" indicates that the asset class had not been eligible before the crisis but was made eligible during the crisis. "Expanded" indicates that the asset class has been eligible since the pre-crisis and the eligible type of security was expanded during the crisis. "Not eligible" indicates that the asset class has continued to be ineligible through the crisis period.

[2] The term auction facility of the Fed is included in OMOs as its profile is close to OMOs of other central banks such as the ECB and BoJ.

[3] Public securities are bonds issued or guaranteed by central or local governments or government agencies.

[4] Asset backed commercial paper was made eligible by the BoC.

Source: IMF (2010), Central Banking Lessons from the Crisis, Washington.

Since the mistrust into banking system increases during a crisis and a run on deposits may be expected, it is important that a central bank's vault has enough money.

If the crisis escalates and threatens to bankruptcy in some banks, it would be necessary that a central bank and the Government jointly consider the "banking system rescue" plan. In any case, a preferred solution should be the market solution, but it is not often the real option during the crisis. To wit, during the crisis, on one hand, the interest for investing decreases due to higher risk, while bankruptcy of banks not classified as systemic may, on the other hand, lead to panic. Then, temporary nationalization or recapitalization of a bank by the state is recommended. In general, financial support to a bank may be provided through "injecting" cash, loan, purchase of assets, placing deposits, recapitalization or nationalization of a bank.

Central bank's or state assistance is usually conditioned and it requires adoption and implementation of bank resolution plan, limiting the amount of salaries, prohibition to payout bonuses, suspending the shareholders' rights, change of management, and the like.

Condition in problematic banks should be solved as soon as possible in order to:

- prevent "spreading the contagion",
- preserve financial stability and public confidence into the banking sector and
- limit losses of state, i.e. tax payers.

If a crisis becomes deeper non-traditional instruments should be considered:

- **State recapitalization of banks** - If there are no market solution for the systemically important banks state recapitalization of banks should be considered. It could be less costly compared to the liquidation of the bank.
- **Blank guarantees for deposits** - The category of psychological arsenal instruments also includes increasing the amount of guaranteed deposits, in order to reduce run on deposits with banks. During the crisis, EU increased the amount of guaranteed deposits, first from EUR 25,000 o EUR 50,000, and then to EUR 100,000. Some countries implemented blank guaranties for deposits. Although many countries have not had enough funds to guarantee all insured deposits, these measures had strong psychological effect and they slowed the deposits outflow.
- **State guarantees for interbank loans** -The important element in the functioning of the banking system is interbank loans. Most interbank loans are with short maturity and the majority are overnight. Banks are required to hold an adequate amount of liquid assets. If a bank cannot meet these liquidity requirements, it will need to borrow money in the interbank

market to cover the shortfall. Some banks, on the other hand, have excess liquid assets above and beyond the liquidity requirements. These banks will lend money in the interbank market. A sharp decline in transaction volume in this market was a one of major contributing factor to the collapse of several financial institutions during global financial crises. In such circumstances state guarantees for interbank loans can be useful.

- **Bridge banks** - These are temporary financial institutions founded for the acceptance of deposits and sound assets of one or few failed banks. Bridge bank may be allowed to take over all or some segments of banking operations like granting new loans and extend repayment of existing loans. Non-performing assets are liquidated or transferred to an assets management company. If it is expected that a bridge bank would be sold soon to a solvent bank, the Government may decide not to inject any capital into that bridge bank, thus the arrangement with the bridge bank becomes potentially cheap for the Government.
- **Negative interest rate** - When central bank buys securities there's more money in bank accounts. Banks are able to lend more and the money supply increases. When the money supply increases, interest rates go down. And so this is traditional monetary policy—buying and selling short-term securities, and affecting the money supply and the interest rate. This is what central bank did during the financial crisis— they used the monetary policy tool to push interest rates almost to zero. But once short-term interest rates are at zero, then what do we do? ECB decide to go slightly into negative territory. The idea is if there is negative interest rate, it means that keeping money in banks will be costly, then economic agents will invest or spent money, that both will contribute to economic recovery.
- **Large-scale asset purchases** - Quantitative easing (QE), also known as **large-scale asset purchases**, is an expansionary monetary policy whereby a central bank **buys** predetermined amounts of government bonds or other financial assets in order to stimulate the economy and increase liquidity. Fed has implemented three rounds. The first round consisted of buying government and agency securities, the second round was government securities, and the third round started with mortgage-backed securities, and then added government securities.
- **Forward guidance** - Forward guidance means that the central bank suggesting expected time frames for the duration of interest rates and/or policy actions. The objective is to let the market know what central bank plans are for the future. With the hope that this will encourage market to borrow and to spend because they will have more confidence in the market.
- **Temporary limitations to capital flows** - In case of capital flight temporary limitations to capital flows can be considered.

- **IMF arrangement** - If a central bank and the government do not dispose with sufficient funds for crisis resolution, the option to be considered is possible arrangement with the IMF. During the global financial crisis, the IMF reacted relatively swiftly and provided recovery funds to many countries.

2.4. Rules versus discretion

In terms of central bank credibility, the regime in which a central bank would opt for simple policy rules for an indefinite period would produce the best results. However, such an arrangement could lead to significant expenses in the long run because the central bank would lose the possibility to react to shocks. In addition, the history has proven that economies and financial systems continuously change and that no monetary regime can be implemented for an indefinitely long period of time.

The dilemma dating back to monetarism and Keynesianism argues whether monetary policy should be based on rules or discretion?[2] This translates to whether central bankers should actively use monetary policy to stabilise economy or should monetary policy be restricted by some sort of a rule. Opponents of discretion believe in the market's self-balancing nature, at least in the long run. They find that economic policy creators lack knowledge and competence, sometimes even courage, which is why their measures have a destabilizing effect rather than a stabilizing effect on the economy. They also cite the danger of political pressures as well as pressures of interest groups on monetary policy creators to back their view that instead of stabilising, discretion can actually destabilise the economy. Arguments supporting the pursuit of discretionary monetary policy are that: it is not possible to formulate rules for all situations in advance, no rule can be in force for an indefinite period, monetary policy creators cannot disregard developments in the real economy, etc.

Kydland and Prescott (1982) reignited this debate by including rational expectations in late 1970s, i.e. the Phillips curve supplemented by expectations. The essence of this concept is that by stimulating aggregate demand and introducing unanticipated inflation the central bankers can temporarily reduce unemployment. However, rational expectations cannot lead to systemically unanticipated

[2] The rule actually represents a predetermined manner of (monetary) policy reaction to the existing situation in order to meet the target. With discretion there is no predefined reaction and (monetary) policy creators take measures they consider to be most appropriate to reach the monetary policy objective in the given situation.

inflation, thus the systematic pursuit of such policy would ultimately have no effect on unemployment, but it would only lead to the inflation increase. They found that central bankers would often aspire to short term gains, which would result only in higher inflation in the long run, and thus they advocate policy rules.

In practice, there is a vast array of solutions. The oldest example of the use of rule was the gold standard. In the wake of World War II, the entire Bretton Woods system was based on the dollar's gold bullion standard. All examples of monetary targeting show that the rule was prioritised over discretion. Fixed exchange rate regime leaves almost no room for the pursuit of discretionary monetary policy and in modern practice its best match would be the principle of monetary policy based on rules. Inflation targeting regime is a combination of rule and discretion. The rule is given in the form of inflation target to be met, and central bank is given discretion regarding the choice of instruments it will use to reach the inflation target. A specific type of rule is the Taylor rule which emerged from the monetary policy pursuit practice of the Fed in late 1980s and early 1990s.

Central banks took various approaches to this challenge. For example, the Fed pursued monetary policy based on the Taylor rule at one point, but since the global financial crisis outbreak they resorted to discretionary monetary policy. The ECB's approach is between the rule and discretion since it has the target inflation rate as well as indicative value for monetary aggregate M3. The Bank of England uses inflation targeting which is a mix of rule and discretion. A large number of economies in transition pursue the policy rule based on fixed exchange rate.

2.5. Econometric Models

As all decision makers, central bankers also face with uncertainty and insufficient knowledge on the functioning of economy. However, the role of central bankers is important because their decisions affect the entire economy. To that end, one of the most important tasks of research departments of central banks is forecasting, i.e. the manner in which economic entities will react on measures imposed by a central bank.

In order to meet these tasks, almost all central banks nowadays have macroeconomic models in place. The objective of a macroeconomic model is to:

- Identify economic trends (GDP trend, industrial output and other important sectors),
- Identify how those changes will reflect on price and financial stability, and

- Determine changes needed in monetary policy instruments to meet the ultimate objective of monetary policy.

It is not possible in the economy, like in natural sciences, to run a controlled experiment that would confirm the validity of an econometric model. Econometric models are based on historical data. Central bankers are particularly interested in what would happen with inflation if money supply increased. This information can be derived from past experiences in similar situations, but the dilemma is that if there were no similar situations in the past, or in relation to the past, could changes in some other important variables occur such as the velocity of money circulation, inflationary expectations or marginal propensity to consume. In such a situation, an econometric model may give rise to a wrong conclusion.

Widespread implementation of inflation targeting resulted in increased use of this model. It is not problem using of this model, vice-versa they can be very useful tools, but the problem was because central banks dominantly relay on this models and they have many weaknesses. No one econometric model predicted Global financial crises. Even the IMF, in its 2007 Global financial stability report, said the following on the eve of the crisis: "Favourable global economic prospects, particularly strong momentum in the euro area and in emerging markets led by China and India, continue to serve as a strong foundation for global financial stability. None of the individually identified risks by themselves threaten financial stability". They were also based on the econometric models.

Numerous problems may appear when using econometric models, such as:

1. The future is unknown and an econometric model must be developed for the assessment of future actions. So far, the economists have not agreed either on a specific model or on a specific econometric technique to be used.
2. A large number of models come from main postulates of some macroeconomic theory (e.g. Keynesian models, classical models, neoclassical models, and the like), and no macroeconomics consensus has been reached yet on the prevailing macroeconomic theory.
3. The dilemma remains whether all complexities of the modern world can be shown through macroeconomic equations. There is no doubt that any econometric model represents the simplification of reality.
4. Time lags can create serious difficulties in the application of econometric models, and the Lukas critique should be taken into consideration. Time lags are particularly long in dynamic economies when applying monetary policy instruments. Therefore, it is not unusual that central bankers are often being accused of making systemic error in timing of instruments.

Blinder described this situation with a guest that comes to an unknown hotel and notices that his room is cold. He raises the heating level to the thermometer by one degree and goes to shower and after half an hour the room becomes cold again. He raises the heat by another degree, and in the middle of the night he is awakened by unbearable heat. Similarly, central bankers can estimate whether a restrictive policy is needed and implement certain instruments. After some time they will recheck the "temperature" of the economy and conclude that it is still "too hot", and additionally increase the level of restriction. However, long lags can, in fact, result in a too high level of monetary policy tightening and lead the economy into recession.

5. The values of exogenous variables must be evaluated. Such an evaluation is not easy or precise, i.e. there is always the possibility of making smaller or bigger error when determining them.
6. The relations between certain variables can be changed very frequently, more frequently than it is possible to adjust the model.

Therefore, a dilemma is if macroeconomic models should be abolished or more macroeconomic models should be used. However, it is almost impossible to evaluate the impact of change in monetary instruments without macroeconomic model. Bearing in mind all restrictions of econometric models, they should not be the main decision-making instrument, but an additional or corrective instrument. This is also supported by the Blinder's (1998) hypothesis, which he applied while being a member of the FED Board – "use a large number of econometric models and do not trust any of them too much". Almost the same view has Issing (2005), who points out that mathematical models are useful for the economy as they enable creating conclusions that could not be otherwise created, but the models can never lead us to make a conclusion that they represent the real world. Bryant (1983) believes that it is possible to set a mode, with small variations of fundamental assumptions, which would prove each assumption to be the result of optimisation of individual behaviours. Lionel (1996) highlights that econometric techniques should be used as a support to economic analysis and definitely not as its substitute, and one should always be sceptical when it comes to their results.

2.6. International coordination of monetary policy

Over the past several decades, financial markets and institutions underwent radical transformation and a sudden expansion, induced by general trends of deregulation, liberalisation, globalisation, as well as computer technologies advances. International capital flows intensified; markets have developed new and sophisti-

cated instruments, with the drastic improvement in the speed of financial transactions execution significantly lowering financial transaction costs. The degree of interdependence of financial institutions from different countries considerably increased, thus the financial system gained a global character. Also, banking crises are more difficult to predict than the currency crises, however, the negative effects on economic activity are far more long-termed after systemic banking crises (Asanović, 2017, p. 158).

On the other hand, monetary policy remained within national limits with central banks as one of the symbols of national sovereignty, except in few special cases like the European monetary union (EMU). With regard to the global character of the financial system, crises become less national and more global, which the global financial crisis confirmed.

The first disturbances that announced the Global financial crisis started in the USA in early 2007. At the beginning, it was not treated as anything serious, the Fed did not share relevant information with other central banks, and most of central banks outside the USA were not aware about the problems until the midsummer of 2007. Even then the disturbances were not taken seriously. Very soon, the crisis spread throughout the entire world.

We also have a global financial innovation that is usually created to bypass national regulation. In such conditions individual actions have less chance for success. In order to prevent future crises, it will be necessary to increase international coordination in managing monetary policy and sharing information. Resolving the issue of monetary policy's national sovereignty and the necessity of global action in crisis prevention remain major challenges.

2.7. Target inflation rate

Inflation is usually targeted within the range of 1% and 3%. It gives small space for expansionary monetary policy during crises because of the risk of negative rate of inflation. It was the reason why some authors proposed higher target rate of inflation. It will provide more room for decreasing interest rates, but it will be very difficult to convince the public and politicians used to live with low inflation that higher target inflation will provide more space to combat recession. Nevertheless, it is unlikely that central banks would agree to higher target inflation.

3. Conclusion

The global financial crisis has posed numerous challenges to the traditional monetary policy. The first dilemma referred to the objective of monetary policy, i.e. whether financial instability represents a higher risk for central banks than price instability. It is obvious that financial stability will increasingly gain in importance as an objective of central banks.

The traditional framework of monetary policy, `one instrument, one objective`, is adequate only in the conditions of price instability. Innovations in this area and a growing implementation of unconventional monetary policy instruments will be necessary in order to overcome future crisis.

Financial markets as well as crises have become global, while monetary policy (except for several exemptions, like that of the ECB) remained national. In order to successfully overcome future crises, international coordination of monetary policies and joint actions are necessary.

The existing banking supervision models proved inadequate and significant changes will be needed in this area, from tightening stress test assumptions, consolidated supervision, to strengthening home-host supervision.

Excessive reliance of central banks on econometric models resulted in the fact that central bankers were overwhelmed by the global financial crisis. Econometric models are a useful instrument, but they suffer from numerous imperfections. Therefore, the sole reliance on these models while neglecting expert opinions may lead central bankers to wrong conclusions.

There is still no agreement on the optimal monetary policy regime and whether monetary policy should be based on rules or discretion.

Another dilemma is whether a higher rate of inflation targeting would be desirable since it would leave more room for monetary policy actions in the period of recession.

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