The Optimal Monetary Rule for the Slovak Republic

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Summary: The optimal monetary rules should help to economic agents to fortify their anticipation about monetary policy. At the same time they should make application of monetary policy by central bank more effective. Consequently, numerous central banks as well as other economic agents try to determinate an optimal monetary rule responding to given macroeconomic conditions. However, this can be very difficult especially for transition economies or post-transition countries. This is the case of the Slovak Republic; its time series are relatively short and macroeconomic environment has to face different shocks. Thus, a monetary rule should be just some kind of recommendation for monetary authority that does not have to be followed as a binding commitment.

1. Introduction

For investors, commercial banks as well as for whole public it is important to know the reaction of the central bank to macroeconomic evolution of their country. Above all, the economic agents wish to know evolution of base rate that gradually has an impact on other interest rates and has an influence on economy as a whole. On the other hand, it is even in the interest of the central bank to make its reactions more transparent and understandable for public. Eventually, economic agents should know the reaction function of the monetary authority corresponding to the actual situation. If the activities of the monetary authority are transparent, accountable and predictable, the credibility of the central bank rises and application of monetary policy is more effective.

Consequently, measurements of monetary policy are applied through the transmission channels more successfully. Formulation and exact expression of the reaction function helps in the decision making process as for application of monetary instruments. The reaction function, respectively the monetary rule

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enables to quantify the employment of a certain monetary instrument in existent macroeconomic conditions.

One of the most known monetary rules is so-called Taylor rule suggested by an American economist John B. Taylor. Taylor tried to deduce an optimal monetary rule in 1993 [Taylor, 1993, p. 196]. This rule does not create a trade-off between inflation target and economic growth. It encourages price stability as well as stability of economic growth.

In fact, this rule quantifies recommendations for central bank. Its original form was following [Taylor, 1996, p.192]:

$$i = \pi + gy + h(\pi\text{-}\pi^*) + r f \tag{1}$$

where, *i* is a nominal short-term interest rate measured in percentage. π is an inflation rate measured in percentage. π^* is targeted inflation rate. Parameters *π^*, r f, g, h* have positive values. *g* and *h* are weights of output gap and of inflation gap respectively. The last member r *f* is an equilibrium interest rate of central bank.

Consequently, it is obvious that nominal interest rate depends on gap between actual inflation and targeted inflation as well as on gap between real GDP and potential one. A positive output gap will probably induce increase of inflation. Thus, result of the equation would suggest increase of nominal base rate. Inflation gap that is positive difference between real and targeted level will cause pressure on increase of base rate, too.

Thanks to empirical observations of American economy and base rate of the FED from 1987 till 1994, Taylor specified his rule in following way:

$$i = \pi + 0{,}5y + 0{,}5(\pi\text{-}2) + 2 \tag{2}$$

However, the rule can be applied in this form only in the conditions of the USA. Taylor assumes that the equilibrium interest rate in the USA equals 2, potential output is 2 and weights for inflation gap and for output gap are the same, they equal 0,5. The FED should pay an equal attention to inflation and output stability when calculation base rate. It corresponds to the actual strategy of the FED that follows equally three targets: inflation – unemployment – growth [Stiglitz, 2004, p.15].

2. Monetary Rules in the Conditions of the Slovak Republic

Recently, the National Bank of Slovakia (NBS) applied so-called discretionary strategy of monetary policy as for decision-making and strategic process. It means, strategy of the NBS was not based on exact models or monetary rules that would simplify decisions of monetary authority. Finally, creation of such

kind of models and monetary rules that would react on actual macroeconomic situation in a reliable way was not possible in the past. The Slovak Republic did not dispose with sufficiently long time series of macroeconomic indicators. And it did not enable to reveal relevant econometric relations. More over, the economy was in the transformation process and was exposed to external as well as internal shocks.

Still, in connection with standardisation of economic environment, there is increasing necessity and at the same time possibility to describe economic mechanisms and role of the economic policy. Thus, it becomes possible to quantify impact of chosen economic measurements through overall econometric macroeconomic model based on monetary rules beside other equation. Such a model creates a framework for determination of mid-term inflation forecasts and it increases credibility of monetary policy and transparency of its communication [Ševčovic, 2005, p.1].

The NBS started to apply Taylor type monetary rule in the beginning of 2005. Taylor rule is an integrated part of quarterly model consisting of several equations and macroeconomic relations. However, the NBS has not already published exact parameters of Taylor rule convenient for the Slovak Republic.

3. A Possible Determination of the Optimal Monetary Rule in the Slovak Republic

Monetary rules can be divided into two basic groups; forward-looking and backward-looking rules. Forward-looking rules work with forecast data and this is their great advantage because quantified monetary policy instrument will operate only in the future. Consequently, an optimal recommended value should be calculated on the base of predicted data. However, there is a risk of incorrect forecasting and it is obvious especially in transition countries and for counties with short time series. Finally, this is the case of Slovakia. Therefore, this paper tries to suggest a procedure for calculation of backward-looking rule, i.e. rule based on past and actual data. Backward-looking rules describe mainly past activities of central bank. As activities of the German Bundesbank in the field of monetary policy are considered to be rather successful, several authors decided to suggest an optimal monetary rule of the Bundesbank, respectively of the European Central Bank as its follower, on the base of past data, using *ex-post* methodology [Gerdesmeier, Roffia, 2003, p.7].

If the activities of the NBS are considered to be rather effective, an optimal monetary rule as a function of central bank reaction can be also suggest on the base of past reactions of the NBS and past and actual macroeconomic data.

The inflation target is missing in Slovakia till December of 1999. In the following years, the inflation target is known at least in an implicit way and during

last period it is known even explicitly. Thus, it becomes an engagement for the central bank.

Quarter and month data were used for calculations. However, in the calculation of monetary rules are used mostly quarter values that enable to abstract at least partially from frequent short-term fluctuations. At the same time quarter data are more comfortable if we want to work with GDP and output gap as these indicators are published only quarterly. Finally, even in the case of the Slovak Republic, using of quarter data was followed by better results.

Several economists while formulating monetary rules assume application of other relevant indicators of base rate. These rules are called as expanded monetary rules. E.g. analyse of Gerdesmeier and Roffia has proved a certain positive correlation between base rate and monetary aggregate M3 in the Euro Area [Gerdesmeiera a Roffia 2003, p. 24]. Slovakia is small and very open country. Its openness index for year 2004 was 67% as for exports and 70,5% ass for imports (Exp/GDP for year 2004 in current price was 0,671 and Imp/GDP was 0,705) [http://www.etrend.sk]. Consequently, we could suppose that a reaction function of the NBS should consist also of other variables besides inflation and output gap.

This study observed potential influence of exchange rates EUR/SKK, USD/SKK, balance of payments, evolution of export, value of monetary aggregate M2, evolution of indicator of unemployment and index of real wages. However, any of these indicators did not influence base rate significantly.

Main monetary policy instrument of the NBS reacting on the change of inflation and output gap is base rate. In the case of the SR, base rate correspond to two-week REPO interest rate. It is expressed in nominal way in monetary rule.

Several authors use market interest rates, e.g. interest rates on inter-bank deposit market instead of base rate. Therefore, this paper applies calculations with both base rate and 3-month base rate BRIBOR. BRIBOR is the interest rate on Slovak inter-bank deposit market. BRIBOR has been determined since July 1995. Its determination was temporary interrupted from the 29th May 1997 till the 15th October 1997 because of decision of eight banks [http://www.nbs.sk]. That is the reason why data from this period are missing.

Figure 1: *Relation between base rate and BRIBOR*
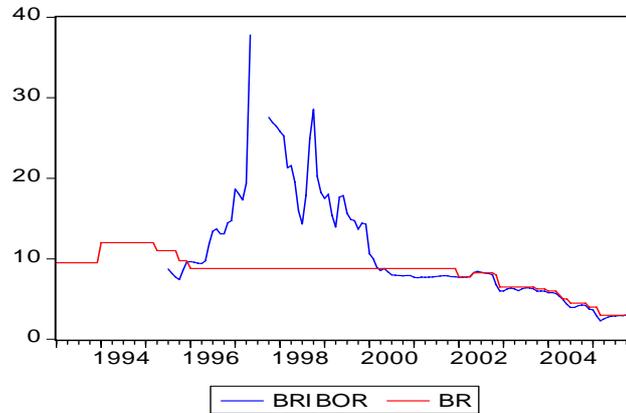
Comparatively strong correlation between BRIBOR and base rate (BR) can be observed in Slovakia especially during last years. Consequently, it is possible to substitute base rate by BRIBOR in the reaction function of central bank. This is confirmed by the figure 1:

The correlation between evolution of base rate and indicators of inflation and GDP on the other hand should be observed first of all through figures.

Following figure expresses relation between quarter data of base rate (BR) and inflation rate (MZMI):

Figure 2: *Relation between base rate and inflation rate (quarter data)*
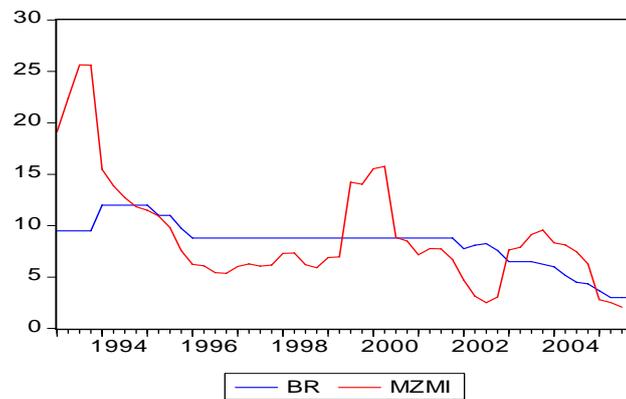
We can observe a certain correlation that has gradually rising trend. Consequently, we can assume that the NBS while determining base rate reacted more and more to evaluation of inflation. We can expect even more correlation after application of explicit inflation targeting after year 2005.

Similar relation can be observed also between inter-bank deposit interest rate BRIBOR and inflation rate based on quarter data. Evolution of BRIBOR reacts to evolution of inflation in a more sensitive way because of development of inter-bank market and financial instruments.

Analogical conclusions are received when studying correlation between base rate or BRIBOR and inflation gap IGAP, i. e. difference between actual inflation rate and inflation target 2%.

Figure 3: *Relation between base rate and inflation gap*
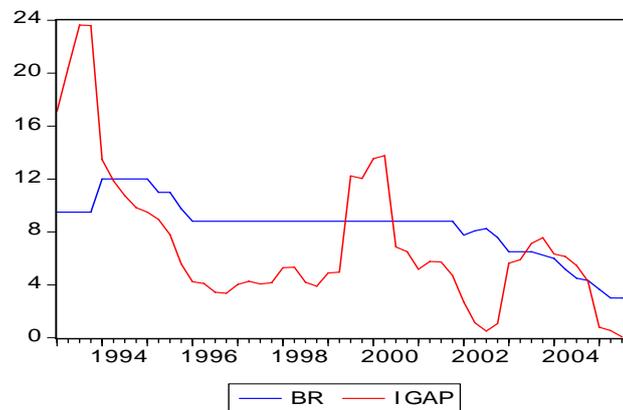
Source: NBS, Trend, own calculations

However relations between interest rates and indicators of GDP, e.g. of output gap YGAP are not so obvious. It is presented even in the strategy of the NBS that targets mainly price stability and it does not determinate such a great weight to economic growth. This is manifested in the following figure:

Figure 4: *Relation between base rate and output gap*
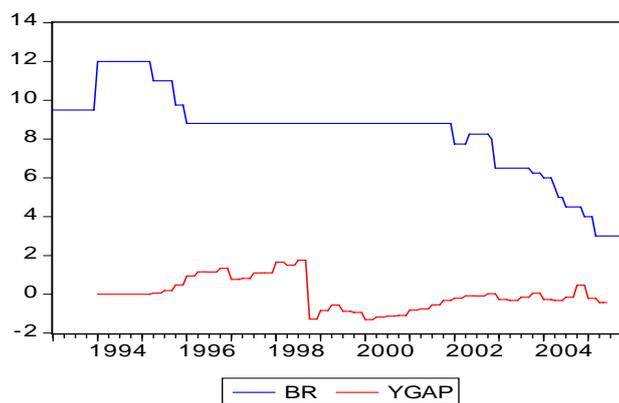
Source: NBS, Trend, own calculations

Monetary rule was suggested in this study using method of least squares through EViews econometric programme. According calculations of this study an optimal monetary rule of the NBS could be expressed e.g. in the following way:

$$LOG(BR) = .00959503697 + .9177638276LOG(BR(-1)) + .110379389LOG(IGAP) + .04060861773LOG(YGAP) \tag{3}$$

R-squared	.980909
Adjusted R-squared	.976503

According above-mentioned equation the NBS put higher weight to inflation gap IGAP and lower one to output gap YGAP. The weight of inflation gap is almost three times bigger than weight of output gap. As it was already mentioned, inflation gap means difference between real inflation rate and targeted inflation level. However, in Slovakia, values of targeted inflation have been officially known only since 2004 and explicitly it has been known only since 2005. Consequently, in the case of this study, long-term inflation target was determined at the level of 2% of consumer price index, respectively of harmonised consumer price index. In fact, this is the convergence level of the Euro Area and this should be also long-term targeted level in Slovakia respecting Maastrichts criteria. We can observe that smoothing factor is very strong, thus evolution of base rate BR depends mainly on its own values from previous periods BR(-1). Such results are consistent with the monetary rule theory, with actual trends concerning determination of monetary rules, e.g. in the USA or in the Euro Area and finally, this results are approaching to the actual reaction function of the NBS. In addition, expressing capacity of this model is comparatively high as correlation coefficient is approximately 98% (R^2 = .9809).

Similar results are confirmed also by other tests where base rate is substituted by BRIBOR. In this case the monetary rule could be expressed in the following way:

$$LOG(BRIBOR) = .5734897105 + .5814828039LOG(BRIBOR(-1)) + .4094827489LOG(IGAP) + .1906888309LOG(YGAP) \tag{4}$$

R-squared	.964163
Adjusted R-squared	.952218

Even in this case, weight of inflation gap is higher than weight of output gap. According to the last equation, the NBS associates approximately two times higher importance to inflation stability than to stability of economic growth. Correlation coefficient is also relatively high, it makes 96,4%. BRIBOR depends of its own past value BRIBOR(-1) but not so significantly as it was in the previous case. However, it is quite natural because BRIBOR is formed on inter-bank

market and base rate is determined by central bank. Still, smoothing factor plays even in the last case important role.

In spite of above-mentioned facts, an optimal and functioning monetary rule should be elaborated in a more precise way. This study can be considered just like an introduction to more comprehensive calculations as it was, e.g. in the case of Gerlach's and Schnabel's [2000, pp. 165-171] work that ignored the non-stationarity of the data as also this paper did. However, it would be important to test stationarity of the Slovak time series and together with longer series and more stabilised environment it would increase robustness of the optimal monetary rule.

4. Conclusion

Results of Taylor rule or of some other monetary rule should be just a recommendation for analysts of central bank. It is very advisable to rectify given recommendation in practice according specific situation in the country and according other impacts.

Even the European Central Bank (ECB) applies Taylor rule. Though, its recommendations have just an orientation character because environment of the Euro Area is very heterogeneous. Thus, monetary rule should be some kind of benchmark. The ECB applies different measurements in countries with higher vulnerability to cyclical shocks (Spain, Portugal, Ireland, the Netherlands) and different instruments in the countries more resistant to cyclical changes (France, Germany, Italy) [Report of International Monetary Fund, 1998].

The National Bank of Slovakia has to follow actual monetary trends and not only in connection with potential entrance of Slovakia to the Euro Area. Its top-priority interest should be an optimal management of inflation, eventually of some other macroeconomic targets. What will be the role of monetary rule recommendations in the decision making process depends on the monetary authority choice.

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Optimalno monetarno pravilo za Slovačku Republiku

Rezime: Optimalna monetarna pravila bi trebalo da pomognu ekonomskim agentima da ojačaju svoje projekcije o monetarnoj politici. U isto vreme, ona bi trebalo da učine primenu monetarne politike centralne banke efikasnijom. Iz toga sledi da brojne centralne banke, kao i durgi ekonomki agenti, teže da odrede optimalno monetarno pravilo za date makroekonomske uslove. Međutim, ovo može da bude vrlo teško, posebno za tranzicione privrede ili post tranzicione zemlje. To je slučaj sa Slovačkom Republikom: raspoložive vremenske serije su relativno kratke i makroekonomsko okruženje je suočeno sa različitim šokovima. Monetarno pravilo bi zbog toga trebalo da predstavalja tek jednu vrstu preporuke za monetarnu vlast, koje nema karakter nametnute obaveze.

Ključne reči: Optimalno monetarno pravilo, Tejlorovo pravilo, Reakciona funkcija, Centralna banka, Nacionalna Banka Slovačke.

JEL: E50, E52, E58