

APPROPRIATENESS OF THE ECB INTEREST RATE POLICY WITH RESPECT TO THE SLOVAK ECONOMIC CONDITIONS

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Abstract

The paper deals with the actual issue concerned with the monetary policy of the Slovak Republic after adopting Euro. The focus is on the comparison of the modified Taylor rule describing the situation in the Slovak Republic with the key interest rate of the ECB as the monetary authority of the whole Euro Area.

Keywords: *Modified Taylor Rule, Monetary Policy, Key Interest Rate*

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1 INTRODUCTION¹

The entrance of the Slovak Republic into the Eurozone in 2009 has been a significant step for our further economic development. One of the most important changes was the transfer of the main decision within the monetary policy from the National Bank of Slovakia to the European Central Bank as the monetary authority of the Eurozone.

Based on the previously derived econometric equation of the modified Taylor rule, we have tried to analyze if a monetary policy realized by the ECB is also suitable for the economy of the Slovak Republic under present conditions.

The second chapter presents the theory of the Taylor rule and its application for the US conditions. The modified Taylor rule for the Slovak Republic is introduced in the third chapter. The fourth chapter is devoted to the analysis of the interest rate policy in the Eurozone from 2009.

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2 TAYLOR RULE

The rule defined by an American economist John B. Taylor in 1993 is one of the most discussed and popular monetary rules. The output of Taylor's equation equals to the key interest rate the central bank of a country should set in order to react to the macroeconomic development correctly. According to Taylor, the two parameters influencing central banks' decisions about the main interest rate are the inflation rate and the level of GDP. This results in the following equation:

$$i = \pi + gy + h(\pi - \pi^*) + r^f \quad (1)$$

where i stands for the short-term nominal interest rate, π represents the inflation rate, π^* the inflation target, y the GDP gap and r^f is the target real interest rate by zero inflation gap and zero GDP gap. The coefficients h and g are the weights of the inflation and GDP gap. π^* , r^f , g and h are always positive.

In case the actual inflation rate equals to the target one and the actual GDP value equals to the potential product (i.e. the GDP gap is zero), the nominal interest rate that should be set by the central bank equals to the target nominal interest rate ($\pi + r^f$).

If the inflation rate exceeds its target value, central bank should increase the interest rate above its target value. This action would slow down the economic growth and inflation would return to its original value. The coefficient h expresses the exact value by which the interest rate should answer to an increase of the inflation gap by one.

Analogically, if the GDP gap is negative, the measure a central bank should impose is the decrease of the key interest rate in order to accelerate the economy. The output will reach the potential level again.

Except for defining the general form of the monetary rule, Taylor (1993) has also suggested the precise value of the coefficients that should reflect the situation in the USA. The exact US equation is as follows:

$$i = 2,0 + \pi + 0,5y + 0,5(\pi - 2,0) \quad (2)$$

Both the target inflation rate and the real target interest rate are equal to two. The weights of the inflation gap and the GDP gap are 50%. However, more recent research (Brayton, Levin and Tryon (1997)) has showed the weight of the GDP gap should be closer to 1.

If the inflation rate and the level of GDP equal to their target values, the real interest rate will be 2% (the nominal interest rate will be two plus the inflation rate). For each percentage point the inflation rate rises above (falls under) the 2% level the real interest rate increases (decreases) by 0,5 percentage points. The analogical conclusion can be said about the GDP.

This theoretical equation is also supported by the official statements of FED. The regulation of the inflation rate and the economic development are two equivalent goals.

As the history has showed, the Taylor rule has been the reliable equation describing the evolution of the US economic situation over the past 30 years, mostly from 1985. During the periods when FED followed the rule, consciously or not, the USA has recorded the growth. On the other hand, when theoretical and real values of the key interest rate differed, macroeconomic indicators were also not on their ideal levels².

Since then, various economists have tried to derive the Taylor-Type formula for their countries. See Gerlach and Schnabel (1999), Gerlach-Kirsten (2003), Adema (2004) or Molodtsova, Rzhvskyy and Papell (2008) for Euro Area, Nikolov (2002) for The Great Britain, Kuttner and Posen (2003) for Japan.

3 MODIFIED TAYLOR RULE IN THE SLOVAK REPUBLIC

Concerning the Slovak Republic, there have been several authors applying the Taylor-Type rule. See Mesároš (2006), Gavliak (2006) or Neupauerová (2006).

In 2011 we have derived more actual modified rule for the Slovak conditions. (Siničáková and Pavličková (2011)) Unlike the original Taylor Rule based on an empirical research, we have realized an econometric analysis. We have used quarterly data from 1/2000 to 4/2008. During this period, the main monetary authority in Slovakia was still the National bank of Slovakia (NBS) and the model we had planned to obtain was the one describing the situation in the Slovak Republic before joining the Euro Area.

We started with the application of the original Taylor model under the Slovak conditions³. However, as the GDP gap was showed as an insignificant factor, we have decided to expand the model with additional parameters, such as the lagged values of the key interest rate in Slovakia set by the NBS (BR_{t-1}), the quarterly rate of inflation calculated as the geometric average of the monthly data smoothed using the Hodrick-Prescott filter (HICP), the percentage change of the quarterly balance of payments data (BP), SKK/EUR exchange rate, the percentage change of an unemployment rate and the time parameter reflecting the fact that data are quarterly. In process of developing model, factors exchange rate and the percentage change of unemployment rate have been excluded due to statistical insignificance. General form of the modified Taylor rule model that considers only significant variables is:

$$BR_t = \beta_0 + \beta_1 \times HICP_t + \beta_2 \times BP_t + u_t \quad (3)$$

² For more details see Judd and Rudebusch (1998), Papell (2010)

³ For more details see Siničáková and Pavličková (2011)

Table 1 provides a descriptive statistics of variables that enter into equation (3).

Table 1 Descriptive statistics of the input variables

Variable	BR	HICP	BP
Number of observations	36	36	36
Mean	5.747	5.743	-0.444
Median	4.875	5.230	-0.027
St. deviation	2.166	2.418	2.557
Variance	4.691	5.845	6.539
Minimum	2.500	2.719	4.104
Maximum	8.800	10.981	11.468

The development of variables' values for period 2000 – 2011 that enter into equation (3) are depicted in Figure 1.

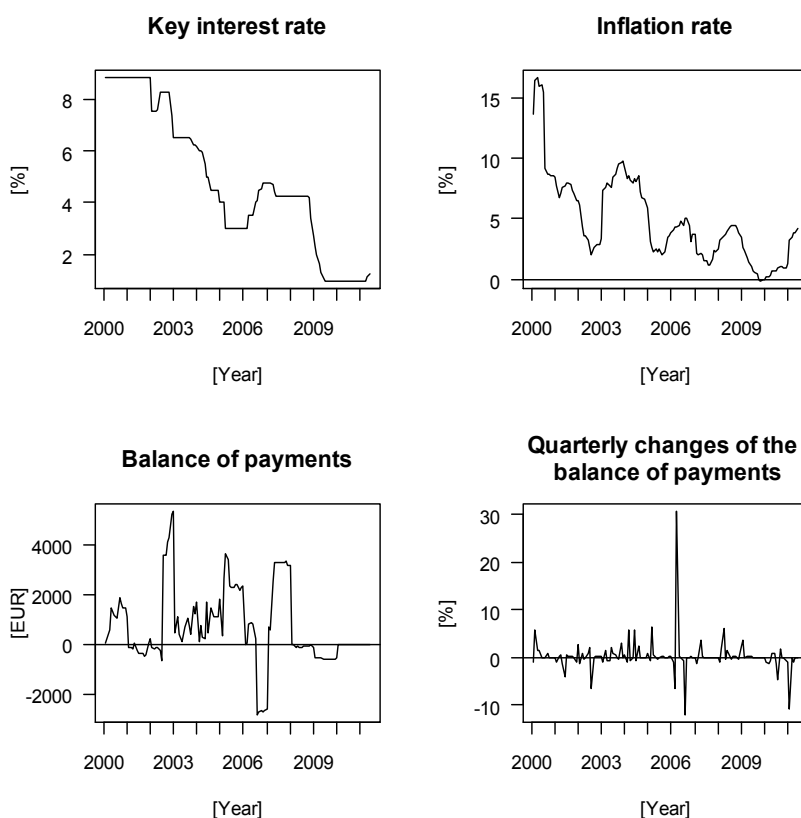


Figure 1 Values of variables entering into equation of modified Taylor rule for the period 2000 - 2011

As the lagged value of the dependent variable has also been taken into consideration, it must have been submitted to the Koyck Transformation in order to avoid the autocorrelation of the first order. The adjusted linear model gains the form:

$$BR_t - \rho \times BR_{t-1} = \beta_0 + \beta_1 \times HICP_t + \beta_2 \times BP_t + u_t \quad (4)$$

The value of the correlation coefficient ρ is 0.7944332.

Results of testing significance of independent variables of the model given by equation (4), are provided in Table 2.

Table 2 Significance test of the independent variables

Variables	Estimation	St. error	t-value
Intercept	-0.05473	0.22918	-0.239
HICP	0.18740	0.03772	4.969
BP	-0.06088	0.03311	-1.839
Signif. codes: 0 *** 0.001 ** 0.01 * 0.05 · 0.1			
Multiple R-squared: 0.4508			
Adjusted R-squared: 0.4165			

The model was submitted to the Jarque-Bera normality test, the Durbin-Watson and the Breusch-Godfrey tests of autocorrelation of residuals, the Breusch-Pagan test of heteroscedasticity of residuals, the test of multicollinearity realized using the Variation Inflation Factor and the correlation matrix of independent variables and the Ramsey reset test of the model specification. The resulted model fulfils all the requirements of a linear model based on the mentioned tests (See Table 3).

Table 3 Testing the assumptions of a linear model

	Test	p value
Normality of residuals	Jarque-Bera test	0.012
Autocorrelation of residuals	Durbin-Watson test	0.124
Heteroscedasticity of residuals	Breusch-Pagan test	0.313
Specification test	Ramsey RESET test	0.933
Multicollinearity	VIF value	
	1.014	

After testing significance of variables of the proposed model, the final form of modified Taylor rule model has been as follows: (Siničáková and Pavličková (2011))

$$BR_t = -0.05473 + 0.7944332 \cdot BR_{t-1} + 0.18740 \cdot HICP_t - 0.06088 \cdot BP_t \quad (5)$$

As the significant parameters influencing the decision of the Slovak central bank when setting the main interest rate the lagged value of it, the rate of inflation and the balance of payments development came up. According to the equation, the lagged parameter affects the dependant variable most significantly. The increase of the lagged value by one raises the key interest rate by 0.7944332. Logically, the central bank defines a new value of the interest rate considering the previous one. In some cases, more significant change is needed, in some other cases the interest rate is kept on the same level.

The rate of inflation is another parameter with the positive effect on the interest rate. The rise of the inflation rate by one causes the increase of the key interest rate by 0.18740. This result emphasizing the importance of the inflation rate stems from the official commitment of the National bank of Slovakia to maintain the inflation rate as the most important monetary goal slightly under 2% in a medium term. Moreover, the mutual relationship is supported by the economic theory. Growing inflation is often connected with the positive development in the economy. And usual measure used by the monetary authorities to slow down the rise is the increase of an interest rate.

The last parameter, the interquarter change of the balance of payments, disposes of a negative influence on the key interest rate. Each increase of the independent parameter decreases the key interest rate by 0.06088. Firstly, the presence of this factor in the model can be advocated by the strong openness of the Slovak economy. Secondly, for the negative, although not very strong, relationship between those two variables several possible and most probably complementary explanations should be mentioned. One possible explanation of the situation is the exchange rate interventions. The active balance of payments can cause the currency revaluation. If it is unwanted the central bank usually decreases the interest rate to influence the exchange rate. Moreover, the analyzed period can be generally considered as the years of economic growth. And they were connected with the positive development of the balance of payments on one hand and with the decrease of the interest rates in the economy on the other hand.

The introduced modified Taylor rule successfully describes the situation within the analyzed period – from 1/2000 to 4/2008. Whether it is capable to reflect a monetary development in Slovakia also after the entrance to the Eurozone with the new monetary authority and during the economic crisis, we will see in the next chapter devoted to this analysis.

4 METHODOLOGY AND ANALYSIS

In this chapter we are analyzing the modified Taylor rule in the conditions of the Slovak economy during the period January 2000 – May 2011 with the focus on the era of Slovakia in the Eurozone. We are verifying the validity of the proposed rule for the period when the National Bank of Slovakia was the monetary authority of the Slovak Republic (till December 2008) but mostly for the period from January 2009 to May 2011 after entering of the Slovak Republic to the Eurozone using monthly data.

The methodology is as follows. We are comparing the real values of the key interest rate with those obtained by applying the modified Taylor rule under the Slovak conditions. The key variables in the equation (1) entering into the model are monthly data of the inflation measured by the HICP, monthly change of the balance of payments of the Slovak Republic and the lagged values of the key interest rate. Monthly data of the inflation rate and the balance of payments are available. However, a problem came up considering monthly data of the key interest rate. Both the National Bank of Slovakia and the monetary authority of the Eurozone and after entering in the Eurozone also the monetary authority of the Slovak Republic, the European Central Bank (ECB), publishes the dates of change of the key interest rate and the changed values. Hence we approximate monthly data of the key interest rate by a weighted average in a particular month (we consider 30 days in a month based on a German approach) that could be calculated by the equation (2).

$$BR_t = \frac{\sum_{j=1}^k n_j \times BR_j}{30}, \quad (6)$$

where:

BR_t – weighted average of the key interest rate in a particular month,
 n_j - number of days in a month in which the key interest rate BR_j is valid,
 k – number of various key interest rates BR_j .

The key interest rate being considered during the period January 2000 – December 2008 is the base rate published by the National Bank of Slovakia and during the period January 2009 – May 2011 the fixed rate for main refinancing operations in the Eurozone.

In Figure 2 the development of the real values of the key interest rate and the values proposed by the modified Taylor Rule in the Slovak Republic is depicted.

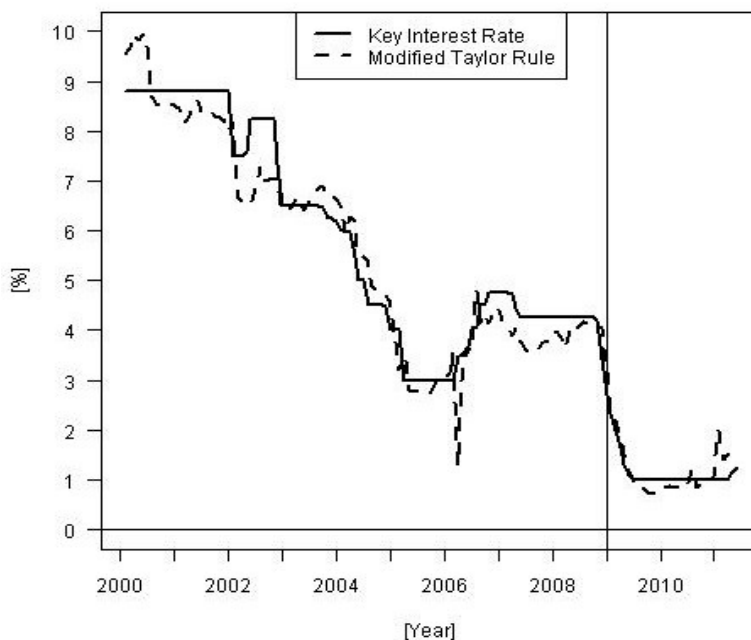


Figure 2 Development of the Key Interest Rate and the rate proposed by the modified Taylor Rule

The close relationship of the key interest rate of the NBS and the modified Taylor rule for the Slovak Republic until the end of 2008 has already been examined in our previous paper. (Siničáková and Pavličková (2011))

Now, let's look on the period after the entrance of the country into the Eurozone (see Figure 1). The development of a rate calculated by the equation (1) copies the development of the key interest rate until June 2009. During this period the ECB reduced the key interest rate four times due to the global economic crisis. Although the ECB has more conservative approach to the economic crisis than the FED or other major central banks in the world, the evidence that the European economy followed the United States into recession has forced the ECB to make decision about reducing the key interest rate.

The deviation of the ECB key interest rate from the one suggested by the modified Taylor rule in Slovakia is visible in the middle of 2009. From June 2009 until June 2010 the modified Taylor rule proposed slightly smaller level and after December 2010 slightly higher level than was the key interest rate applied by the ECB. In May the ECB raised the key interest rate from 1% to 1,15% and in June to 1,25%, but the modified Taylor rule in the same time recommended greater growth of the key interest rate (up to the level of 1,65%). This can be explained by the policy of the ECB (2011) that sounds: "keeping inflation under control for the area as a whole" because "it is

essential to maintain the ECB's credibility.“ Thus, the policy of the ECB must deliberate the fight against the growing inflation on one hand. However, the debt crisis in countries like Greece, Ireland, Spain and Portugal must be taken into account on the other hand. Higher interest rates make it more expensive for these countries to pay off their debts. Hence the key interest rate grew during the beginning of 2011 only slightly.

To test a statistical significance of a difference between the interest rate proposed by the modified Taylor rule and the key interest rate given by a the NBS, ECB respectively, nonparametric tests were used because the data of the key interest rate and the data of the interest rate proposed by the modified Taylor rule are not normally distributed. To test the normality of the compared data the Shapiro test and the Jarque-Bera test were used. As you can see in Table 4, on the level of significance $\alpha = 0.05$ we can reject null hypothesis that the data of the key interest rate and the data of the modified Taylor rule rate are normally distributed.

Table 4 Testing normality of the data

		Data of the key interest rate	Data of the modified Taylor rule rate
Shapiro test	W	0.9055	0.9456
	p-value	8.26e-08	3.33e-05
Jarque-Bera test	p-value	0.017	0.031

In order to test a statistical significance of differences between the key interest rate and the modified Taylor rule rate the two sided Wilcoxon test and the two sided Kolmogorov-Smirnov test were applied. Both tests did not reject null hypothesis claiming no difference between the median of the key interest rate data and the median of the modified Taylor rule rate data on the level of significance $\alpha = 0.05$ (see Table 5). Hence, we can conclude that differences between the key interest rate and the modified Taylor rule rate are not statistically significant.

Table 5 Testing difference between medians of the data

		Data of the key interest rate
Wilcoxon test	W	9976
	p-value	0.368
Kolmogorov-Smirnov test	D	0.1606
	p-value	0.058

5 CONCLUSION

With respect to our previous research presenting our modified Taylor rule as a suitable tool describing the monetary policy of NBS in the Slovak Republic over the

period 2000-2008, we have tried to find out whether the ECB monetary policy, although neither following the mentioned rule nor considering the specifics of member countries separately, satisfies the development of the Slovak economy. The differences between the modified Taylor rule determined for the Slovak conditions and the key interest rate set by the ECB are not significant even after the entrance of Slovakia into the Eurozone. Hence we can express our opinion that the NBS would most probably apply the similar monetary policy to the one realized by the ECB respecting the current conditions of the Slovak economy.

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