MONETARY RULES AND THEIR APPLICATION IN TIMES OF ECONOMIC CRISIS AND IN THE EURO AREA

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Introduction

Nowadays, the strategy of monetary policy application has become one of the most discussed topics. World economic crisis helps experts to realize that no existing tool is perfectly efficient. Therefore, they try to analyse which kind of monetary policy rules would be most appropriate. Both politicians and economists defend their opinions; either they support the discretionary policy or the policy of the rule.

Discretionary policy means that the central bank does not follow any pre-determined steps how to proceed under certain macroeconomic circumstances. The greatest advantage is the freedom in the process of choosing reactions to the economic actions.

On the contrary, monetary rule policy can be guided by some specific rule that must be followed by the central bank. This leads to the confidence within the relationship between the monetary authority and other economic subjects.

1. Rule vs. Discretion Discussion

Until the 19th century, the discretionary strategy was preferred by most of the countries of the world. No precise monetary rules were applied by monetary authorities except the "gold standard" and the exchange rate stability [15]. However, during the last 100 years, monetary rules have found their followers. Good example of such a rule was the "gold standard", where the unit of account is a standard amount of gold.

Wicksell [21] brought a very simple rule, but still, it was not widely spread. Paradox is that it's the most important disadvantage was its simplicity. Many experts criticized the fact that the interest rate in the economy is only influenced by one parameter – price stability.

Friedman's k-percent rule is world known. The rule is also referred to as the „golden rule of money stock growth" [17]. Friedman claimed that the rate of growth of money supply should be equal to the rate of growth of real GDP in economy. This rule was used in a certain form in the year 1935 already, when statistician Snyder [21] estimated a 4% growth rate of trade in the USA and stable velocity of money. Taking this information into account, he assumed that a 4% expansion of money per year will lead to the economic stability. Later, in the 1960s and the 1970s, Friedman, himself, advocated the rate of growth of money supply of 4 %, which was equal to the level of economic growth at that time.

Even more significant increase in the number of monetary rule followers came in the 1970s and the 1980s. It was the case of Kydland and Prescott [5] for instance. They pointed out the problem of time inconsistency. A time inconsistent policy can make the public happy, but only in a short run. In achieving long-run policy goals, only time consistent policy can be successful. They offered the explanation by using the example of floods. Long term goal of the government is to prevent houses in areas threatened by floods. Politicians will inform people that they will not help them financially in the case of floods. However, in a short run, if the disaster really happens, they will still support those who have suffered losses. Therefore, in any future case, people will not consider the government's threat credible, if it did not act according to its commitments. It will be more difficult for the government to influence people's behaviour if any problem occurs. In general, by using the rules, the problem of time inconsistency will be eliminated.

Monetary policy rules defenders were also Buchanan and Brennan [5]. They were convinced that discretionary policy enables a central bank to generate inflation above its optimal level. Barro and Gordon [28] expanded this theory in the 1980s and claimed that monetary authority will always have propensity to lower the unemployment at the expense of higher inflation.

At that time, McCallum invented the so-called McCallum rule [21]. The author focused on

monetary base as a central bank's target. This parameter is influenced by inflation rate, real GDP growth and growth of velocity of money. McCallum claims the US economy would have achieved better results if it had followed his rule, especially in 1930s and 1970s.

In 1990s, monetary rules based on regulation of interest rate gained in importance. In 1993 J. B. Taylor presented a very easy monetary rule which has become very popular immediately. Since then, many countries all over the world have applied this rule as a tool for monetary policy decision making process.

1.1 The Taylor Rule

The author, J. B. Taylor, professor at the Stanford University, wanted to provide a very simple guideline for the monetary policy [25]. He focused his research on the situation of the USA and brought the equation that is now known and applied by many countries all over the world. Everybody emphasizes its simplicity. The form of this equation is:

$$i = \pi + gy + h\,(\pi - \pi^{\star}) + r^{f} \qquad (1)$$

i represents short-term nominal interest rate in percentage set by a central bank, π stands for the rate of inflation in percentage, $\pi^{\star}$ means the inflation target in the economy, *y* is the output gap and r^{f} is neutral real interest rate that corresponds to zero inflation gap and zero output gap. Coefficients *h* and g express the weights of both of these gaps. $\pi^{\star}$, r^{f}, *g* and h are all positive values.

Other literature brings a slightly different equation [4]:

$$i_t = i^{\star} + a\,(\pi_t - \pi^{\star}) - b\,(u_t - u_n) \qquad (2)$$

where π plus r^{f} are replaced by one parameter, that is $i^{\star}$. It expresses the target nominal interest rate. The weights are *a* and *b*. The most important change here is the unemployment gap, which is used instead of output gap. As we know, higher output is connected with lower unemployment and vice versa. Therefore, the sign in front of this component is negative.

Both equations claim, that if actual inflation rate is equal to the target value and actual product rate has also reached the value of potential product (output gap, or unemployment gap are zero), nominal interest rate set by the central bank should be equal to the target nominal interest rate (i_t, or $\pi + r^{f}$).

In case that actual inflation rate exceeds the target value, monetary authority should raise the interest rate above its neutral value. Increase in interest rate will slow down the economic growth, raise the unemployment and inflation will get back to its target. The rate of increase of interest rate is expressed by coefficient h, or a.

On the contrary, a negative output gap (the case when unemployment is higher than its natural value), the central bank should apply the expansionary monetary policy and lower the interest rate. This reaction will be followed by the rise of the total product in the economy until it reaches its potential value. It will be connected with the decrease of unemployment to the natural rate of unemployment.

1.2 Opinions of the Taylor Rule

In general, the Taylor rule is considered to be a supplement monetary tool to inflation targeting. The rule focuses on achieving the inflation target in a middle-run. Moreover, it reacts to the GDP evolution that is closely connected to the inflation.

The Taylor rule is perceived very positively thanks to its intuitiveness, lifelikeness and simplicity. In order to get the result, only data of actual inflation and output gap are necessary. It describes the policy applied in the past, as well as it provides certain guide how to proceed in the future.

The critics of this rule point out insufficient flexibility that ties banks´ hands. But, Taylor [1] himself defends his rule. He claims it is not determined absolutely and does not set the interest rate blindly. On the contrary, it reacts to the macroeconomic changes. One of the critics is Svensson [1]. He finds restrictive a very small number – 2 of parameters determining the monetary policy. It leaves no room for considering other information. Another important problem arises when we try to determine the exact level of neutral interest rate and output gap or to choose the right set of data.

During the past 20 years, practice has brought some specifications of the Taylor rule in order to minimize the drawbacks. In general, we recognise forward-looking and backward-looking Taylor rules. The former one uses predicted (ex-post) values, while the latter one prefers actual data. The difference is visible on the example of the USA from 1997 [3]. Backward-looking rule suggested no change of the interest rate, but the forecasts-based one leads to increase in interest

rate. Detailed analysis showed higher costs in case of keeping interest rate stable. Therefore, the Americans [3] claimed forward looking rule to be more convenient and efficient. This fact is also supported by the main goal of monetary policy, which is to influence the future evolution, not the present one.

However, Taylor himself vindicates monetary rule derived from actual data, as his own rule was originally formed this way [3]. He claims the rule helps economists to review the current economic situation and provides basis for future decisions.

Moreover, he adds, the economists should not follow the rule mechanically. „...There will be episodes where monetary policy will need to be adjusted to deal with special factors." [3] Nevertheless, he sees significant advantage in using rules even in the environment, where it is impossible to be guided by them blindly.

2. The Taylor Rule and the Economic Crisis

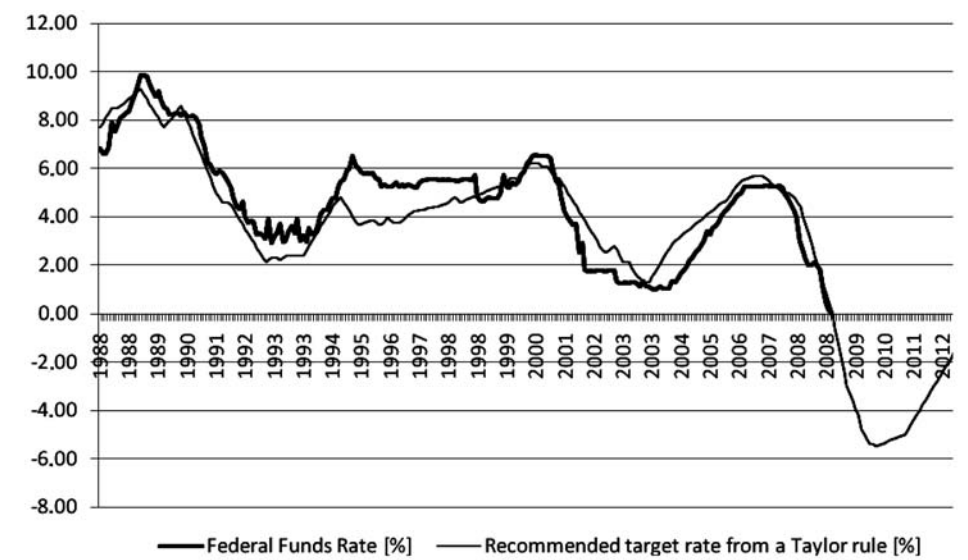
We did not have to wait very long to confirm Taylor's words. The economic crisis has not only brought uncertainty and chaos to the entire world; it has also discredited the reliability of the Taylor rule. Results of Rudebusch [26], vice-president of San Francisco's National Bank, have shown that the interest rate should reach the values of about -5 % in these months. It is, of course, impossible to implement in practice. As current federal funds interest rate is 0 %, the difference between calculated and real value is significant, i.e. 5 %. Fig. 1 provides the review of this situation:

Taylor said, his rule showed that the FED´s policy is appropriate [26]. However, he criticized formula used by the FED. "They say they're using the Taylor Rule, but they're not." While the coefficients for both inflation and output gap in the original Taylor rule are 0.5, the FED uses higher coefficient for the output. Moreover, Taylor works with actual data, as has been mentioned before. However, the FED calculates this rule using predictions. Based on the results, Rudebusch emphasizes necessity of other tools (to pump money into the economy). On the contrary, Taylor defends his rule as a convenient formula even during the financial crisis.

3. The Taylor Rule in Various Countries

Despite current discussion about applicability of the Taylor rule during the world economic recession, it is still popular and adopted by many countries all over the world. As it was originally designed for the US economy, experts in other

Fig. 1: Comparison of results of the Taylor rule and real interest rate in the USA from 1988 to 2010



Source: elaborated according [2]

countries had to adjust it to their own conditions. For example, practice has showed lower interest rate variability than suggested by the rule. Therefore, interest rate smoothing is used. General form of this alternative Taylor rule is as follows [1]:

$$i_t = \lambda i_{t-1} + (1-\lambda)[i^* + Y(\pi_t - \pi^*) + \beta(y_t - y_t^*)] \quad (3)$$

λ represents interest rate smoothing coefficient, its values are from the interval [0,1]. It reduces the interest rate volatility as the answer to the economic disturbances. Moreover, exact values of the parameters are never known, so it is not possible to estimate their influence on interest rate precisely.

Another change of the model in comparison to the original formula is a lagged parameter of interest rate from the previous period i_{t-1}. Central bank expresses its commitment to change the interest rate when inflation changes. If public understands this commitment, central bank is able to influence the long-term interest rate by quite small movements in a short-term interest rate.

Following part of the paper offers practical applications of the Taylor rule in chosen countries and own calculation of a Taylor-Type rule for Slovakia.

3.1 The USA

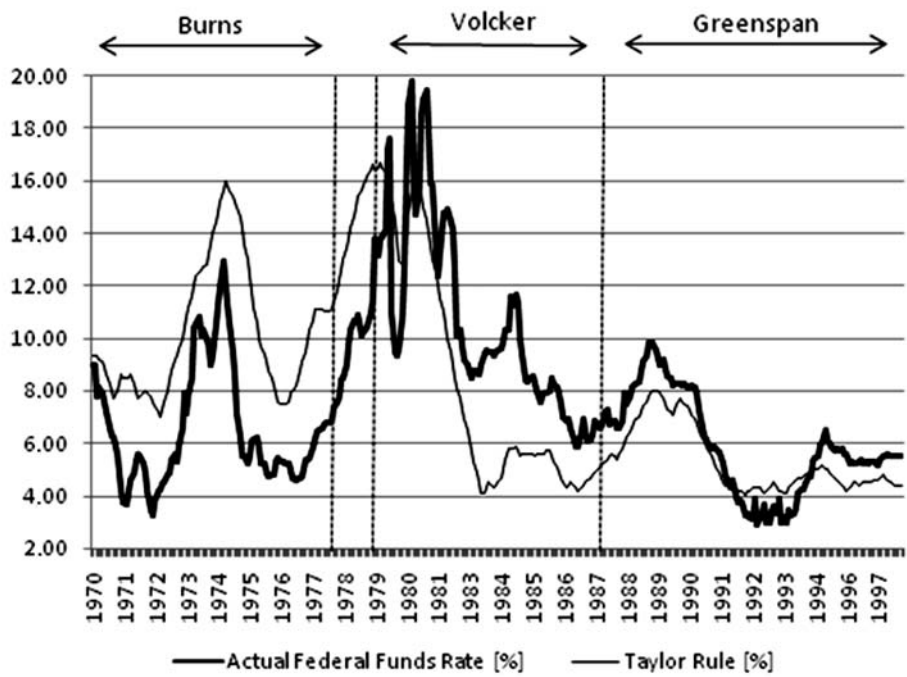
Originally, Taylor suggested the formula for the USA. Coefficients were based on empirical study; they were not econometrically estimated [25]:

$$i = 2.0 + \pi + 0.5\, y + 0.5\, (\pi - 2.0) \quad (4)$$

Inflation target and real neutral interest rate equals 2 %. Moreover, according to Taylor, both inflation gap and output gap have the same influence on interest rate, therefore, both these components have the same weights of 0.5 %.

Mathematic interpretation sounds: If actual inflation rate equals the targeted one and the economy has achieved potential product, the real interest rate is 2.0 %. For each percentage point by which the inflation rises above (decreases under) 2.0 %, interest rate will increase/lessen by 0.5 percentage points. And each 1-percentage rise/

Fig. 2: Comparison of the Taylor rule results to Federal Funds Rate during the period of three FED governors – Burns, Volcker and Greenspan



Source: [12]

fall of output above its potential level means rise/fall of interest rate by 0.5 %.

Economic interpretation emphasizes that both inflation and economic growth (respectively low unemployment) are two equivalent goals. This fact corresponds to official announcements of the FED.

The Taylor rule describes economic evolution in the USA during the past 30 years very truly, especially since 1985. In periods, when real interest rate was equal to the one given by the formula, the economy was growing. On the contrary, during the years, when these values were different, macroeconomic parameters were not ideal.

Fig. 2 compares the Taylor rule with federal funds rate on quarterly basis from 1970 to 1998, the period of three FED governors – Burns, Volcker and Greenspan [12].

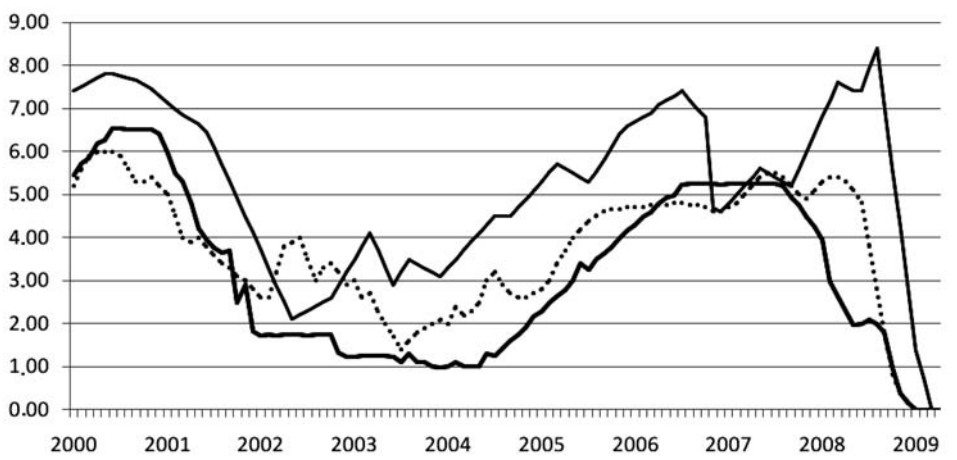
During Burns period, interest rate in the economy was lower than that given by the formula. Still, their evolution was highly correlated. These years were connected with significant increase in inflation. If the FED had followed the Taylor rule (with target inflation of 2 %), inflation would have been lower.

The period of Volcker brought opposite evolution. The figure shows interest rate moving under the level determined by the rule. These years were also connected with a sharp reduction of inflation that was more aggressive than the one suggested by the formula.

Greenspan´s period meant compliance of values in real economy and those calculated from the rule. High correlation continued till 2002. Following four years of Greenspan´s governance were under sharp critique. Taylor accused the FED of stimulating monetary policy too much that have caused housing bubble. In the beginning of year 2010, a vehement discussion has started after Bernanke, current governor of the FED and superseder of Greenspan, defended the US monetary policy in years 2002–2006. He pointed out the differences between the Taylor rule results based on actual data and those based on predicted data. While Taylor suggested contemporaneous values, the FED used forecasted ones. Fig. 3 shows much stronger correlation between latter data and federal funds rate than when calculating with actual data. Therefore, the FED´s policy in these years seems to have been appropriate.

Taylor reacted to Bernanke´s speech immediately [22]. He defended his opinion and claimed that the deviation from the Taylor rule was the largest since 1970s. He pointed out several problems and drawbacks of Bernanke´s analysis [22]. Firstly, the forecasted inflation used by the FED in the Taylor rule was too low, because the inflation during the given period had increasing trend. Secondly, there is uncertainty about the type of forecasted inflation. Beside the data that the FED has used, there is also an average of private sector inflation. However, the result will still be „too low for too long“. Thirdly, Bernanke criticized the Taylor's formula that it reacts to short-term movements of inflation. Nevertheless, current inflation measured by price indices avoids this problem as well. Fourthly, Taylor disagrees

Fig. 3: Comparison of the Taylor rule and The federal funds rate using inflation forecasts



Source: [22]

with Bernanke´s statement about low statistical relationship between the deviation from the rule and the housing bubble. The OECD [22] has provided this research and showed high correlation between these two variables. Finally, Taylor thinks it is not necessary to observe his rule to conclude that federal funds rate was too low. The real interest rate in this period was even under zero, which supported borrowers and led to the housing bubble.

In conclusion, although Taylor considers Bernanke´s view wrong, he finds outburst of this debate positive. The FED has started to analyse its own policy and evaluated it transparently.

As already said, Greenspan was replaced by Bernanke in his post. During this period the economic crisis has raised the issue of the most appropriate way to conduct the monetary policy and the number of critics has been increasing again.

3.2 Great Britain

Although the Bank of England has not committed itself to follow strictly any monetary rule, its main goal is to keep stable and low inflation. Since June 1997, inflation target has been 2.5 % [19]. Moreover, in the past years, central bank has used McCallum and the Taylor formula based on quarter data as assistance by decision taking. The Taylor rule derived from British data from 1993 till 2001 by Nikolov has taken on this form [19]:

$$R_t = r_t^{ss} + 1.5*(\pi_{t-1} - 2.5) + 0.5*(y_{t-1} - y^*_{t-1}) \quad (5)$$

r_t^{ss} represents neutral real interest rate based on indexed bonds. Output gap values move from 0.25 to 0.75.

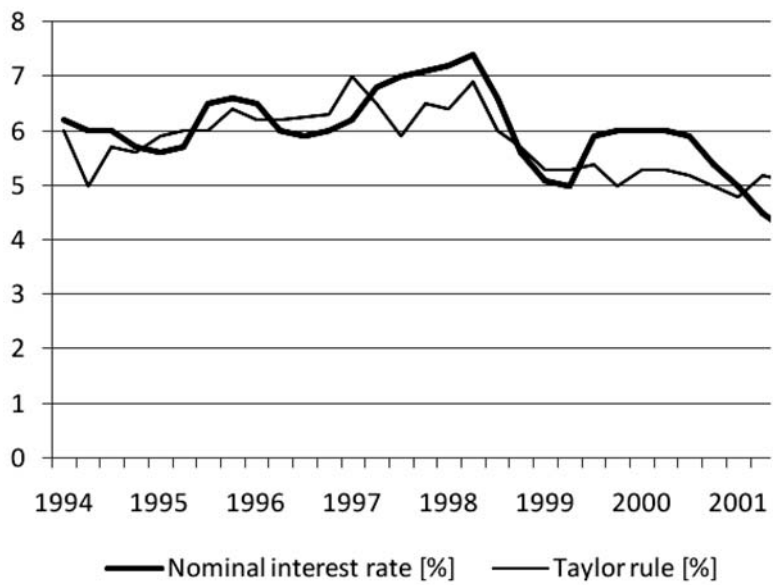
Comparison of the Taylor rule results and nominal interest rate is obvious from Fig. 4.

Moreover, the Bank of England calculates the so-called reverse Taylor rule with inflation gap coefficient of 1.5 % and output gap coefficient of 1.0 %. This enables to extract the information about the output growth.

3.3 Japan

Application of the Taylor rule in this country was specific in comparison to other countries. The reason is low inflation even deflation, which is long-term problem of the Japanese economy. If the key interest rates set by the central bank are close to zero, it is impossible to evaluate the monetary policy through the Taylor rule because it may result in negative values that cannot be applied.

Fig. 4: Comparison of the Taylor rule results and nominal interest rate in Great Britain from 1993 to 2001



Source: [19]

Kuttner and Posen [12] worked out several versions of both forward- and backward looking Taylor rules based on conditions of the Japanese economy in the years 1986–2001. They used the following form of the formula:

$$i_t = (1-\rho_1-\rho_2)[r^*+\pi^* + \alpha\,(y_t - y^*_t) + \beta\,(\pi_t - \pi^*)] + \\ + \rho_1\, r_{t-1} + \rho_2\, r_{t-2} \qquad (6)$$

Except for the parameters and coefficients included in the original formula, the interest rates from two previous periods were added here. Inflation was computed by CPI, the inflation target is 1.0 %. The values of all the coefficients are collected in the Tab. 1 and Tab. 2 according to the method used for calculating the output gap.

The Tab. 1 shows that the interest rate calculated by using the forward-looking rule was in the analysed period sensitive mostly to the evolution of output gap. On the contrary, in case of forward-looking rule the coefficients of the output gap were relatively low. The high values were only connected with β. Therefore, the Japanese economy reacted significantly to the changes in inflation rate, while the answers to movements of output gap were negligible.

3.4 China

The authors of the Taylor rule in China are Xie and Luo [12]. They analysed the situation from 1992 to 2001 and used the quarter data. Their formula has this form:

$$i_t = (1-\rho)\alpha + (1-\rho)\beta\pi_t + (1-\rho)\gamma y_t + \rho i_{t-1} + \varepsilon_t \qquad (7)$$

The coefficients are in the Tab. 3.

Xie and Luo came to the conclusion that the forward-looking rule describes the Chinese economic situation appropriately. According to the data, the output gap has larger influence on the interest rate than inflation.

3.5 The Czech Republic

The Czech National Bank as the central bank and the monetary authority in the Czech Repub-

Tab. 1: Values of coefficients of the backward looking Taylor rule in Japan

Method of calculating output gap	r*	β	α	ρ_1	ρ_2
Linear trend	2.36	1.12	0.58	1.15	-0.29
HP filter	1.18	1.64	0.79	1.26	-0.36
Kuttner-Posen model	1.88	0.72	1.60	1.25	-0.34
Quadratic trend	0.87	0.60	0.57	1.38	-0.44

Source: [13]

Tab. 2: Values of coefficients of the forward-looking Taylor rule in Japan

Method of calculating output gap	r*	β	α	ρ_1	ρ_2
Linear trend	2.14	2.52	-0.04	1.31	-0.45
HP filter	2.34	2.46	-0.10	1.27	-0.42
Kuttner-Posen model	2.10	1.91	0.51	1.26	-0.37
Quadratic trend	1.95	1.93	0.01	1.49	-0.59

Source: [13]

Tab. 3: Coefficients of the Taylor rule in China

α	β	γ	ρ
1.84	0.81	2.84	0.82

Source: [12]

lic has used a new analytic tool, so called model g3, since January 2007 [20]. This dynamic model provides the interpretation of actual economic evolution of the country and consequently the prognosis of the future state including the analysis of the risks connected with this forecast.

Important part of this model is the forward-looking reaction function of the central bank using the quarter data, which is based on the formula of J. B. Taylor. It expresses the relationship between the nominal interest rate and the expected inflation. In comparison to the original Taylor rule, it excludes the output gap. Its form is [16]:

$$i_t = \rho i_{t-4} + (1-\rho)(\tilde{i}_t + \psi \pi_{t+4}) + \varepsilon_t \quad (8)$$

i_t represents nominal interest rate, ρ is the interest rate smoothing parameter, $\tilde{i}_t$ stands for the neutral interest rate in the economy, which is the sum of real interest rate and inflation expectations. ψ presents the weight of the deviation of inflation from its target and ε_t expresses monetary policy shocks.

This formula takes into account quarter data and is forward-looking.

3.6 Poland

Polish monetary reaction function combines the signs of models for closed economy and those for small open economy. The formula expresses the influence of inflation deviation from its target, GDP, interest rate growth rate and GDP growth rate to the interest rate. Moreover, the rule takes into account unexpected shocks. Gradzewicz and Makarski suggested the following formula [8]:

$$\hat{R}_t = 0.71\,\hat{R}_{t-1} + 0.29\,[1.31\hat{\pi}_t + 0.46\,\hat{Y}_t] + 0.11\mathrm{d}\,\hat{Y}_t + \\ + 0.2\mathrm{d}\,\hat{\pi}_t] + \varphi_t \quad (9)$$

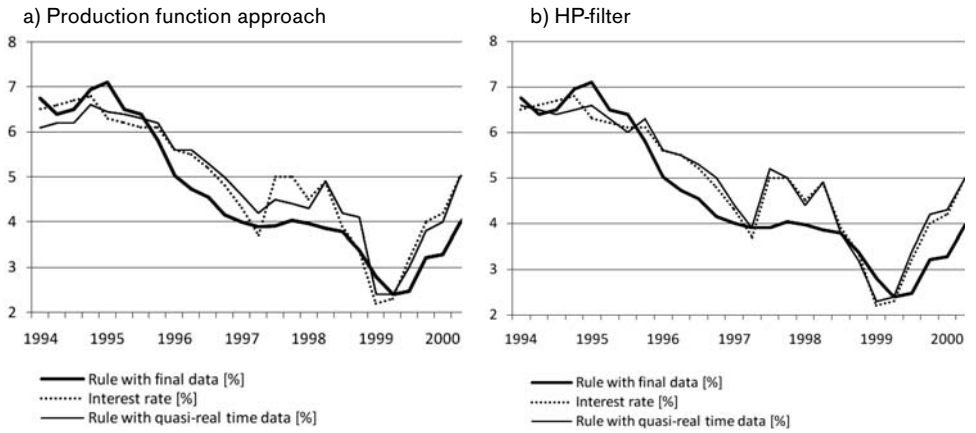
The interest rate smoothing coefficient reaches the level of 0.71, which is under the expected value. On the contrary, inflation and GDP coefficients are above the expectations. This Polish example has showed the importance of the monetary rule that can help to specify the situation in the economy.

Except for these countries, the Taylor rule is also calculated in other countries, such as Hungary, Latin American countries or Australia. Our objective was to calculate the Taylor rule for Slovakia.

4. Application of Monetary Rules in Monetary Union

It would seem that it is not necessary to formulate a particular monetary rule for each monetary union member state separately, as monetary policy is applied in a common way for the whole union. However, if a National central bank knows a monetary rule for its country, it can defend economic interests of that country in a more obvious and transparent way. It can give to the central bank more arguments in common decision making process.

Fig. 5: The Taylor rule based on actual and ex-post data in the euro area



Source: [1]

4.1 The Euro Area

Success of the Taylor rule inspired many experts to derive its form for the euro area.

Gerlach and Schnabel [7] have conducted research and found out that interest rate given by Taylor was moving very closely to the interest rate in a real economy. Exceptions were only years 1992, 1993, periods of disturbances on exchange market.

Interesting results came out from a study by Adema [1], as well. She criticized using ex-post data when calculating the Taylor rule. She preferred actual data available in the period when monetary authority decides about the height of interest rate.

In order to compare the results based on various data, she decided to analyse the situation both with ex-post and actual data. She estimated interest rate to be 3 % and target inflation 2 %. As the ECB uses HICP by calculating inflation, she used this index as well. Results are visible in the Fig. 5.

These two graphs show the difference between the results based on actual and ex-post data. It was not as clear as in the USA, as the relation between the interest rates and the output gap is weaker in Europe. It is well known also through official statements of the FED´s and the ECB´s goals.

4.2 Slovakia

Since January 2009, the Slovak Republic has been a member state of the euro area. Consequently, the goal of the Slovak central bank corresponds to the one of the ECB, which is price stability. Inflation target is announced officially at the level of 2 %. Slovak monetary policy is based on inflation targeting. It can seem that a member state of the European Monetary Union does not need an own monetary rule as a common monetary policy is applied for the whole euro area. Loss of independent monetary policy is one of the most cited disadvantages of euro adoption. However, a common monetary policy is often a compromise taken during the Governing Council sessions where the Executive Board and the governors, or presidents of all national central banks of the euro area, meet usually twice a month. The Governing Council takes the monthly monetary policy decisions, which means setting the key interest rates for the euro area [8]. As governors of national central banks can intervene and vote, they should know an optimal monetary rule for their country to influence e.g. level of base rates. An optimal monetary rule can facilitate their decision making process, even if it is not a binding commitment.

Several authors [18] have already tried to suggest an appropriate monetary rule for Slovak conditions. Our objective was to calculate a suitable form of such a rule applied to situation in Slovakia. The possible Taylor rule calculated econometrically after Koyck transformation could be:

$$BR_t - \rho.BR_{t-1} = \beta_0 + \beta_1.HICP_t + \beta_2.PB_t + u_t$$
$$\rho = 0.7944332 \qquad (10)$$

The formula is based on quarter data from the second quarter 2000 till the end of 2008 gained from the Eurostat and the National Bank of Slo-

Tab. 4: Descriptive statisctics

Variable	Key interest rate of NBS (BR)	Inflation rate (HICP)	Balance of payments – annual change (PB)
Number of observations	36	36	36
Mean	5.747	5.743	-0.444
Median	4.875	5.230	-0.027
Standard deviation	2.166	2.418	2.557
Variance	4.691	5.845	6.539
Minimum	2.500	2.719	11.468
Maximum	8.800	10.981	4.104

Source: own calculations according to [9] and [10]

vakia (NBS) statistics [8], [9]. BR stands for key interest rate set by the NBS. HICP represents harmonised index of consumer process and is smoothed by HP filter. The reason to apply HICP as a measure of inflation was that it is used in the whole euro area. PB is percentage change of quarter imbalances of balance of payments.

Descriptive statistics of the model is expressed in Table 4.

This model fulfils tests of normality of residuals, heteroscedasticity, multicolinearity and autocorrelation.

As we can see in Fig. 6, the differences between the Slovak formula and the original Taylor rule are significant. First of all, this rule offers harmonised index of comsummer prices, while Taylor has taken inflation gap into account. Using inflation gap in the Slovak formula has led to the failure in residual normality test. Moreover, our derived formula includes, beside inflation and output parameters, the information about balance of payments as well. The main reason for the formula expansion is the fact that the Slovak economy is significantly open, as it is obvious from several studies [23]. Both import and export ratios to GDP are above 70 % [14].

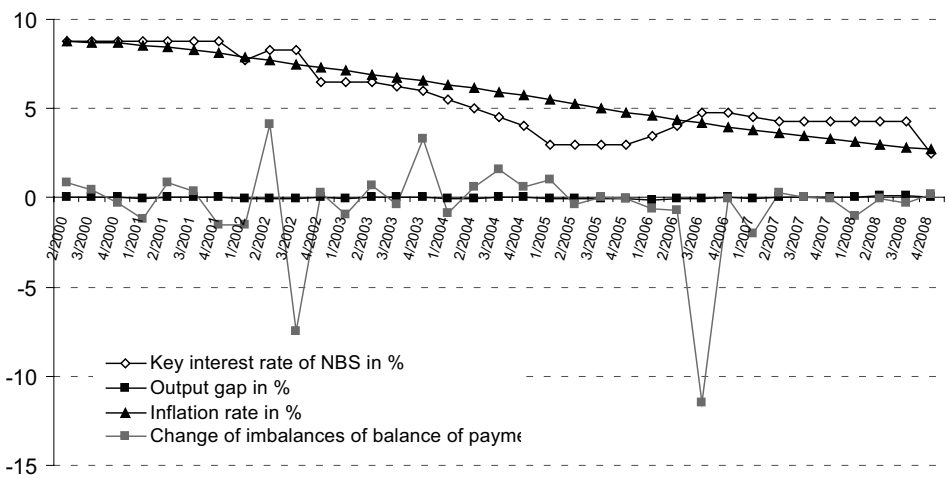
Moreover, the Taylor rule has been already modified in several countries and consequent the Taylor-type rules were suggested (e.g. [8], [19]). Modifications of the Taylor rule were justified in several publications, e.g. [18] with the respect to country specifics, level of a country centralisati-

Tab. 5: Results of modified Taylor equation

Variables	Estimated coefficients	Standard error	t value
Intercept	-0.05473	0.22918	-0.239
HICP	0.18740 ***	0.03772	4.969
PB	-0.06088 .	0.03311	-1.839
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1			
Multiple R-squared: 0.4508 Adjusted R-squared: 0.4165			

Source: own calculations according to [9] and [10]

Fig. 6: Evolution of key interest rate, output gap, inflation rate and imbalances changes in % since 2/2000 to 4/2008



Source: own calculations according to [9] and [10]

on or decentralisation at regional level [27] and particular macroeconomic circumstances. Consequently, different variables can be taken into account in formulation of a Taylor type rule, e.g. balance of payments, asset prices [24] etc.

Consequently, the final output of our model is:

$$BR_t = -0.05473 + 0.7944332.BR_{t-1} + 0.18740.HICP_t - 0.06088.PB_t \quad (11)$$

According to the formula, if HICP is raised by 1, the base interest rate should increase by 0.187. This coefficient confirms the reality. If the inflation is getting to higher values, it is usually connected with the growth that leads to overheating of the economy. Then the central bank could raise the interest rates to slow the economy down and to prevent it from crossing the potential product. Close relationship between these two variables is also observable on the Fig. 6. Both parameters have, in the analysed period, a slightly decreasing trend.

The increase in changes in imbalances of balance of payments of 1 leads, as the formula says, to the decrease in changes of key interest rate by 0.061. However, if we express it absolutely, the rise in imbalances of balance of payments should lead to a more significant increase in key interest rate. Apparently, this relationship is not as tight as the previous ones, although it is still important. This confirms the following graph, presenting mostly contradictory trend of the variables.

Finally, comparatively high parameter associated to key interest rate in previous period means, that Slovak central bank did not change its base rate abruptly but rather gradually. This fact is consistent with other studies, e.g. [18].

Strong correlation ($R^2 = 0.978$) between calculated and really applied key interest rate indicates succesfull the National Bank of Slovakia monetary policy application and its coherence with the Taylor-type rule.

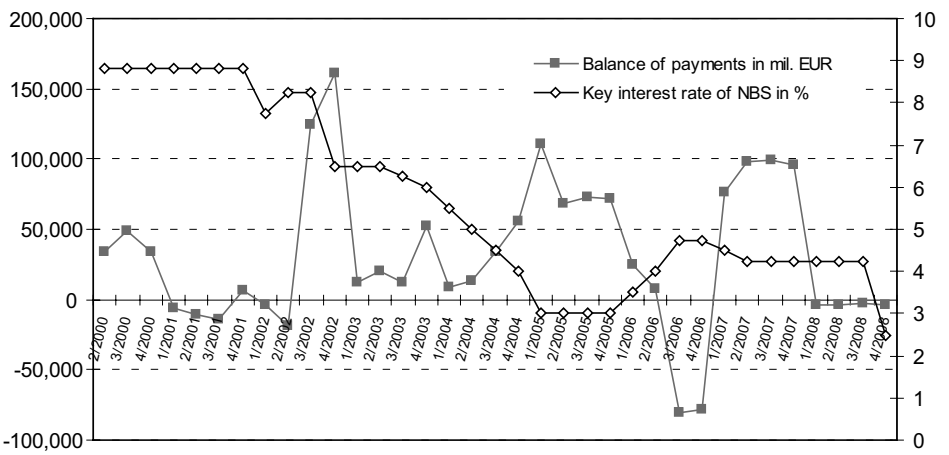
5. Conclusion

Many experts question nowadays, during the world crisis, the accuracy of the Taylor-Type rules. They claim they bring negative results, which cannot be applied. Although Taylor himself states that his original rule works even now and the FED does not use the right data, positive opinion on this easy formula is discredited.

However, in the long term such a formula can be helpful. Central banks are able to decide about the level of key interest rate more precisely. Naturally, monetary rule should not be followed blindly; nevertheless, it should serve as a certain guideline. After all, this has been the original message of the Taylor rule.

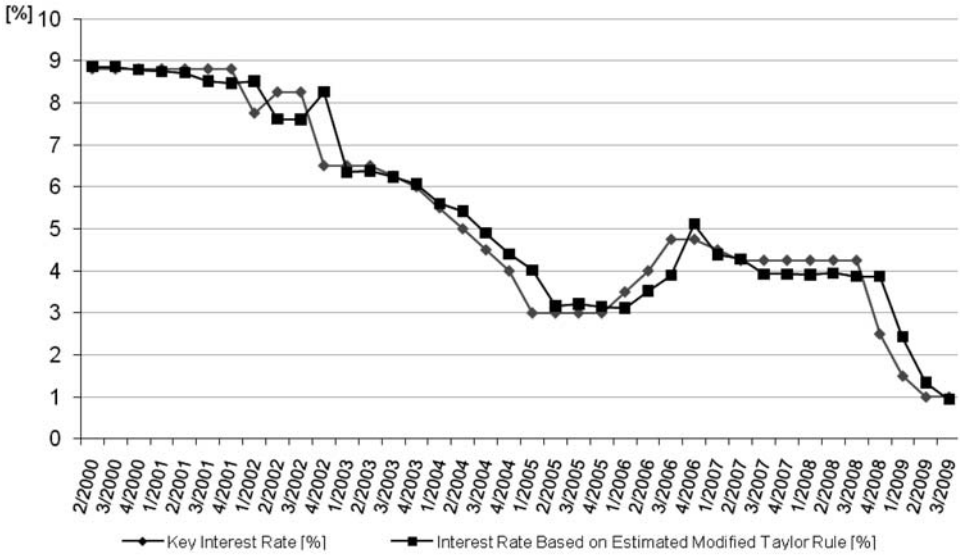
The Slovak Republic should not be an exception. The Taylor rule could represent a monetary tool that helps to direct the requirements of the country when deciding about the level of interest rates to be set in the euro area. Although, monetary decisions are valid in all member countries, they can take part in discussions where the final consensus is achieved.

Fig. 7: Evolution of balance of payments and key interest rate in % since 2/2000 to 4/2008



Source: own calculations according to [9] and [10]

Fig. 8: Comparison between the key interest rate in Slovakia and the estimated modified Taylor rule interest rate, observed period 2/2000–3/2009



Source: own calculations according to [9] and [10]

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Doručeno redakci: 16. 3. 2010
Recenzováno: 10. 9. 2010, 15. 9. 2010, 15. 1. 2011
Schváleno k publikování: 1. 7. 2011

ABSTRACT

MONETARY RULES AND THEIR APPLICATION IN TIMES OF ECONOMIC CRISIS AND IN THE EURO AREA

Marianna Siničáková, Viera Pavličková

The Taylor-type rules and similar monetary rules gained much sympathy during previous periods because of their simplicity and transparency. However, the period of crisis threatened their position in the application of monetary policy. It seemed that the Taylor rules were not valid any more. Despite this fact, Taylor managed to defend his rule for the moment arguing that the data used by the Federal Reserve System were not correct. The Taylor-type rules were discredited. Still, in long-term their application can be important.

In the paper we have compared the formulations of monetary rules in several countries. Moreover, it would seem that the application of monetary rules makes no sense for the individual euro area member states, as their monetary policy is applied in a common way by the European Central Bank. Though, if a national central bank knows a monetary rule for its country, it can defend economic interests of that country in a more obvious and transparent way. It can give to the central bank more arguments in common decision making process at the level of the European Central Bank Governing Council. Consequently, we have decided to calculate a monetary rule for Slovakia as the latest euro area member state. Our derived formula includes, besides harmonised index of consumer prices, lagged base rates, the data on balance of payments as well. The main reason for the formula expansion is the fact that the Slovak economy is significantly open. Besides these facts, other aspects had to be taken into consideration, too.

Naturally, any monetary rule should not be followed blindly; nevertheless, it should serve as a certain guideline. After all, this has been the original message of the Taylor rule.

The paper was elaborated within the project VEGA 1/0973/11.

***Key words**: monetary policy rules, the Taylor rule, discretion, the euro area, economic crisis.*

***JEL Classification:** E52, E 58.*