E C O N O M I C S B U L L E T I N

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I contemplate the Taylor rule as a benchmark for setting monetary policy in some Accession Countries to the EU in the 1998−2003 period. I find that countries with a floating exchange rate regime (the Czech Republic, Poland and Hungary) moved short−term interest rates as suggested by the Taylor rule and in a similar way the ECB is doing. On the other hand, the Taylor rule predicts worse interest rate behaviour in the Slovak Republic where inflation targeting is not adopted yet.

This research was supported by a grant from the BBVA Foundation PB/29/FS/02. I am grateful to seminar participant at 7th INFER Workshop The Consequences of the EU Enlargement to Central and Eastern Countries, Eric Girardin and an anonymous referee for their useful comments. Correspondence to: Ramón María−Dolores, Departamento de Fundamentos del Análisis Económico, Facultad de Economía y Empresa, Universidad de Murcia e−mail: ramonmar@um.es
Citation: Maria−Dolores, Ramon, (2005) "Monetary Policy Rules In Accession Countries to EU: Is the Taylor rule a pattern?." *Economics Bulletin*, Vol. 5, No. 5 pp. 1−16
Submitted: November 30, 2004. **Accepted:** September 15, 2005.
URL: http://www.economicsbulletin.com/2005/volume5/EB−04E50013A.pdf

Monetary Policy Rules in Accession Countries to EU: Is the Taylor rule a Pattern?*

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September 14, 2005

Abstract

I contemplate the Taylor rule as a benchmark for setting monetary policy in some Accession Countries to the EU in the 1998-2003 period. I find that countries with a floating exchange rate regime (the Czech Republic, Poland and Hungary) moved short-term interest rates as suggested by the Taylor rule and in a similar way the ECB is doing. On the other hand, the Taylor rule predicts worse interest rate behaviour in the Slovak Republic where inflation-targeting in monetary policy is not adopted yet.

JEL Classification: E52

Key Words: Taylor rules, inflation targets, monetary policy, exchange rates

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1 Introduction

Monetary policy has considerably changed in some Central and Eastern Europe Countries during the middle of the 90s. Since some of them have been admitted to the EU there is a significant difference in the way monetary policy has been conducted. The majority of central banks in these countries have adopted a new law on its independence making price stability the central bank's number one priority similar to the ECB directive. As a consequence of this change, inflation rates have been less volatile and lower than in previous years. Several authors, such as Peersman and Smets (1998), Taylor (1998, 1999) and Gerlach and Schnabel (2000) discussed the usefulness of the Taylor rule as an informal benchmark for setting policy in the EMU area during the early days of the ECB.

On the other hand, some recent literature centred on the 'twin pillars' approach of the ECB has stressed the fact that the ECB is not following a conventional Taylor-rule. Basically, the first ECB pillar is 'an analysis attributing a prominent role to money' while the second is 'an analysis focusing on a wide range of other economic and financial indicators'. The ECB believes that monetary developments contain information about future price developments and can therefore help in the overall assessment of risks to price stability. For this reason, it points to a focus on monetary and credit aggregates as a way to avoid asset price instability. Nevertheless, the ECB usually takes into account that monetary policy does not respond in a mechanical way to deviations of M3 growth from the reference value[1].

More recently, Gerlach (2004), one of the pioneers in studying the 'two pillars' strategy, has discussed interest rate setting by the ECB, developing indicators of the Governing Council's assessment (such as inflation, economic activity and M3 growth) and investigated their impact on interest rate decisions. In this

[1] See in Gerlach (2003) a formal interpretation of the ECB's two pillar framework for monetary policy.

paper, it is estimated an ECB's reaction function where a statistically significant response exists to inflation and M3 growth. The author also points out that the 'Taylor principle' appears satisfied in the sense that the interest rate has to rise by more than one percentage point in response to one percentage point rise in inflation.

In this paper I show that a Taylor rule captures fairly well the behaviour of short-term interest rates in some Accession Countries (ACs hereafter) which explicitly adopt inflation targeting such as the Czech Republic, Poland and Hungary[2].

The Taylor rule also helps to slightly predict interest rate behaviour in the Slovak Republic where, up until now, there is no news about an inflation-targeting adoption. In spite of the fact that this country is not assuming inflation-targeting, it could be executing its monetary policy in a similar way to the Euro-area. Nevertheless, my empirical analysis is naturally restricted by the lack of data in terms of both length of time series and of quality and reliability[3].

The majority of countries which have adopted an inflation targeting in their monetary policy have a flexible exchange rate. For instance, Hungary had a crawling band exchange rate regime from 1995 to 2000 and changed its regime to a more flexible system (managed float) in 2000. The Czech case is very similar to Hungary. It went from a crawling band system in 1996 to a managed float during the 1997-2000 period and decided to adopt an independent float exchange rate in 2001. Finally, Poland had a crawling band exchange rate system from 1995 to 1999 and adopted an independent float regime in 2000[4].

[2] The dates of adoption of inflation targeting for Czech Republic, Hungary and Poland are January 1998, June 2001 and October 1998.

[3] There are no monthly available data for Lithuania and Malta.

[4] The more recent exchange rate developments ordered from more fixed to more flexible are: 1.Dollarization or Euroization: no separate legal tender, 2. Currency Board: currency fully backed by foreign exchange reserves. 3. Conventional Fixed Pegs: Peg to another currency or currency basket within a band of at most ± 1%. 4. Horizontal Bands: Pegs with bands larger than ± 1%. 5. Crawling Peg: Pegs with central parity periodically adjusted. 6.

The analysis of the performance of the Taylor rule in the rest of Accession Countries to EU for which there are available data (Estonia, Latvia, Slovenia and Cyprus) would not be appropriate. In Estonia, the exchange rate system for the 1992-2003 period was the currency board. The Latvian case is very similar to its northern neighbours and the main objective of its monetary policy is to maintain a fixed parity against a basket of currencies (a conventional fixed pegs). Finally, Cyprus had a fixed pegs system during the 1991-99 period and adopted an horizontal bands system in 2000. In these countries it would not be appropiate to consider the Taylor rule given their economic characteristics. As we know, the more fixed the exchange rate is the more endogenously determined monetary policy is. Thus, I analyse the Slovak Republic case where a crawling band exchange system was employed for the 1996-97 period and a managed float regime after 1997. In this country we have a slightly flexible exchange rate.

Finally, there is another important argument to support the idea that the performance of the Taylor rule would be better in countries which adopt inflation-targeting. We usually solve an optimization problem for the central bank to derive an optimal monetary policy rule. The linear version of the Taylor rule is obtained from a quadratic loss function which only includes inflation deviations from its target. Then, the Taylor rule should predict well the interest-rate setting in these types of countries.

Crawling Band: Crawling peg combined with bands of more than ± 1% 7. Managed Float with no Pre-announced Exchange Rate Path: Active intervention without precommitment. 8. Independent Float: Market-determined exchange rate and monetary policy independent of e. r. policy.

2 The Taylor (1993) rule and its econometric estimation

The original Taylor (1993) rule established:[5]

$$i_t = r^* + \beta_1(\pi_t - \pi^*) + \beta_2 y_t \tag{1}$$

where i_t, π^*, r^*, π_t and y_t denote the nominal interest rate, the target inflation rate, the equilibrium real interest rate (constant), the rate of inflation over the past year and the output gap, respectively.[6]

To analyse the Taylor rule properties in ACs countries I follow Clarida, Galí, and Gertler (2000) where the observed interest rate smoothing behaviour is represented by a partial adjustment model whereby lagged values of the interest rate are also included as explanatory variables. So, the optimally determined interest rate is interpreted as the desired rate towards which the current interest rate sluggishly adjusts. That is,

$$i_t = \rho(L) i_{t-1} + (1-\rho) i_t^* + \xi_t, \tag{2}$$

where $\rho(L) = \rho_1 + \rho_2 L + \cdots + \rho_{n+1} L^n$, $\rho \equiv \rho(1)$, and i_t^* is given by the right hand side of equation (1). Substituting (1) into (2), the model to be estimated is

$$i_t = \gamma + \rho(L) i_{t-1} + (1-\rho)(\beta_1 \pi_t + \beta_2 y_t) + \xi_t, \tag{3}$$

where γ is an intercept term and ξ_t is an error term.

By reasons related to data revisions, the current values of inflation and the output gap are taken to be unknown by the central bank when setting interest rates, then the equation (2) can be estimated by the Generalised Method of the Moments (GMM), using lagged values of the variables as instruments[7]. I also

[5] For an analytical derivation of the Taylor rule see Svensson (1997).

[6] Taylor (1993) proposed $\beta_1 = 1.5$ and $\beta_2 = 0.5$ to predict correctly the Federal Reserve period for the 1987-1992 period.

[7] As an additional check on the robustness of the results a forward-looking versions of (2) can be estimated where the current values of $\pi_t (y_t)$ are replaced by expectations of future variables $k(q)$ periods ahead, $E_t \pi_{t+k}$ ($E_t y_{t+q}$).

estimate the previous equation assuming that π_t and y_t are directly replaced by its values in the previous period, π_{t-1} and y_{t-1}, a Backward-Looking (BL) Taylor rule.

3 Empirical Evidence

3.1 Data description

The Taylor rule is estimated using the Czech Republic, Poland, Hungary and the Slovak Republic monthly data on inflation, the output gap, and short-term interest rate. All the data is drawn from the Eurostat database. Inflation is measured by the annual percentage change in the seasonally-adjusted Harmonised Consumer Price Index (HCPI). Output is measured by the seasonally-adjusted Industrial Production Index (IPI). The natural output level is the Hodrick-Prescott (HP) trend of the logged IPI. The output gap is then computed as the difference between the logged IPI and its HP trend. The sample periods are: the Czech Republic (1998:03-2003:09), Poland (1997:02-2003:09), Hungary (1998:02-2003:09) and the Slovak Republic (1999:06-2003:09).

3.2 Main results

As is conventional in the estimation of contemporaneous or forward-looking Taylor rules, the estimation method relies upon the choice of a set of instruments from the set of variables within the central bank's information set, such as lagged variables, that help forecast inflation and output or any other contemporaneous variables that are uncorrelated with the policy rule shock[8].

Then, the Generalized Method of Moments (GMM) can be used to estimate the parameter vector by exploiting the set of orthogonality conditions. Since

[8] The list of instruments includes a constant-term, six lags in interest rate, six lags in inflation and six lags in the output gap.

the composite disturbance has an MA(k) representation, due to the overlapping nature of the forecast errors, the weighting variance-covariance matrix used to implement GMM is the one proposed by Newey and West (1987). The overidentification restrictions of the model are not rejected by the data at standard significant levels.

I estimate three versions of the GMM model: (i) no forward-looking component for inflation and output gap, (ii) a forward-looking component of twelve and zero months for inflation and output, respectively and (iii) a forward-looking component of twelve and six months for inflation and output, respectively[9].

The estimated monetary policy rules are displayed in Table 1. I observe that the BL rule always predicts better than that derived by GMM (Root-Mean-Squared-Errors, RMSEs, are shown in Table1) models in Poland, the Czech Republic and Hungary. The results in the BL model show that the weights on inflation and output gap are very significant in both types of estimation although are not identical to those of the original Taylor rule. For the Czech Republic and Poland I observe the largest similarities deriving a weight for inflation (β_1) of 1.04 and 1.27 in the BL rule, respectively. With reference to the output gap (β_2) I obtained values of 0.51 and 0.99, respectively. In all cases, except in Hungary and the Slovak Republic, the point estimates of β_1 are above unity in line with an inflation-stabilizing policy rule as explained by Clarida et al. (2000).[10]

Nevertheless, this result could be caused by the adoption by Hungary of an inflation target policy since June 2001 and our sample period captures data between 1998 to 2003. For the Slovak Republic I offer predictions using the GMM model that derives better results. I consider a forward-looking component for inflation of one year and the coefficient is below unity. This value implies that the Slovakian central bank is executing an accommodative monetary policy rule .

[9] I only offer the best GMM model for each country in Table 1 to save space.

[10] The number of lags in the interest rate smoothing behaviour is chosen by using the Akaike Information Criteria.

Finally, in order to ascertain the forecasting advantages of using the Taylor rule to track the evolution of short-term interest rates I compute the dynamically simulated fitted values of the GMM and BL estimated rules. As an illustration of my results Figs.1-3 depict the interest rate (continuous line) and the within sample predictions in the Czech Republic, Poland and Hungary obtained by the BL Taylor rule (dotted line) and Fig.4 the same for the GMM rule in the Slovak Republic.

3.3 A Comparison with the ECB Taylor rule

In order to compare the monetary policy reaction functions derived in the previous ACs with the rule followed by the ECB I estimate GMM and BL Taylor rules for the Euro-zone. I have considered monthly data for the Euro area over the period 1997:01-2003-09 to be able to compare results. These data have been constructed by Eurostat using weighted averages of the individual countries with GDP-weights measured in units of PPP at 1995 prices. The idea is to study how a surrogate ECB would have behaved had it exerted monetary control over the Euro area during a period comprising the pre-EMU period (before 1999:01) and afterwards.[11]

Although this exercise could be subject to several criticisms (see Introduction), its main objective it is to observe similarities between these countries and the Euro area in a simple way. Gerlach (2004) estimates a reaction function which includes the ECB developing indicators of the Governing Council's assessment of inflation, economic activity, and M3 growth, and investigates their impact on interest rate decisions. He finds M3 growth statistically significant[12].

Thus, my results are reported in Table 2 and Fig.5 graphs the BL Taylor rule dynamic predictions for the Euro-zone and demonstrate that this rule could be

[11] This exercise implicitly assumes that the ECB has the same preferences as national central banks before EMU.

[12] Unfortunately, I do not have access to these indicators and I can not use a M3 growth variable inside the Taylor rule because there are no data available for all the countries in my sample.

a good approximation. I select a BL Taylor rule because it predicts better than a GMM Taylor rule. When we observe the associated coefficients to inflation (β_1 = 1.11) in the BL model we find that they are very similar to those derived from the Czech Republic (1.04) and Poland (1.27) for similar periods. With reference to the output gap response (β_2) I detect more divergences. For the GMM model which assumes a forward- looking behaviour of 1-year for inflation I obtain a β_1 equal to 1.26. This value is very similar to the cases of Poland (1.20) and Hungary (1.25). I also obtain a high value for the smoothing behaviour parameter in the Euro area. This result shows that the ECB appears to have a strong preference to minimize volatility in its interest rates.

Finally, to explore this issue I consider the next experiment. I suppose that each ACs central bank had followed a policy rule of the type I estimate for the ECB. So, at each point in time, I calculate the target interest rate under the ECB rule, given the historical measures of the inflation and output gaps for that country. Figs 6-9 depict the outcome of this exercise. Historical rates are above the implied interest rate under ECB policy as a consequence of the disinflation process in the Czech Republic, Poland and Hungary. Note that the gap between the interest rate and implied ECB target policy varies similarly in the Czech Republic and Hungary. For the nineties the disinflation period was strong and short-term interest rates are clearly above the implied target. After that episode they tend to be similar although the last year the gap widens during the last year. Such a widening gap was caused in the Czech Republic by a strong appreciation of the Czech koruna from the end of 2001 that led the Government and the Central Bank to adopt a package of measures to halt this trend. In Hungary there were similar events and the currency appreciated substantially, with some speculative fluctuations, following the changes to a floating exchange rate system.

Poland seems to be a similar case, we always have interest rate above the implied under ECB policy in the majort part of the sample except the year 1999. It is true that there was a disinflationary period in Poland but financial

markets could have forced to maintain high real rates to sustain exchange rates during longer periods than in the Czech Republic and Hungary. The Polish authorities used to operate a clear exchange rate policy based on a crawling peg. The zloty lost almost 10% of its value in the currency fluctuations induced by the Russian crisis and subsequently switched to a free float (April 2000), an exchange rate strategy consistent with inflation targeting. Finally, I observe short-term interest rates under the target implied by the ECB rule in the Slovak Republic. This result could be due to a lack of inflation-targeting in its monetary policy.

4 Conclusions

Since the demise of the Soviet-type communist regimes at the start of the 1990s, the ACs have made substantial progress in transforming their economies. As a consequence, for a large majority of these countries, the perspective of EU membership became a reality last May 2004. In addition to structural reforms, the implementation of macroeconomic stabilisation programs appears to be a major determinant. There is a great diversity in monetary policy frameworks and exchange rate regimes among these countries although they share a common goal, accession to the EU and the adoption of the Euro. Some countries, with a relatively free or fully floating exchange rate regime (the Czech Republic, Poland and Hungary) have decided to adopt an inflation-targeting monetary policy.

The results derived from monetary policy responses of these ACs central banks to inflation and output gaps suggest that these three countries are following the Taylor rule. This result could be explained by the desire to be included soon in the EU and years later to join EMU. The use of Taylor rule would serve them during the transition process in order to allow them to maintain macroeconomic stability and speed up the process of nominal convergence. I also analyse a country without inflation-targeting in monetary policy, the Slovak Republic,

and observe that the Taylor rule predicts worse interest rate behaviour than in other ACs.

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Table 1. Estimated Taylor rules in some ACs

Coefficient	Czech Republic	Poland	Hungary	Slovak Republic
	A. GMM Taylor rule			
	(π_t, y_t)	(π_t, y_t)	(π_t, y_t)	(π_{t+12}, y_t)
$\hat{\rho}_1$	0.83*	0.92*	0.91*	0.46*
	(0.08)	(0.02)	(0.03)	(0.001)
$\hat{\gamma}$	2.37*	3.54†	4.39*	7.05*
	(0.18)	(2.14)	(0.08)	(0.01)
$\hat{\beta}_1$	0.59*	1.20*	1.25*	0.11*
	(0.05)	(0.14)	(0.30)	(0.002)
$\hat{\beta}_2$	0.24†	0.23	1.14	0.19*
	(0.14)	(1.11)	(0.99)	(0.007)
p-J	0.084	0.081	0.077	0.072
$Adjusted - R^2$	0.92	0.90	0.89	0.69
$RMSE$	0.91	1.78	1.40	1.77
	B. BL Taylor rule			
$\hat{\rho}_1$	0.88*	0.79*	0.77*	0.53*
	(0.02)	(0.05)	(0.08)	(0.05)
$\hat{\gamma}$	1.15*	7.06*	3.81*	6.07*
	(0.57)	(1.51)	(2.31)	(0.52)
$\hat{\beta}_1$	1.04*	1.27*	0.87*	0.15*
	(0.12)	(0.14)	(0.19)	(0.01)
$\hat{\beta}_2$	0.51*	0.99†	0.28†	0.20
	(0.13)	(0.64)	(0.16)	(0.26)
$Adjusted - R^2$	0.93	0.92	0.92	0.73
$RMSE$	0.80	1.67	1.36	1.85

Notes: The figures in parenthesis are standard errors. The superscripts * and † denote the rejection of the hypothesis that the true coefficient is zero at the 5 percent and 10 percent significance levels, respectively. p-J is the p-value of the J-test over-identifying restrictions

Table 2. Estimated Taylor rules for the ECB

Coefficient	GMM Taylor rule (π_{t+12}, y_t)	BL Taylor rule
$\hat{\rho}_1$	0.87^*	0.91^*
	(0.04)	(0.04)
$\hat{\gamma}$	1.52^*	1.58^*
	(0.79)	(0.50)
$\hat{\beta}_1$	1.26^*	1.11^*
	(0.52)	(0.64)
$\hat{\beta}_2$	$0.57^\dagger$	$0.66^\dagger$
	(0.31)	(0.37)
p-J	0.089	–
$Adjusted - R^2$	0.87	0.88
$RMSE$	0.95	0.83

Notes: The figures in parenthesis are standard errors. The superscripts * and † denote the rejection of the hypothesis that the true coefficient is zero at the 5 percent and 10 percent significance levels, respectively. p-J is the p-value of the J-test over-identifying restrictions

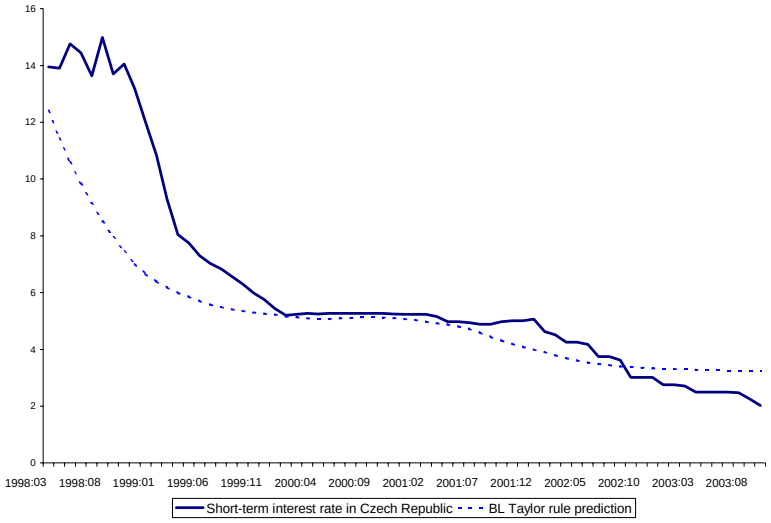

Fig.1: BL Taylor rule in Czech Republic

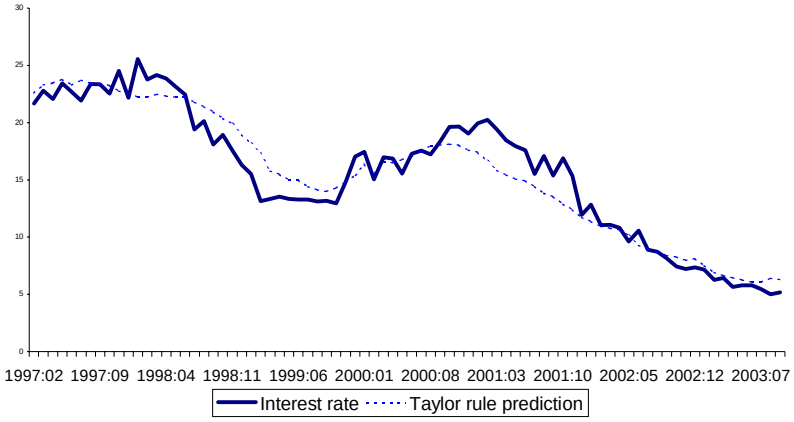

Fig.2: BL Taylor rule in Poland

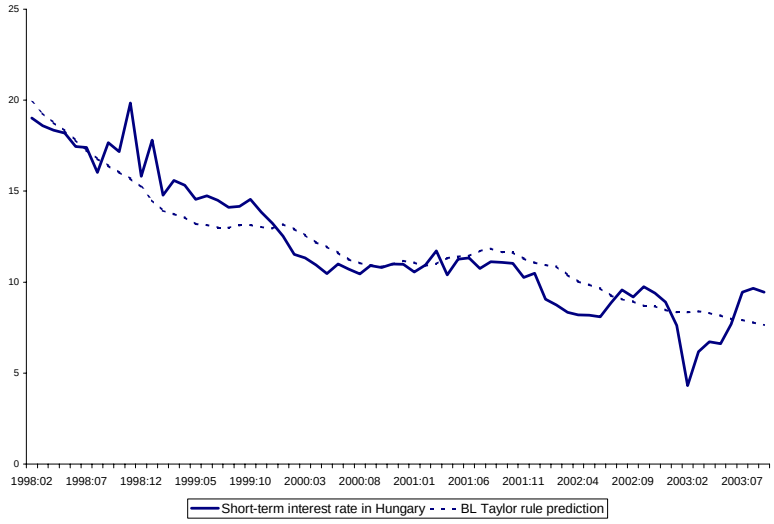

Fig.3. BL Taylor rule in Hungary

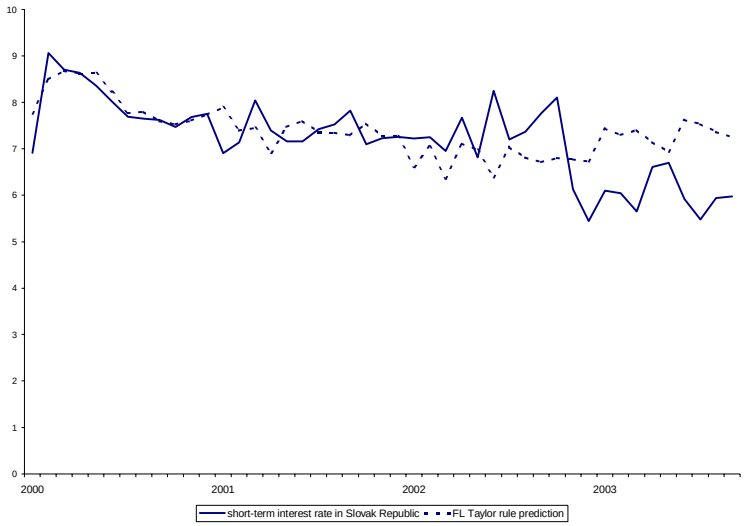

Fig.4. FL Taylor rule for Slovak Republic

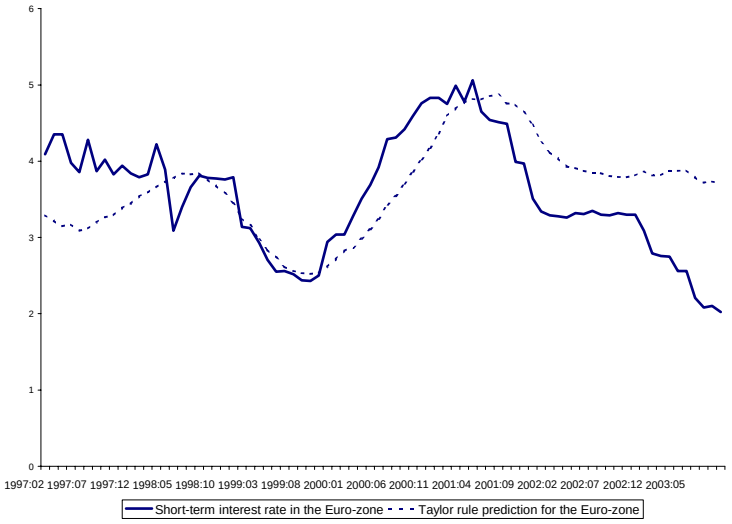

Fig.5: BL Taylor rule for the Euro-zone

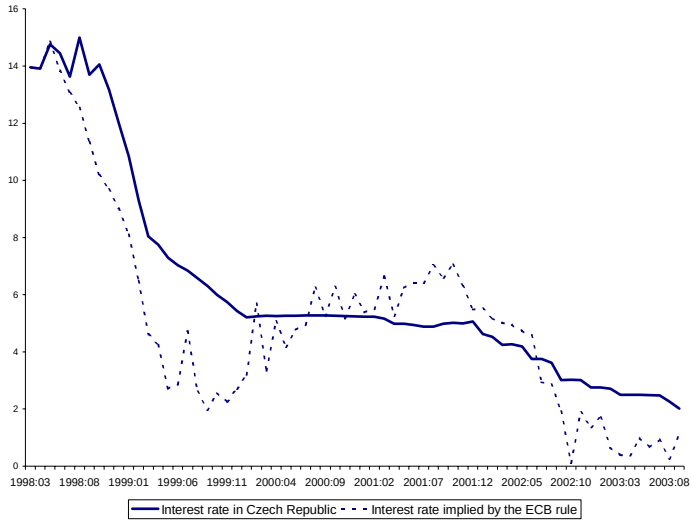

Fig.6: Interest rate in Czech Republic under ECB policy

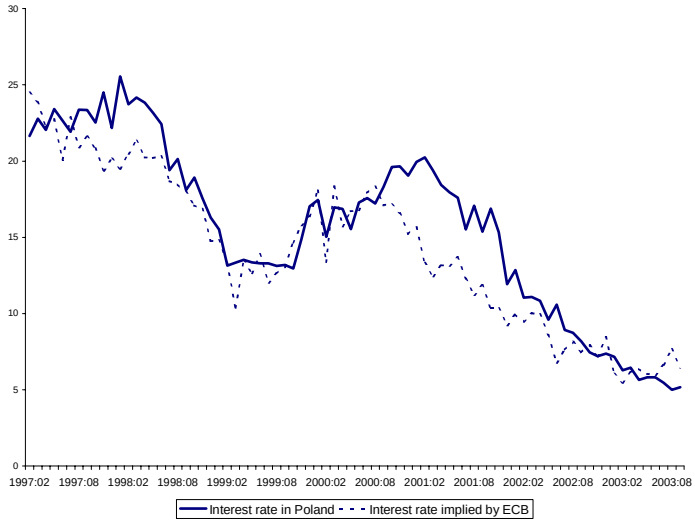

Fig.7: Interest rate in Poland under ECB policy

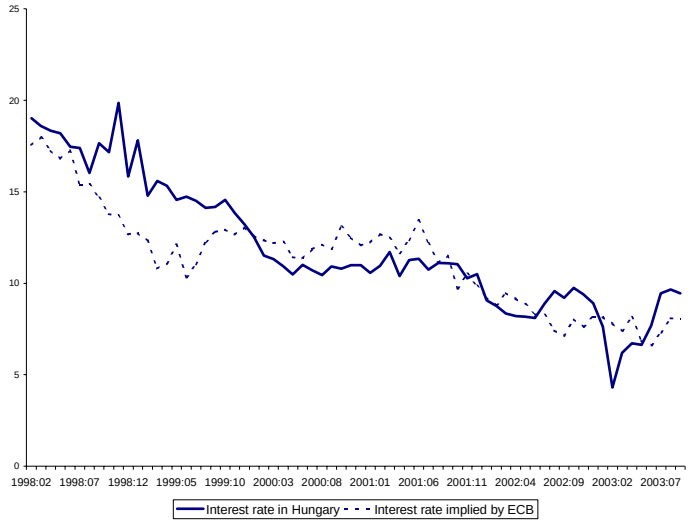

Fig.8: Hungary interest rate under ECB policy

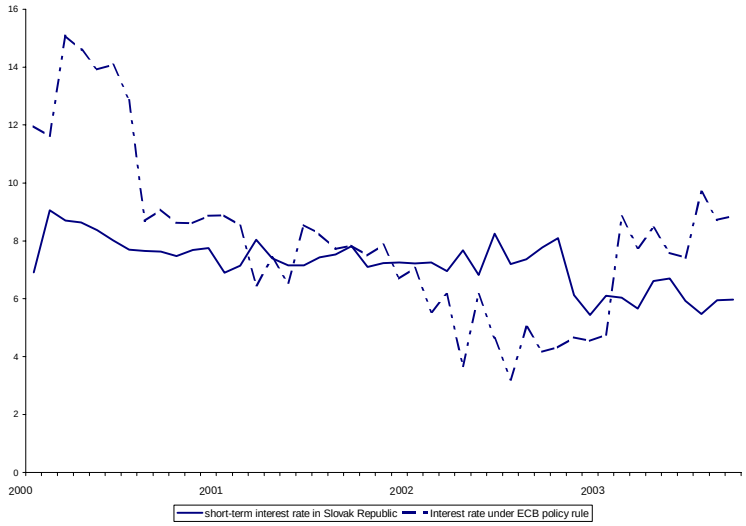

Fig.9. Interest rate in Slovak Republic under ECB policy rule