EFFECTIVENESS OF MONETARY POLICY IN ROMANIA

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Abstract: *The efficiency of monetary policy at macroeconomic level presupposes the study of Taylor's relationship: the change in the interest rate leads to changes in the current and estimated inflation rate as well as in actual and potential GDP. This article studies the effectiveness of monetary policy in Romania, between 2005 and 2017, both monthly and quarterly, with the help of the ARDL methodology. The results show that monetary policy has been adaptive over the last 20 years; over the years the interest rate cut has led to lower inflation and GDP cuts, with equilibrium interest rates lower than Taylor's interest.*
Keywords: *interest rate, inflation, GDP, monetary policy*

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INTRODUCTION

The Taylor monetary policy rules appeared in 1993 and have been widely used as a tool for assessing the monetary policy of the different countries, whether independently or in comparison with other monetary policy rules or guidelines. The use of such rules to such an extent was determined on the one hand by the high capacity to characterize monetary policy actions and, on the other, by the simplicity of their use in economic models.

The Taylor Rule (1993) is a simple monetary policy rule that mechanically links the monetary policy rate to inflation deviations from the inflation target and GDP versus its output gap. It was originally proposed by academic literature as a simple illustration of the desirable monetary rule for the United States of America, but later became a popular tool for assessing monetary policy stance in both advanced economies and emerging economic markets.

This article looks at the Taylor monetary policy model for Romania, a Central and Eastern European state with an independent monetary policy that will join the European Monetary System (EMU) in the future. Romania has assumed and applied directly and explicitly an inflation targeting strategy, and under these circumstances the analysis of the Taylor monetary model is of particular importance.

Currently, in most countries, the main purpose of monetary policy is to ensure Price stability, without neglecting other important goals, such as economic growth, full employment or exchange rate stability. However, the priority of price stability over other monetary policy objectives is typically stipulated in the legislation of central banks in most countries (Loayza and Schmidt-Hebbel, 2002). There are two important economist views on how the central bank can achieve price stability: it can be achieved by using monetary policy rules by reducing policy errors, increasing the transparency of monetary policy, and preventing political influence on policy-makers; Discretionary monetary policy, without the need to implement Rules or considering that the rules are impractical.
The rest of the study is made up of four sections: Section 2 gives an overview of the literature, Section 3 provides the theoretical model, and Section 4 presents the data, methodology and empirical results. Section 5 summarizes the main findings and draws some political implications.

LITERATURE REVIEW

Since the development of the Taylor model (1993), many studies have attempted to test the validity of the rule for other economies and time. Monetary policy focuses on the choice of political instruments that are transmitted by interest Rate and monetary base. The concept of monetary policy reaction function (MPRF), motivated by Taylor's 1993 article emphasizes the inverse coefficient of the Philips equation while explaining how central banks react to macroeconomic conditions by changing the interest rate. In the fundamental work Taylor's monetary policy response function, a linear trend was used to measure GDP potential, and the estimated inflation was 2% (Taylor, 1993), the reason being that this rule may stimulate the rate Nominal short-term nominal value of the United States. Policy rule Taylor specifies that the central bank's interest rate therefore increases if inflation rises above the target inflation rate or GDP rises above the potential GDP, and vice versa. The central bank's policy rates, on the other hand, decrease if which inflation is below the target rate or real GDP falls below potential GDP.

Recent studies have extended Taylor rules almost to all existing countries in an attempt to validate a globally applicable rule. Moreover, several recent papers extended Taylor's rule to countries in Central and Eastern Europe: Angeloni (2007) studied Czech Republic, Poland and Hungary for the period 1999-2004 and concluded that the respective central banks respected The fundamental objective of price stability; Paez-Farrell, 2007, studied the four Visegrad countries in 1998-2006, taking into account the exchange rate and concluding that for the three more developed countries this indicator is important.

The first study targeting Romania was made by Frommel and Schobert, 2006 by expanding the traditional analysis group (Czech Republic, Poland, Slovakia and Hungary) to Romania and Slovenia by introducing the exchange rate as a supplementary explanatory variable. The period 1994-2005 was analyzed, and the authors conclude that the Taylor rule is not respected for these countries; later in 2011, the mentioned authors also took into account the changes of the foreign exchange regimes, the results being much improved.

Vascek (2009) analyzes the 12 eastern European countries for the period 1994-2007, but improves model variables (effective exchange rate, money supply, long-term interest rate, external interest rate and asset prices). The author concludes that Taylor's policy is not always in line with the official monetary policy rule.

Căpraru & Radulescu (2016) analyzes Romania for the period 2005-2015, taking into account the anticipation of the NBR, and concludes that the Taylor rule applies in our country.

Popescu (2005) analyzes the 12 Eastern European economies, using 3 models derived from Taylor Rule, introducing additional variables related to financial stability. The author shows that the rule is kept to their fundamental price stability goal, but in parallel with the stabilization of real economic activity and the exchange rate. However, changes in nominal short-term interest rates closely follow changes in the nominal short-term interest rate in the euro area, while the inclusion of asset price developments indicates a heterogeneous situation among selected CBs.

METHODOLOGY

The best known example of the instrumental rule is Taylor's rule (1993):

$$i_t = i + 1.5(\pi_t - 2) + 0.5y_t$$

where i_t is the interest rate level in period t (in the original wording Fed quarterly refinancing rate (Fed quarter rate funds) is the target rate of interest rate, π_t is the inflation rate, and y_t is the output gap level (the difference between current and potential GDP). According to Taylor's rule, the interest rate level responds to inflation and output gap variations.

In a general form, a Taylor type rule can be written like this

$$i_t = i + \alpha(\pi_t - \pi^*) + \beta y_t$$

Depending on the values that the coefficients α and β take, the type rules Taylor can describe the central bank's behavior as a benchmark for assessing monetary authority behavior, such as Ball (1997) and Weymark (1999), in strategies to target inflation, nominal yield or other strategies.

If inflation and GDP values are predetermined, the Taylor rule is a predetermined rule, as in the examples above. If inflation and GDP are forward-looking, the rule becomes an equilibrium condition (the default rule).

$$i_t = i + \alpha\ (\pi_{t+1}/t - \pi^*) + \beta\ y_t{+}1/t$$

In estimating the model, I used the following variables:

1) Inflation (infl_proc) denoted by pt is presented as monthly consumer price growth (monthly inflation rate as shown in BNR reports and bulletins). The percentage inflation that was used in estimates was determined by dividing the value in monthly bulletins to 100.
2) Gross domestic product was replaced by monthly industrial output (y_t) due to the lack of monthly gross domestic product data. As in the BNR reports and bulletins, industrial production appears in the form of real monthly variations, and within the model industrial output appears in absolute values, we obtained the series of real monthly industrial production values taking as a basis the level of January 2005, and dividing by index of industrial production with fixed base in the respective month. The fixed base index was determined as the product of the chain-based indices. Within the model, the gap was considered as a deviation from the trend, and appears as a logarithm. The trend was determined by applying a Hodrick-Prescott filter to industrial logarithm series. Besides this method was attempted to establish a target level of industrial production, as a benchmark month, as a peak for the calculation period and as an average, but the results obtained by using the differences from these reference values resulted in unsatisfactory results.
3) the real interest rate (i_t). For the interest rate, the data on active interest for non-bank clients available in the NBR reports and bulletins were used. Using rate assets was determined by the fact that the interest rate on loans is the main factor influencing the investments, and the interest rate appears within the aggregate demand equation. Due to the fact that the values in the database indicated the annual interest rates, we proceeded to calculate the corresponding monthly interest rates using the compound interest rate formula:

$$Il_{yearly} = (1 + i_{monthly}/100)12$$

Real interest was calculated using Fisher's formula:

$$i_{real} = (1+i_{nominal})/(1+r_{infl}) - 1$$

Where r_{infl} is the month-on-month rate of inflation.

The Philips inflation equation will be calculated as follows:

$$\pi_{t+1} = \alpha_1 + \alpha_2\,\pi_t + \alpha_3\,y_t + \alpha_4\,\text{dummy}$$

The dummy variables corresponding to the months of 2008 capture the shock of inflation generated by the economic crisis.

RESULTS

The econometric estimates are based on a sample covering the period from January 2005 to March 2017. The sources of data are the annual reports and monthly bulletins of the NBR.

Tabel 1 Descriptive statistics

	Exchange rate	Interest_NBR	Inflation	inflation Target	IPI	IPI Potential	GDP	GDP Potential
Mean	4.098	6.268	4.327	3.593	107.758	107.758	32866.48	31728.21
Median	4.272	6.250	4.450	3.000	108.500	105.265	33075.65	32852.26
Maximum	4.558	17.310	10.100	7.500	130.000	129.742	43120.50	41355.93
Minimum	3.133	1.750	-3.000	2.500	77.400	75.965	18321.00	17209.64
Std. Dev.	0.413	3.158	3.300	1.384	14.270	13.738	6079.242	6203.746
Skewness	-0.706	0.469	-0.240	1.773	-0.342	-0.274	-0.596	-0.654
Kurtosis	1.938	3.376	2.059	5.518	2.354	2.456	2.937	2.705
Jarque-Bera	18.983	6.236	6.783	115.113	5.388	3.624	2.851	3.595
Probability	0.000	0.044	0.033	0.000	0.067	0.163	0.240	0.165
Sum	598.314	915.220	631.8000	524.600	15732.70	15732.70	1577591.	1522954.
Sum Sq. Dev.	24.748	1446.610	1579.790	277.813	29527.90	27369.87	1.74E+09	1.81E+09
Observations	146	146	146	146	146	146	48	48

In order to check the possibility of applying the least squares method, we tested the stationarity of the series used. As can be seen from Table 1, the ten series used are stationary with a probability of 5%.

Table 2 Augmented Dickey Fuller Unit Root Test results

	In Levels	Order of Integration	In First Difference	Order of Integration
Interest NBR	-9.749 0.000	I(0)		
Inflation	-6.596 0.000	I(0)		
Inflation Target	-6.565 0.000	I(0)		
IPI	-11.587 0.000	I(0)		
IPI Potential	-3.163 0.024	I(0)		
GDP			-3.758 0.006	I(1)
GDP Potential			-6.459 0.001	I(1)
Exchange rate	-8.986 0.000	I(0)		
Interest 1month	-10.867 0.000	I(0)		

Interest 3months			-8.098 0.006	I(1)

The results of the Zivot and Andrew unit root test are presented in Table 3. These results suggest that we can reject the single root node for IPI and WPI to a significance level of 5%, while we fail to reject the root hypothesis for the rest of the series. This result clearly contradicts the results obtained through the root unit test without structural breaks for these two series.

At the same time, the test identifies the endogenous point of the most significant structural break point (BT in each of the time series examined in this paper.) The breaking date of each time series is shown in Table 3. This also has important implications. As Piehl et al., (1999) points out, knowing the break point is essential for the correct assessment of any program designed to bring about structural changes, such as tax reforms, banking sector reforms and regime exchanges, etc. Generally, 2008, when the country experienced a severe economic crisis, is considered to be the most suitable candidate for a structural break in Romanian data. The results show that seven of the eight series studied testify to the presence of a structural break in 2007-2009.

Table 3 Zau unit root test results

	Zau unit root test	Chosen break point	Zau unit root test	Chosen break point
Interest NBR	-5.249 0.337	2008M01	-5.511 0.077	2008Q1
Inflation	-4.587 0.281	2007M08	-4.586 0.002	2010Q3
Inflation Target	-5.460 0.005	2007M01	-4.763 9.23E-05	2013Q1
IPI	-6.833 2.21E-07	2008M11		
IPI Potential	-6.694 0.000	2009M01		
GDP	-5.566 0.000	2008M09	-8.098 4.64E-08	2009Q1
GDP Potential			-6.459 0.001	2009Q3
Exchange rate	-5.571 0.001	2008M09	-5.558 0.000	2008Q4

As you can see, inflation in the current period is explained to a much larger extent by the inflation in the previous period than by the evolution of industrial production. The R2 coefficient shows that the variance of the independent variable is explained to a fairly large extent by the regressors.

From the analysis of the coefficients of the two regression equations we can see that the algebraic signs with which the coefficients enter into equation are in line with those suggested by the economic theory (current inflation is positively influenced by the inflation of the previous period and the increase of the industrial production, while the production Industrial is positively influenced by the previous and negatively to the real interest rate). The values of the estimated coefficients that will be used to deduce the optimal Taylor rule are presented in the table below, together with the associated patch averages.

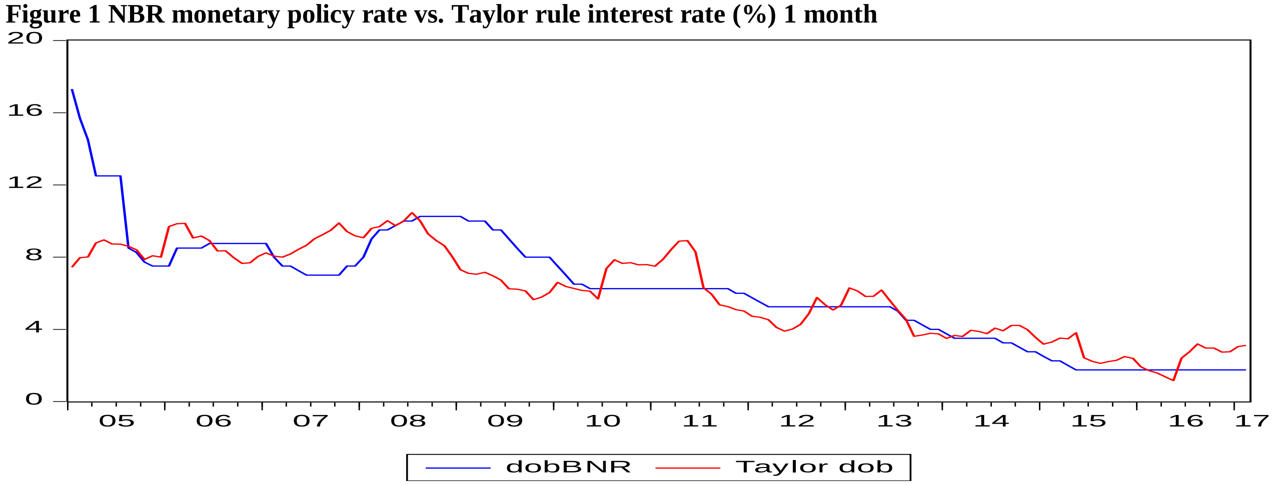
Table 4 Long Run ARDL Regression Estimate

	Coefficients 1 month	Coefficients 3 months
Constant	19.829 (0.000)	18.001 (0.000)
Inflation(1)-Inflation Target	0.5883 (0.000)	0.488 (0.000)
LOG(IPI(-2))-LOG(IPI Potential)	-5.851 (0.202)	5.7882 (0.116)
Exchange rate	-3.444 (0.000)	-2.988 (0.000)
Adjusted R-squared	0.715	0.693

To be able to use the Taylor rules as a reference for assessing BNR policy, we estimated the Taylor rule model with real data. In this approach I did not take into account the fact that the National Bank of Romania uses monetary money as the main instrument of monetary policy, and instead I assumed that the interest rate is being used, trying to see whether the use of such an instrument would have been efficiency. As can be seen from the estimated regression, the variance of the independent variable is largely explained by the regressors, which is also confirmed by the value close to 1 of the coefficient of determination, but this should be regarded with caution, given that the values of the series that designate the independent variable Also depend on the rate of inflation, which also appears as a regressor equation.

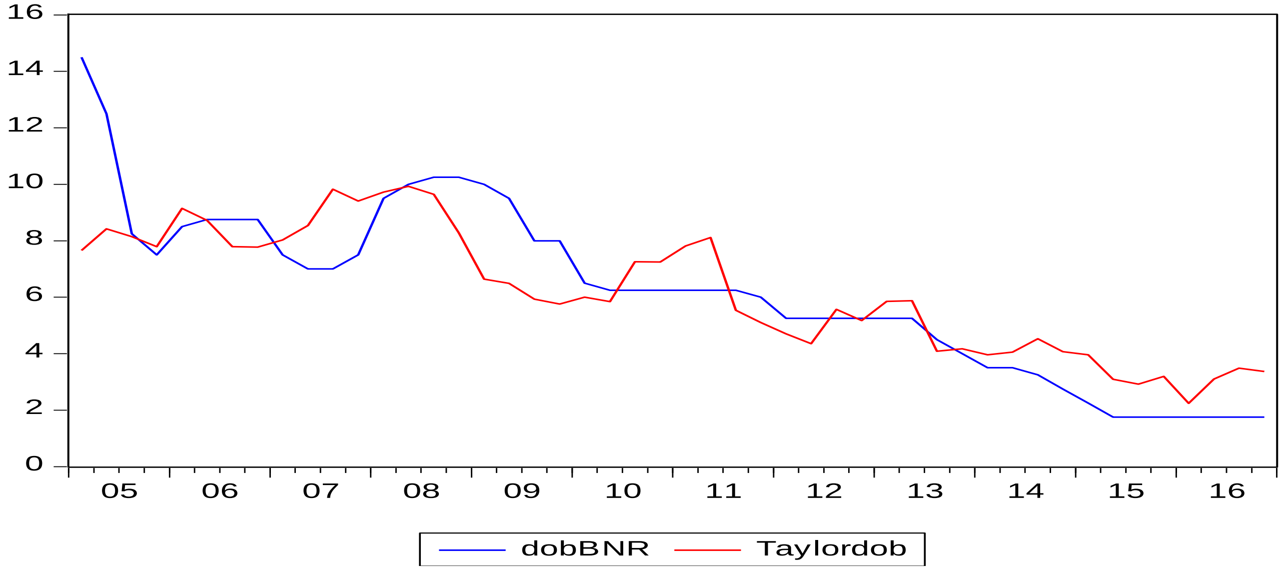
After analyzing the coefficients obtained for the estimated equation we can see that both parameters (output gap and inflation) negatively influence the real interest rate. If inflation is obvious, in the case of industrial production gap, the negative coefficient reveals that an increase in industrial production, even in real terms, has often been accompanied by an increase in inflation, and as a result Leading to rising nominal interest rates to avoid overheating the economy, the simultaneous rise in inflation has made the real interest rate fall.

Figure 1 NBR monetary policy rate vs. Taylor rule interest rate (%) 1 month



If, on the other hand, we use as criteria for assessing the possibility that Romania has followed a monetary policy based on a Taylor rule intersections between the estimated parameters of the Taylor rule and the variance ranges for the parameters of the optimal rule obtained by punctual estimation.

Figure 2 NBR monetary policy rate vs. Taylor rule interest rate (%) 3 month



As a result, we can conclude that a Taylor rule without any restrictions on coefficients could not have characterized the monetary policy of the NBR in 2005-2017, according to the criteria taken into account.

CONCLUSIONS

This paper attempts to test whether a rule of Taylor can be used to characterize monetary policy in Romania in the last decade, and whether that rule is effective in relation to a general rule used as a benchmark and determined theoretically.

The evaluation results can be summarized as follows:

- after calculating the confidence interval of 95% for the ratio c of the coefficients of Taylor's function, it was found that both a rule corresponding to the strict pricing target ($\gamma = 0$) and a rule corresponding to nominal income targeting (defined as having $\gamma = 1$) Falls within this range
- for the pure-price rule, the Taylor function coefficients do not fall within the confidence intervals for optimal rule coefficients as punctual estimation, but only by applying the 95%

Because of the very high asymptotic square abnormalities of the optimal rule coefficients, this criterion was considered not relevant enough and it was concluded that a rule consistent with strict price targeting cannot be considered as effective

- for the rule corresponding to the nominal income target, the coefficients determined from the general economic model fall within the ranges corresponding to the optimal rule, both after the punctual estimation and after the intersection of the confidence intervals criterion. It has been concluded that such a policy of monetary policy may under certain conditions be effective and a confidence interval for the loss function coefficient that indicates the relative importance of output stabilization over the importance of stabilizing inflation
- for the econometric determined general rule, the estimated values of the reaction function parameters were outside the optimum range, but the intersection of the 95% confidence interval of these coefficients and that of the optimal rule coefficients was non-widespread. Because it was econometric data, a third criterion was used, according to which the ratio between the coefficients determined by the econometric coefficient of the reaction function had to have a certain value depending on the econometric estimated coefficients for the equations of the Philips curve and the aggregate demand; Because this criterion was not met, it was considered that the estimated rule cannot be effective

However, the results can be seen with some reservations given the following shortcomings:

- the absence of monthly GDP series, which has led to the use of industrial production as the proxy variable
- even for industrial production, the series were available for most of the period considered in the form of rhythm of growth rather than absolute levels, which implied their estimation by calculations
- some coefficients associated with model functions have a probability associated with a high t-statistical test, which could make them irrelevant
- the absence of a sample of data greater than 8 years, which led to the impossibility of estimating the model using annual or even quarterly data, as used in other international studies of this kind
- the reduced coefficient with which real interest is entering the aggregate demand equation, which, by using the value of that coefficient as the denominator of some functions in determining the asymptotic dispersion, resulted in a very high standard deviation, which led to the decrease of the degree of relevance of the intersection of 95% confidence intervals. With all these shortcomings, we believe that the results obtained can be interpreted as relevant, and for future research, the model should be estimated using annual data, while relaxing some assumptions, the most important being the central bank's variable instrument.

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