

Estimation of Inflationary Expectations and the Effectiveness of Inflation Targeting Strategy*

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Abstract. *The credibility and accountability of a central bank, acting in an inflation targeting regime, are essential because they allow a sustainable anchoring of the inflationary anticipation of economic agents. Their decisions and behavior will increasingly be grounded on information provided by the central bank, especially if it shows transparency in the process of communicating with the public. Thus, inflationary anticipations are one of the most important channels through which the monetary policy affects the economic activity. They are crucial in the formation of the consumer prices among producers and traders, especially since it is relatively expensive for the economic agents to adjust their prices at short intervals. That is why many central banks use response functions containing inflationary anticipations, in their inflation targeting models. The most frequently problem in relation to these anticipations is that they are based on the assumption of optimal forecasts of future inflation, which are, implicitly, rational anticipations. In fact, the economic agents' inflationary anticipations are most often adaptive or even irrational. Thus, rational anticipations cannot be used to estimate equations for the Romanian economy because the agents who form their expectations do not have sufficient information and an*

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inflationary environment stable enough to fully anticipate the inflation evolution. The inflation evolution in the Romanian economy helps to calculate adaptive forecasts for which the weight of the "forward looking" component has to be rather important. The economic agents form their inflation expectations for periods of time that, usually, coincide with a production cycle (one year) and consider the official and unofficial inflation forecasts present on the market in order to make strategic decisions. Thus, in recent research on inflation modeling, actual inflationary anticipations of economic agents which are revealed based on national opinion surveys are being used.

As a result of a previous study testing the equations of an inflation targeting model for Romania, the authors of this article attempt to correct the estimators of inflationary anticipations depending on the central bank reaction, based on the results of a national survey among the population. However, in order to have a more accurate picture of inflationary anticipations and the propagation mechanism of shocks affecting price stability, an analysis of the pricing behavior of the consumer goods bidders in the national economy is also needed.

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The strategy of inflation targeting include the recognition of importance of the inflationary phenomenon in modern economies, meaning therefore that ensuring price stability is the most effective way to support through monetary policy the general objective of long term economic growth. Widely used in industrialized countries in the 90s, the strategy of inflation targeting became an attractive alternative for emerging economies as a result of the crises in Latin America and Asia.

In order to achieve the target-level of inflation, the central bank uses the rules as “guiding elements for building the monetary policy” (Svensson, 1997), not being obliged to apply them in a mechanical manner. The central bank retains the ability to respond to unanticipated shocks by adjusting the level of the monetary policy instruments, provided that the central bank does not sacrifice the final objective.

Inflation expectations play a central role for conducting monetary policy. Since many central banks have explicitly or implicitly adopted an inflation targeting regime, stabilizing inflation expectations has become the primary policy objective. Because there is a lag between policy actions and its impacts on the central banks target, monetary authorities are guided by forecasts. This makes inflation forecasting essential for effective monetary policy. Although monetary authorities seek to stabilize long-term inflation expectations, monitoring short and medium-term inflation is important as well. Whenever inflation exhibits some inertia, good short term inflation forecasts translate into more-accurate longer-term projections.

An influence of communication on inflation expectations is possible in two ways. First, the gap between realized and expected inflation can be influenced by the rhetoric of the central bank. Second, the communication could directly influence the expectations formation process. Thus, the way an indicator is formulated can have a great influence on inflation expectations, whereas the impact on the gap between inflation expectations and realized inflation does not seem to be robust. A possible interpretation is that the rhetoric of the Central Bank communicates risks to price stability in a credible way and that financial market experts react to the announcements by adjusting their inflation expectations in the short run. The influence arises because the indicator seems to summarize information that would otherwise be provided by different macroeconomic variables that are publicly available.

The arguments in favor of greater transparency rest on two pillars – accountability and efficiency. The first stresses the importance of transparency for ensuring the public can hold policymakers accountable. This rationale for transparency resonates strongly among supporters of central bank independence. With independence comes accountability, and accountability

requires transparency. The second argument for transparency is that it improves economic efficiency, in terms of either the operation of financial markets or the implementation of policy.

Transparency may also improve the ability of monetary policy to achieve its goals by ensuring that private market expectations are consistent with the aims of central bank policy. In the forward-looking new Keynesian model that is widely used for monetary policy analysis, for example, the effectiveness of monetary policy depends on the policy's ability to affect expectations about the future path of interest rates (Woodford, 2003). A transparent policy – one that reduces uncertainty about future policy actions – can improve the trade-off between output and inflation objectives.

Both arguments in favor of transparency have been challenged. Critics of formal inflation targeting argue that any regime that holds a central bank accountable for a single objective – such as achieving an inflation target – may lead the central bank to ignore the effects of its actions on broader measures of economic welfare. This is a general problem in designing incentive mechanisms; a high powered incentive scheme works best when actions can be monitored closely⁽¹⁾.

Furthermore, some analysts argue that transparency may actually reduce the central bank's ability to engage in stabilization policies. This last argument is, perhaps, not surprising. Much of the academic literature examining transparency uses models in which monetary policy has real effects only to the extent that it can surprise the public. By creating an inflation surprise, the central bank is able to stimulate real output. Since the public cannot be systematically surprised under rational expectations, the attempt to engineer an economic expansion only leads to an average inflation bias. If transparency reduces the central bank's ability to generate surprises, it weakens the central bank's incentive to engage in expansionary policy and, as a result, lowers the equilibrium rate of inflation. Transparency would seem to be unambiguously advantageous (Faust, Svensson, 2002). However, if the central bank's scope for engaging in stabilization policies is also a function of its ability to generate surprise inflation, transparency reduces that ability.

This limits the potential for policy to reduce economic fluctuations. Transparency may leave the central bank unable to cushion the real economy from macroeconomic shocks, a cost emphasized by Cukierman (2001). Economists now have a great appreciation for the role that systematic, predictable policy can have on the real economy. There are not just surprises that matter. The effects of transparency may differ considerably when the predictability of the monetary policy plays an important role in the economy⁽²⁾.

It is well understood that monetary policy in general and inflation targeting in particular is what is called “management of expectations” (Woodford, 2004, 2005). Monetary policy affects inflation and the real economy mainly through its effects on private-sector expectations about future interest rates, inflation and the real economy. Expectations of future instrument rates (the expected instrument-rate path) matter and affect the yield curve and longer nominal interest rates.

Expectations of future inflation affect actual inflation and longer real interest rates. Expectations of future developments of the real economy and longer real interest rates affect current decisions and plans for the real economy. Thus, transparency makes monetary policy more effective in a direct way, by making possible more effective management of private-sector expectations.

Publishing inflation and real-economy forecasts is already common among inflation-targeting central banks. An interest-rate forecast or some assumption about the interest-rate path is necessary for an inflation and real-economy forecast. Central banks have used different assumptions about the interest-rate path, such as a constant interest rate or a path given by market expectations as revealed by the forward rates implied by the yield curve. A constant interest rate is often a conspicuously unrealistic and time-inconsistent interest-rate forecast. Implied forward rates may result in inflation and real-economy forecasts that do not “look good,” and central banks using this interest-rate assumption have sometimes felt compelled to comment that an interest-rate path higher or lower than the implied forward rates would be more appropriate

Furthermore, a published forecast of the interest rate is useful to the private sector and a better forecast is more useful to the private sector. The central bank should have an obvious information advantage about its own intentions for its instrument rate and be able to produce the best forecast, and, as argued in the previous section, publishing its own interest-rate forecast should be the most effective way for the central bank to manage private-sector interest-rate expectations. Given this logic, and given the increased acceptance of the idea that monetary policy is about managing expectations, it is rather strange that still so few central banks publish their own interest-rate forecast.

Some arguments in the literature against publishing instrument-rate paths seem somewhat contrived. Morris and Shin (2002) shows that public information may reduce social welfare. Because public information is known by all private agents and will affect the behavior of all private agents, it is rational for each private agent to attach more weight to public information than to private information. If the public information is of poor quality, private agents

end up attaching more weight on poor-quality information, which may deteriorate social welfare.

We think that the optimal targeting weight balances the need for accountability with the imperfect ability to monitor the central bank. Monitoring is imperfect if the information on which the central bank bases policy is private and publicly unverifiable. The ability to monitor can also be described in terms of the policy “transparency”; a transparent policy improves the ability to monitor. If monitoring is perfect, the central bank is instructed to care only about achieving a state contingent target for inflation; this solves the accountability problem without distorting stabilization policy. When monitoring is incomplete due to imperfect information, it is optimal to place less weight on achieving the inflation target to avoid distorting stabilization policy.

Political pressures are assumed to operate on the incentive to engage in expansionary policies. These pressures lead to socially undesired fluctuations in inflation. Inflation shocks provide a role for stabilization policies.

Empirical analysis

In these circumstances the central bank tries to achieve inflation target by interest rate channel of monetary policy. The central bank reaction function correlate inflation rate with interest gap, interest rate’s long-term trend, output gap, inflation deviation from target and real exchange rate variation:

$$i_{(t)} = \beta_1 \times i_{gap(t-1)} + i^{trend}_{(t)} + \beta_2 \times y_{gap(t)} + \beta_3 \times (\pi^e_{(t)} - \pi_{(t)}^{target}) + \beta_4 \times mod_curs_real_{(t)} + \varepsilon_{3(t)} \quad (1)$$

The variables included in the reaction function are:

- *the interest rate gap’s previous level.* When including this variable, the central bank is acting cautiously as it considers the adverse consequences that frequent interest rate changes can have on economic agents. Harjes and Ricci (2008) show that the corresponding coefficient for this variable is generally quite high in order to ensure that the monetary authorities are restraining themselves from aggressively countering economy shocks. Thus, monetary authorities avoid sudden changes in rates, a phenomenon known in practice as “smoothing and stabilizing the interest rate”.
- *the interest rate’s long-term trend.* The reason for including this variable is logical: on the long-term, the interest rate tends toward its equilibrium value, thus determining the convergence to the model’s equilibrium point.
- *the inflation’s deviation from the target.* The central bank will adjust the nominal interest rate depending on the inflation’s deviations from

the target. The coefficient for this variable must be higher than 1 in order for the monetary policy’s mechanism to function.

- *the output gap*. When including this variable, the practice of a flexible inflation targeting is considered, as well as the determining role the excess demand has in explaining inflationary pressures.
- *the real exchange rate variation*. The presence of this variable in reaction function equation is necessary to describe the correlation between domestic interest rate and real exchange rate fluctuation in order to improve monetary policy concerning Mundell-Fleming model requirement⁽³⁾. Furthermore a style concordance with aggregate demand and supply equation is also necessary.
- *other shocks* of the monetary policy that can influence the behavior of monetary authorities when dealing with inflation targeting (estimating residuals).

Since the data is expressed quarterly and the inflation target annually, we computed the quarterly inflation target. It is obvious that this feat can only be achieved for the 2005-2009 timeframe, as inflation targeting was implemented starting with 2005. For the 2000-2005 timeframe, the effective inflation’s trend was used as the inflation’s target.

The equation of the reaction function can be written as follows:

$$\begin{aligned}
 i_{(t)} = & 0.7906 \times i_{gap(t-1)} + 0.4110 \times y_{gap(t)} + 0.0704 \times (\pi_{(t)}^e - \pi_{(t)}^{target}) + & (2) \\
 & \begin{matrix} [9.407413] & [2.626591] & [2.941367] \\ (0.0000) & (0.0071) & (0.0148) \end{matrix} \\
 & + 0.0421 \times mod_curs_real_{(t)} + \varepsilon_{3(t)} \\
 & \begin{matrix} [4.131510] \\ (0.0004) \end{matrix}
 \end{aligned}$$

The equation highlights the practice of a flexible inflation targeting strategy, by considering in the central bank’s reaction function the inflation’s deviation from the target and other macroeconomic variables, such as the output gap, or the appreciation/depreciation of the national currency. Including the inflation’s variation from the trend indicates that the monetary policy transmits its effects with delays and therefore it has to react timely to the inflationary pressures that will manifest themselves in the future.

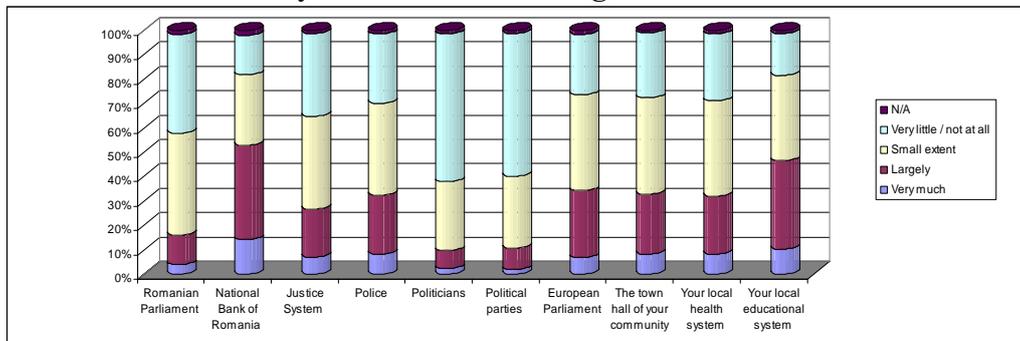
Adaptive expectations

Adaptive expectations state that if inflation increased in the past period, people will expect a higher rate of inflation in the next period, meaning that people base future predictions on what happened in the past. In the real world,

past data is one of many factors that influence future behavior. In particular adaptive expectations is limited if inflation is on an upward or downward trend. These limitations led to the development of rational expectations which incorporated many factors into the decision making process.

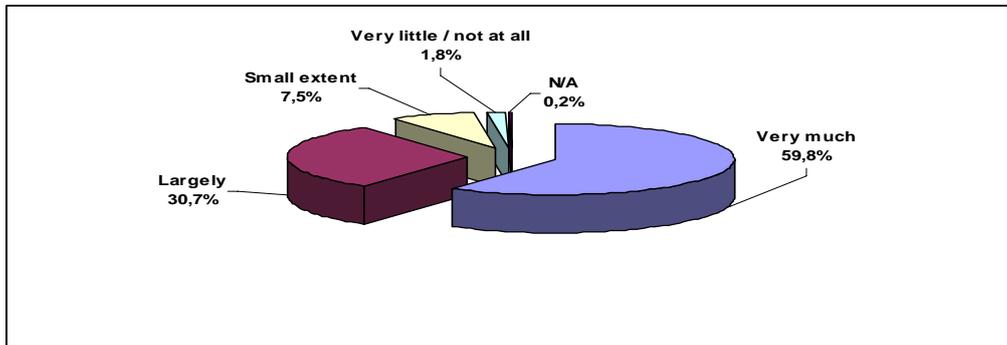
The adaptive expectations of inflation were estimated based on a survey conducted on a representative sample at a national level, mainly focusing upon the state of the economic and social cohesion in Romania⁽⁴⁾. Since the population's attitude towards the national institutions is important for this study, we decided upon including the National Bank among the other institutions considered representative of the market economy system. The main results of the survey indicate that the National Bank is the most credible institution in Romania (with a degree of confidence of about 53% – to large and very large extent) being considered far more reliable than other national institutions. The second best credible institution turned out to be the local educational system (a 46% confidence level – to large and very large extent). Another aspect that should also be noted consists in the fact that the reliability in the European Parliament exceeds the confidence level in the other national institutions. Given the high level of credibility of the National Bank, we can formulate the hypothesis that the signals of the National Bank do have a great influence in shaping the inflationary expectations of the population.

What extent do you trust the following institutions?



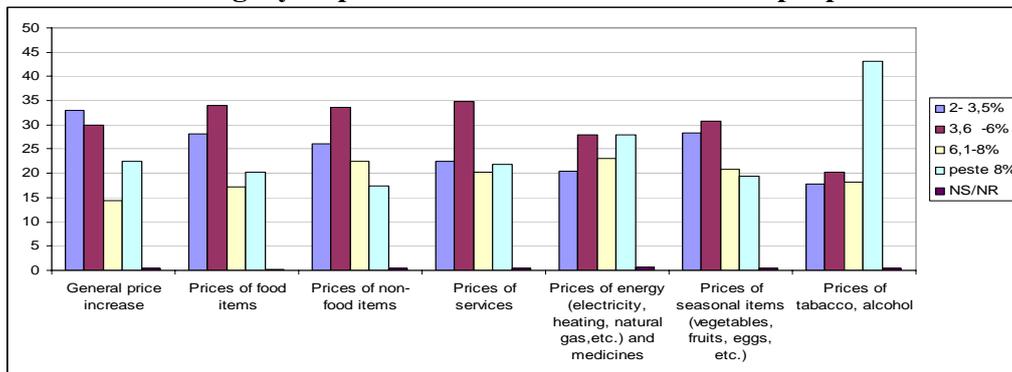
Another question included in the questionnaire took into account the population concern about the general price increase (the increase of the daily living cost). The results of the survey show that the population is very concerned about the inflation outlook (90% of responses indicate a large and very large extent). Such an attitude creates conditions for a positive framework to the “hot money” phenomenon, meaning that inflation expectations could be accelerated by population’s anticipations.

How much you are worried about increase in cost of living (price increase)?



The distribution of the responses concerning the inflation expectations upon different product categories is very interesting, indicating an asymmetry of the extreme preferences, meaning that the degree of supporting inflationary expectations for small and moderate levels (2.5 to 6%) is high, then drops abruptly to 6-8% and then rises again sharply to over 8%. This reveals a certain confusion regarding the inflation perspectives among the population. In terms of statistical significance of population indicators, the results are perfectly normal, since there is still no basic economic culture to allow the population a relatively accurate interpretation of macroeconomic indicators (being evident from the media errors on the correct interpretation of these indicators). In these circumstances it is normal that the answers to have like referential a simple comparison of figures with a normal correction in relation to the great concern about the inflationary expectations.

Which category of prices will increase and in what proportion?



In these circumstances, we reviewed econometrically the response function equation of the National Bank, by introducing the estimated inflation adaptive expectations of the population. Despite the correction time, we notice an improvement in the econometric response function equation of the National Bank, both in terms of coefficients and of significance tests.

$$i_{(t)} = 0.7203 \times i_{gap(t-1)} + 0.4711 \times y_{gap(t)} + 0.0930 \times (\pi_{(t)}^e - \pi_{(t)}^{target}) + \quad (3)$$

[9.167921]	[2.702580]	[3.658791]
(0.0000)	(0.0104)	(0.0304)

$$+ 0.0641 \times mod_curs_real_{(t)} + \varepsilon_{3(t)}$$

[4.780254]
(0.0013)

The results encourage us to continue our research in estimating the inflation adaptive expectations of the entrepreneurs (the representatives of suppliers). In this manner, we can verify the National Bank estimations of the inflation targeting strategy equation, in a constructive framework for ideas exchange among the specialists in the field, in order to improve the effectiveness of the economic policies to control the inflation phenomenon.

Conclusions

The analysis emphasizes the essence of the inflation targeting strategy: the monetary policy has a key role in anchoring inflationary expectations. On the other hand, considering the period of transmission for the mechanism of the monetary policy and the unexpected shocks that can affect an economy, inflation targeting becomes inflation forecast targeting, thus stressing out the strategy's anticipative character and its capability to stabilize the inflation around the target for a medium-term time frame.

Many central banks use reaction functions containing inflationary anticipations, in their inflation targeting models, but there is a problem concerning the assumption of anticipations: rational vs. adaptive (even more irrational). Testing the reaction function of central bank, we tried to compare this alternative assumption based on national survey. The survey revealed that the central bank is the most credible institution for Romanian and the Romanians are very worried about inflationary context.

As a novelty, we valued the information obtained from the survey regarding the population's perceptions on the evolution of inflation, by introducing them as adaptive expectations in the reaction function of the National Bank. Thus, we noticed an improvement in the econometric estimations based on these adaptive expectations.

Notes

- (1) See Walsh (2003) for an application of this principle to inflation targeting.
- (2) The reliance on models in which surprises are the key to the real effects of monetary policy may be one reason that Carpenter (2004) finds only a limited set of lessons for policymakers to learn from the academic literature on transparency.
- (3) It is a common fact that the central bank diminishes the interest rate when there is an unjustified appreciation of the national currency (the exchange rate drops) and it increases the interest rate when the national currency goes through a powerful depreciation (the exchange rate increases)
- (4) PN II Research Project no. 91-050/2007 - *Diminution of inequalities - pre-requisite for economic and social cohesion. Improving the quality of the European integration*. The survey was conducted on a nationally representative sample from March to September 2010.

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