

# Central bank transparency and credibility: The case of Poland, 1998–2004

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## Abstract

In this study we analyse transparency and credibility of the National Bank of Poland's monetary policy under the inflation-targeting regime in the period 1998–2004. To verify NBP transparency we analyse the transparency of the monetary policy framework and the predictability of policy decisions. With respect to the former, we present some indicators suggested in the literature, while with respect to the latter we analyse the formation of interest rate expectations by commercial bank analysts. As far as NBP credibility is concerned, we evaluate the way in which inflation expectations of consumers and commercial bank analysts are formed and how they are related to the inflation target.

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## 1. Introduction

A central bank is credible if the public believes that the monetary authority will do what it says (Blinder, 2000). In the context of inflation targeting (IT) strategy this may be verified by analysing the gap between inflation expectations of economic agents and the central bank inflation target or forecast. Theoretical literature and empirical evidence show that transparency is essential for establishing central bank credibility. Transparency is a multidimensional phenomenon, which involves not only the issue of releasing adequate, in terms of its quantity and quality, information by the central bank, but also correct interpretation of the released

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information by the public. In this sense, transparency should enhance the ability of the private sector to predict monetary policy actions.

The aim of our study is to test the transparency and credibility of the National Bank of Poland's (NBP) monetary policy in the years 1998–2004, as conducted under the inflation-targeting regime. In particular, we examine whether the inflation-targeting framework and the progress that the central bank has made with respect to communication with the public have helped private sector agents predict monetary policy actions and align their expectations with the inflation target. We use survey-based measures of inflation expectations of commercial bank analysts and consumers as well as survey data on commercial bank analysts' interest rate predictions. To verify monetary policy transparency we separately inspect its two dimensions, namely, the transparency of monetary policy framework and of monetary policy decisions. With respect to the former, we present some transparency indicators as suggested in the literature and make cross-country comparisons, while with respect to the latter we analyse in detail the formation of interest rate expectations by commercial bank analysts. As far as monetary policy credibility is concerned, we focus our study on the way in which inflation expectations of consumers and commercial bank analysts are formed and how they are related to the NBP inflation target.

The results of our analysis lead to some puzzling conclusions on the effectiveness of inflation targeting in Poland in shaping expectations of the private sector. Even though transparency of the monetary policy framework in Poland, assessed by the quantity of information shared by the central bank with the public, seems to be relatively high, the predictability of interest rate decisions is weak and there are no signs of improvement in terms of macroeconomic efficiency of interest rate expectations. Despite persistent deviations from the target, the NBP inflation target constitutes an important information variable taken into account by commercial bank analysts. On the other hand, Polish consumers do not pay attention to the inflation target while forming their expectations regarding the future movements of prices. Monetary policy is not credible among consumers.

This paper is organised as follows: Section 2 contains theoretical considerations on the relationship between central bank transparency and credibility, and summarizes the experience of inflation targeters in building transparency and credibility. In Section 3 we briefly describe the Polish experience with the IT strategy and verify the credibility of the NBP inflation targets, focusing on inflation expectations formed by consumers and commercial bank analysts. Section 4 tests the transparency of the NBP monetary policy framework and the predictability of interest rate decisions. The final section offers our conclusions.

## **2. Central bank credibility and transparency — theoretical aspects**

There is a common agreement in the literature on monetary economics that private-sector inflation expectations constitute an important variable in the conduct of monetary policy. A central bank that can manage expectations of the private sector should be able to conduct monetary policy more effectively. Such a central bank is deemed credible. Thus, the concept of central bank credibility refers directly to private-sector expectations. [Blinder \(2000\)](#) provides a very short and intuitive, yet in our view most accurate, definition of credibility: “a central bank is credible if people believe it will do what it says”. This is in line with the concept of [Cukierman and Meltzer \(1986\)](#), who define credibility as “the absolute value of the difference between policymakers' plans and the public's beliefs about those plans”.

Although the central bank's credibility is relatively easy to define, it is difficult to measure. There is no commonly accepted and used indicator of monetary policy credibility. Many of the

existing measures refer to the gap between inflation expectations of economic agents and the central bank's inflation target or forecast (e.g. Faust and Svensson, 1998; Hutchison and Walsh, 1998; Cecchetti and Krause, 2002). Another approach to measuring central bank credibility based on inflation expectations is applied by Bomfim and Rudebusch (2000). In their study, credibility is proxied by a weight attached to the central banks' inflation target in the formation of the private sector's long-term inflation expectations. The authors note that this weight may be interpreted as a fraction of the public that expects the target to be attained.

The growing number of publications on transparency is rooted in the credibility problem as highlighted in monetary economics. If the central bank wants to make the public believe that it "will do what it says", it firstly has to announce what it intends to do, and secondly, make it possible for the public to monitor its actions. The degree of central bank transparency is usually measured as the amount of information disclosed by the central bank to the public at large. But it seems to reflect only one aspect of the issue, ignoring the quality of information released. In this respect we share the view of Winkler (2000), who considers a central bank transparent if the public correctly interprets the information disclosed by monetary authorities.

As transparency is a multidimensional phenomenon it is difficult to provide a single, synthetic definition for it. Therefore, it is useful to deal with the concept by analysing its various aspects. Geraats (2001) distinguishes five aspects of monetary policy transparency: political transparency (disclosure of monetary policy objectives and numerical targets), economic transparency (publication of economic data, forecasts, and macroeconomic models used by the central bank), procedural transparency (openness about the decision-making process, including the monetary policy strategy or rule and the release of minutes and voting records), policy transparency (announcements and explanations of central bank's decisions and its likely actions in the future) and operational transparency (information about implementation of monetary policy decisions and market interventions, as well as explanation of control errors). A similar classification was introduced by Hahn (2002).<sup>1</sup> In formalizing the issue, Geraats (2001) and Hahn (2002) focus on the transparency of a monetary policy framework. There are several indicators that attach numerical value to different types of information published by central banks.<sup>2</sup> One of the most popular indices in the literature was constructed by Eijffinger and Geraats (2006). It encompasses the five dimensions of transparency distinguished by Geraats (2001). In Section 4 we present several indicators of transparency in detail.

The definitions of credibility and transparency of monetary policy suggest that there is a relation between them. Theoretical considerations in this field are usually based on the time-inconsistency model of Barro and Gordon (1983)<sup>3</sup> and the literature on monetary policy games. In these models transparency enables the public to infer the intentions of the central bank, so it may not be beneficial for the central bank to pursue an inflationary policy. In this sense, transparency can discipline monetary policy and enhance credibility.

It appears that a higher degree of transparency leads to higher credibility and a reduced inflation bias, since transparency acts as a constraint on the discretionary behaviour of the central

<sup>1</sup> Hahn (2002) distinguishes three dimensions of transparency: goal transparency (openness about central bank's objectives), knowledge transparency (release of economic data, models and forecasts by the central bank), operational transparency (announcements of central bank's decisions and disclosure of voting records and minutes).

<sup>2</sup> For example, Chortareas et al. (2002) construct an index of transparency based on inflation forecasts published by central banks, while Mahadeva and Sterne (2000) produce a measure of policy explanation.

<sup>3</sup> The time-inconsistency problem and the inflation bias as the potential outcome under discretion was primarily analysed by Kydland and Prescott (1977) and Barro and Gordon (1983).

bank. It constitutes a way of mitigating the time-inconsistency problem and of establishing the credibility of monetary policy without a binding commitment or a monetary rule. Moreover, as King (1996) points out, transparency supports the learning process thanks to which expectations of the public adjust to the target more quickly. The role of transparency as a prerequisite for credibility, suggested by the theoretical models we refer to, seems to be consistent with the intuitive definitions of these terms used in our study.<sup>4</sup>

The relation between transparency and credibility created inspiration for the development of a new monetary policy framework — inflation targeting (IT). In the IT regime central banks attempt to establish credibility through transparency, hence the adoption of this framework is typically followed by major improvements in communication with the public and the market (Mishkin and Schmidt-Hebbel, 2001).<sup>5</sup> There are several empirical studies investigating the effects of increased transparency of the IT framework. The findings suggest that transparency of the IT regime leads to a reduced response of market participants to monetary policy announcements and a decreased volatility of short-term interest rates, which indicates improved ability of the markets to predict actions of the central bank (Muller and Zelmer, 1999; Haldane and Read, 2000; Clare and Courtenay, 2001; Coppel and Connolly, 2003). The speed of reaction to changes in monetary policy instruments typically increases. This indicates that communication practices under IT are effective. Moreover, there is some evidence that adoption of IT leads to lower sacrifice ratios and lower output volatility (Corbo et al., 2001), which suggests increased credibility of the IT strategy.

### 3. Credibility of the inflation targeting strategy in Poland

#### 3.1. *Inflation targeting strategy in Poland*

Until 1998 the National Bank of Poland conducted an “eclectic” strategy by combining elements of exchange rate targeting, inflation targeting, and money supply targeting with the aim of guaranteeing stability in the disinflation process. The intermediate target was to increase the money supply under conditions of a crawling peg of the Polish zloty in relation to a basket of currencies, with limited fluctuations of the exchange rate within the permitted band. This strategy did not allow the two intermediate targets to be met in full, although initially, given the weak links between the Polish economy and global financial markets, it allowed inflation to be reduced smoothly, which constituted the main objective of the monetary authorities. As a result, the average annual inflation was lowered to approximately 12% in 1998.

The integration of the Polish into the world economy created problems for the eclectic strategy, making it impossible to control both the money aggregates and the exchange rate. Therefore the

<sup>4</sup> The analysed models include Cukierman and Meltzer (1986), Faust and Svensson (1998), Eijffinger et al. (2000), Jensen (2000), Geraats (2001). On the contrary, Thornton (2002) questions the relation between transparency and credibility stating that transparency is neither necessary nor sufficient for credibility or accountability. However, he admits that transparency may help enhance credibility so long as the central bank's words coincide with its actions.

<sup>5</sup> As stated by Mishkin and Schmidt-Hebbel (2001): “this major communication effort conducted by central banks is arguably more important under inflation targeting than under alternative monetary regimes, considering the central role played by policy credibility and inflation expectations in attaining inflation targets.” However, Friedman (2004) has a contrary view on communication practices in the IT framework. In his opinion, IT regime transparency is one-dimensional: it focuses on inflation, but hides from public the concern of monetary authorities for real variables (which are important e.g. while deciding about a speed of bringing inflation back to the target). In this sense it obscures central bank goals.

Table 1  
Actual and targeted inflation rate, 1998–2003

	Inflation target	Actual inflation (realization)	Deviation of actual inflation from the target (in %) <sup>a</sup>
1998	9.5%	8.6%	–9.5
1999	8.0–8.5% (changed in March to 6.6–7.8%)	9.8%	+15.3 (+25.6)
2000	5.4–6.8%	8.5%	+25.0
2001	6.0–8.0%	3.6%	–40.0
2002	5.0%±1 pp (changed in June to 3.0%±1 pp)	0.8%	–80.0 (–60.0)
2003	2–4%	1.7%	–15.0

Source: Kokoszczyński et al. (in press).

<sup>a</sup> In the case of a range target the realization to target ratio is calculated with respect to the bound closer to the actual inflation.

monetary authorities decided to introduce inflation targeting as it seemed better suited to continue the disinflation process. Another important reason why the monetary authorities adopted the IT strategy was the need of breaking through the inflation expectations, which were perceived as one of the main obstacles for the reduction of inflation.<sup>6</sup> The announcement of the switch to the IT strategy was made in early June 1998, and in September 1998 the document entitled “Medium-term strategy of monetary policy (1999–2003)”, outlining details of new policies, was released. Therefore the year 1998 is often related to as an interim year (Polański, 2004).

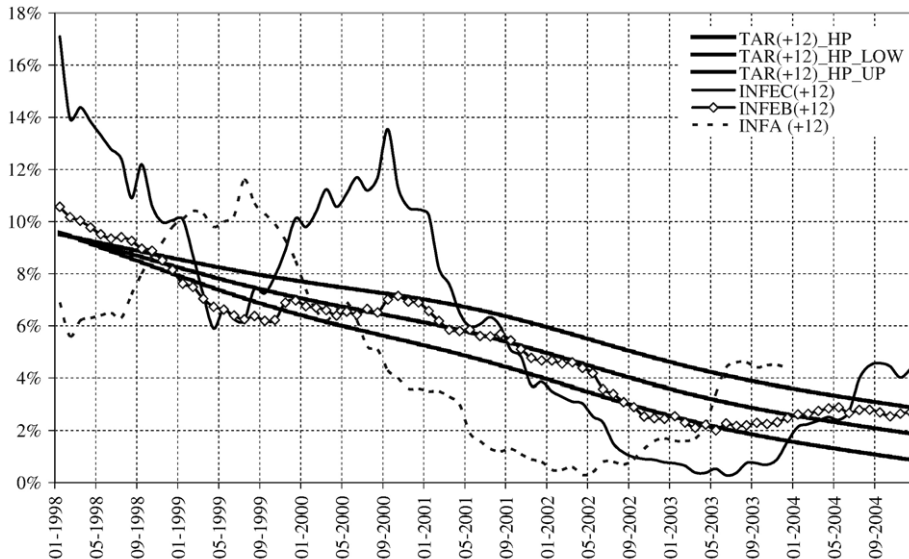
The institutional and procedural changes which preceded the introduction of the IT regime, mainly granting the NBP independence, enhanced the credibility of the new monetary strategy in comparison to the previous one, which contained incentives for the government to underestimate future inflation (Kokoszczyński, 2004). However, the lack of coordination of the fiscal and monetary policies, as well as tensions between the two authorities in the years 2000–2001, indicated a potential source of undermining credibility of the NBP monetary policy (Jonas and Mishkin, 2003).

The Monetary Policy Council (MPC) set the medium-term inflation target at a level “below 4% by the end of 2003”. The MPC also declared targets for the end of each year — for any given year the target was usually revealed to the public in the last quarter of the previous year. In communicating with the public, the relative importance of both types of inflation targets seemed to change in 1998–2003, with a gradual increase in the weight of the medium-term (Kokoszczyński et al., in press). The National Bank of Poland faced difficulties in meeting the inflation targets — all its short-term targets were missed, even those that were revised in the course of the year they had been set for (Table 1).

To obtain implicit monthly inflation targets on the basis of the annual targets set for the end of subsequent years in the period 1998–2003 and of the continuous target 2.5%±1 pp as announced in February 2003, three measures have been calculated: the official target for a given year, a smoothened series computed by the Hodrick–Prescott filter, and a monthly linear interpolation between end-year targets.<sup>7</sup> As they yield similar results, only the HP-filtered series is shown. Since the NBP inflation targets were usually set in the form of ranges, monthly series of their

<sup>6</sup> A comprehensive description of the evolution of the NBP strategy, as well as of the features and outcomes of inflation targeting in Poland may be found in Jonas and Mishkin (2003), Kokoszczyński (2002), Polański (2004) and Kokoszczyński et al. (in press).

<sup>7</sup> Similar measures are suggested by Albagli and Schmidt-Hebbel (2004).



TAR(+12)\_HP – Hodrick-Prescott filtered target (to be attained in 12 months)

TAR(+12)\_HP\_LOW – Hodrick-Prescott filtered lower band of the target range (to be attained in 12 months)

TAR(+12)\_HP\_UP – Hodrick-Prescott filtered upper band of the target range (to be attained in 12 months)

INFEC(+12) – consumers' inflation expectations in a 12-month-horizon

INFEB(+12) – banks' inflation expectations in a 12-month-horizon

INFA(+12) – actual (realized) inflation in a 12-month-horizon

Source : own calculations based on GUS (Polish Central Statistical Office), Ipsos, NBP, and Reuters data.

Fig. 1. Banks' and consumers' inflation expectations, the NBP inflation target (HP-filtered target) and actual inflation.

central values as well as lower and upper bands have been computed. A comparison of the inflation target ranges and the realizations confirms our previous conclusion. Although the disinflation process was successfully terminated, inflation only was within the inflation target range in about 10% of the period analysed (see Fig. 1).

There were different reasons why inflation deviated from the NBP inflation targets. The way in which short-term (annual) targets were set, especially in the initial period of inflation targeting in Poland (point target in 1998 and relatively narrow intervals in successive years) was inconsistent both with lags in the monetary transmission mechanism and with the volatility of inflation, which was highly sensitive to supply shocks coming from food and oil markets. The conduct of macroeconomic policy is perceived as an even more important explanation of inflation target misses (Jonas and Mishkin, 2003): unexpected fiscal expansion combined with easy monetary policy led to an acceleration of inflation and the overshooting of inflation targets in 1999–2000, while a subsequent sharp tightening of monetary policy and its slow relaxation in the absence of further easing of fiscal policy reduced inflation sharply and produced a significant undershooting in 2001–2003. Relative price changes due to the EU accession made inflation rise above the NBP inflation target in 2004.

Imperfect knowledge of the monetary transmission mechanism (Christoffersen and Wescott, 1999) and the evolution of this mechanism amplified the uncertainty faced by the monetary policymakers. As a result, interest rate policy was not in line with the inflation targets. Model-based counterfactual simulations show that the NBP interest rate policy can be seen as excessively



Table 2

Forecast performance of consumers' and banks' inflation expectations, 10/1998–12/2003

	Consumers' expectations	Banks' expectations	Naive forecast
ME	1.17	0.56	1.02
MAE	3.26	2.41	3.23
MAPE	150.6%	161.1%	161.2%
RMSE	3.82	2.76	3.67

Banks' and consumers' expectations are not fully comparable due to different forecast horizons — the horizon for consumers was 12 months, in the case of banks it was changed from 12 to 11 months in November 2000.

ME — mean error; MAE — mean absolute error; MAPE — mean absolute percentage error; RMSE — root mean square error.

Source: own calculations based on GUS, Ipsos, and Reuters data.

expansive in 1999Q1–2001Q3 and 2003Q2–2003Q4, while excessively restrictive in 1998Q4 and 2001Q4–2003Q1. In order to meet the operating inflation targets, more sizeable changes in interest rates would have been required (Kokoszcyński et al., *in press*).

### 3.2. Credibility of inflation targets in Poland

We measure the credibility of the NBP inflation targets by analysing the difference between inflation expectations of the private sector, i.e. consumers and commercial bank analysts, and the inflation target. The process of formation of Polish consumers' inflation expectations has been examined in a number of previous studies. Łyziak (2005) finds that consumers' expectations are neither unbiased nor efficient in macroeconomic terms. No convincing evidence is found of any improvement in the process of forming expectations nor of any increase in their forward-lookingness after introducing the IT (the sample ended December 2002). The properties of Polish commercial bank analysts' inflation expectations have not been examined in a rigorous way as far as we know. However, some preliminary evidence combined with studies on the forecasts of economists conducted in other countries (e.g., Baghestani and Kianian, 1993; Lloyd, 1999) suggests that this group of agents may also form their expectations in a manner inconsistent with the rational expectations hypothesis. Table 2 presents forecast performance statistics of consumers' and banks' inflation expectations<sup>8</sup> under inflation targeting and compares them to a naive forecast (i.e. the most recent inflation data available to respondents at the time of declaring their expectations). On average, both groups of agents overestimate future inflation rates. For bank analysts the bias amounts to 0.56 pp and for consumers it is twice as much, i.e. 1.17 pp.

While inflation expectations set by commercial bank analysts were broadly consistent with the NBP inflation target<sup>9</sup>, inflation expectations of Polish consumers — characterized by a strong backward-lookingness — deviated considerably from the targeted values (see Fig. 1). In 1999–2004, the frequency of inflation expectations that were within the NBP target range amounted to approximately 72% in the case of bank analysts and 21% in the case of consumers.

<sup>8</sup> Consumer inflation expectations are quantified on the basis of Ipsos qualitative survey data with the use of the probability approach, which is described in detail in Łyziak (2005). Commercial bank analysts' expectations are taken from Reuters quantitative questionnaires.

<sup>9</sup> While analysing shifts of the yield curve after interest rate decisions Zieliński (2001) and Ziarko-Siwiek (2004) have found evidence that the NBP monetary policy was credible.

Table 3

Estimation of the credibility parameter  $\lambda$ 

Measure of the NBP target	Consumers' inflation expectations <sup>a</sup>			Commercial bank analysts' inflation expectations <sup>b</sup>		
	$\lambda$ (standard errors in parentheses)	$R^2$ and residuals' diagnostics		$\lambda$ (standard errors in parentheses)	$R^2$ and residuals' diagnostics	
Official target for a given year	−0.16 (0.05)	$R^2$ [adjusted $R^2$ ] — 0.98 [0.98]	DW — 0.75 JB [probability] — 0.09 [0.96] ADF [probability] — −3.18 [0.03]	0.83 (0.04)	$R^2$ [adjusted $R^2$ ] — 0.91 [0.91]	DW — 0.36 JB [probability] — 4.03 [0.13] ADF [probability] — −9.84 [0.00]
HP-filtered target	−0.13 (0.05)	$R^2$ [adjusted $R^2$ ] — 0.98 [0.98]	DW — 0.64 JB [probability] — 0.99 [0.60] ADF [probability] — −2.73 [0.07]	0.80 (0.06)	$R^2$ [adjusted $R^2$ ] — 0.93 [0.93]	DW — 0.11 JB [probability] — 2.01 [0.37] ADF [probability] — −8.68 [0.00]
Linear interpolation	−0.16 (0.05)	$R^2$ [adjusted $R^2$ ] — 0.98 [0.98]	DW — 0.69 JB [probability] — 0.48 [0.78] ADF [probability] — −3.06 [0.03]	0.90 (0.04)	$R^2$ [adjusted $R^2$ ] — 0.96 [0.96]	DW — 0.23 JB [probability] — 2.35 [0.31] ADF [probability] — −7.84 [0.00]

<sup>a</sup>  $T=t+12$ , sample period: 1998:10–2004:12, equations are estimated by OLS using the covariance matrix corrections suggested by Newey and West (1987).

<sup>b</sup>  $T=t+12$  until October 2000 and  $T=t+11$  since November 2000, sample period: 1998:10 to 2004:12, equations are estimated by OLS using the covariance matrix corrections suggested by Newey and West (1987).

To assess the weight attached by consumers and commercial bank analysts to the NBP inflation target in the formation of their inflation expectations, we use the Bomfim and Rudebusch (2000) approach, estimating the credibility parameter  $\lambda$  in the following equation:

$$\pi_{T|t}^e = \lambda \cdot \pi_T^{\text{tar}} + (1-\lambda) \cdot \pi_t^0, \quad (1)$$

where:  $\pi_{T|t}^e$  denotes inflation expectations formed in  $t$  for the period  $T$ ,  $\pi_T^{\text{tar}}$  is the inflation target for the period  $T$ , and  $\pi_t^0$  is the most recent inflation known in the period  $t$ . Estimation results for inflation expectations of consumers and commercial bank analysts in relation to different measures of the NBP inflation target are presented in Table 3. They show that the way both groups of agents form their inflation expectations differ significantly.<sup>10</sup> In their predictions, consumers seem to rely heavily on the current inflation rate. The credibility parameter is significant, but negative, which implies lack of credibility.<sup>11</sup> Still, despite of frequent NBP inflation target misses, commercial bank analysts follow the NBP inflation target closely with a lower weight attached to current price behaviour. It is to some extent surprising in the light of the survey among central bankers and macroeconomists of

<sup>10</sup> Empirical evidence on divergences in the formation of inflation expectations by different groups of the population may be theoretically justified by referring to the concept of sticky information. Models of this kind (Mankiw and Reis, 2002; Carroll, 2003; Mankiw et al. 2003) assume that economic agents update their information only periodically because of costs of collecting and processing information. It is plausible that for consumers these costs are considerable, what would explain a relatively limited use of available information by this group of agents, whose expectations are far from fulfilling the macroeconomic efficiency criterion (Lyziak, 2005).

<sup>11</sup> The lack of credibility of the NBP inflation targets among consumers may reflect the fact that NBP targets might not be rooted in the public consciousness. It is likely especially in the case of short-term targets set by monetary authorities during the disinflation phase of IT in Poland.



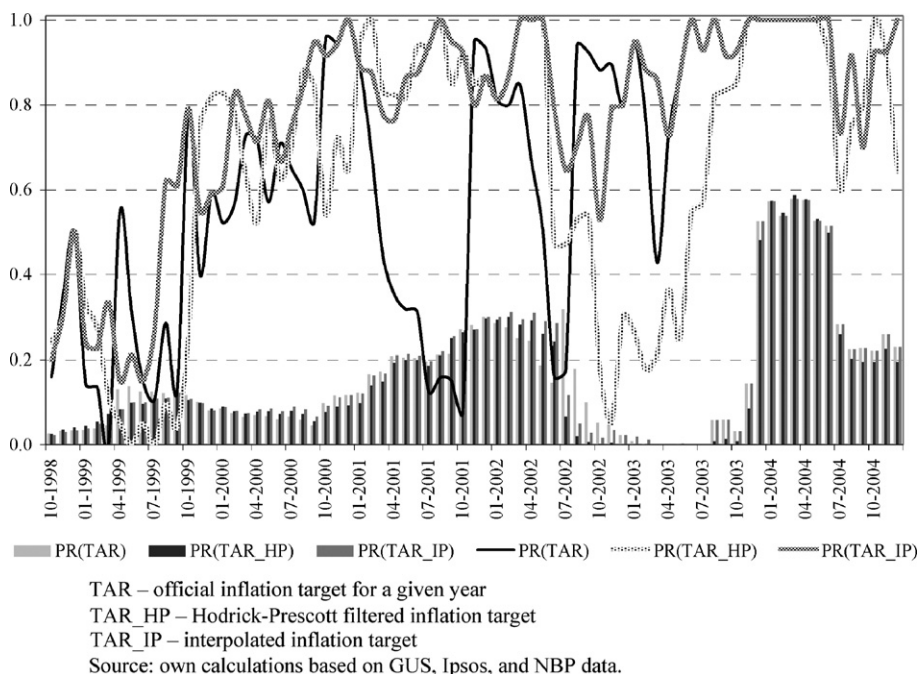


Fig. 2. Probability of future inflation being within the NBP inflation target range — consumers (bars) and commercial bank analysts (lines).

[Blinder \(2000\)](#), which suggests that the best way for a central bank to establish credibility is to have a history of doing what it says it will do.

An analysis of the probability of future inflation being within the NBP inflation target range ([Fig. 2](#)) shows that although it differs significantly for both groups of economic agents, it is characterized by a positive trend, indicating a gradual increase of credibility of the NBP inflation target.<sup>12</sup> Two major exceptions from this tendency occurred during the fast disinflation 2002–2003 and the EU accession in 2004. Differences in the volatility of banks' and consumers' assessments concerning the probability of achieving the NBP inflation target interval result mainly from different methods applied to derive both indicators.<sup>13</sup>

#### 4. Transparency of the inflation targeting strategy in Poland

##### 4.1. Transparency of the inflation-targeting framework in Poland

The inflation-targeting framework in Poland evolved over 1998–2004. In particular, communication patterns and the quantity of information shared by the National Bank of Poland with the public were subject to considerable changes.

<sup>12</sup> It should be underlined that it is partly due to the fact that inflation target bands, primarily relatively narrow, were gradually becoming wider.

<sup>13</sup> In the case of consumers we refer to a density function, whose parameters are estimated on the basis of qualitative survey data, while in the case of commercial banks we measure it as a fraction of banks declaring their predictions consistently with the NBP inflation target range. Frequent and sizeable changes in the number of banks participating in the survey lead to a relatively high volatility of estimated probabilities.

Mahadeva and Sterne (2000) measure central bank transparency on the basis of a survey focusing on the information published by central banks that enhances the public understanding of the central bank policy, analyses and forecasts. The results presented in Table 4 indicate that central banks that define themselves as inflation targeters are characterized by a higher degree of transparency, as compared to the total sample of banks included in the survey. The transparency indicator for the National Bank of Poland calculated in 2000 was a bit below the average of the inflation targeters. However, significant changes were introduced to the NBP information policy in August 2004, as reflected in the publication of an inflation projection with a formal risk assessment and modifications of the MPC *Inflation Reports* and decision statements, which from then on are more concise and forward-looking. Therefore, following the methodology of Mahadeva and Sterne (2000), we decided to recalculate indicator, which now is well above the average in the sub-sample of inflation targeters in 2000.

A commonly used measure of the monetary policy transparency mentioned in Section 2 is the index proposed by Eijffinger and Geraats (2006) (EG). The index consists of fifteen components<sup>14</sup>, which include formalization and quantification of goals, publishing of economic data, models and forecasts, releasing of minutes and voting records, prompt announcement of policy decisions and its explanations, as well as discussions of transmission disturbances and control errors. The authors have compiled the index for nine major central banks for the years 1998–2002. The results indicate that in this period the overall degree of transparency significantly increased. As Poland was not included in the survey, we have calculated the EG index for the National Bank of Poland to compare its transparency performance with other central banks. Table 5 presents the results for the least and the most transparent banks in the sample<sup>15</sup> and the NBP in 2002 as well as the current value of the index for the NBP. The Polish central bank is placed in the sub-top of the ranking — the degree of its transparency in 2002 is a bit higher than the average value of 10.7. As far as respective aspects of transparency are concerned, the NBP obtains the lowest score on economic transparency. However, that score increased in 2004 and 2005 as a result of the publication of the inflation projection (August 2004) and the macroeconomic models (December 2004 in Polish, January 2005 in English). One should note that the increase in economic transparency is a general trend among central banks. From 1998 to 2002 most of the central banks included in the survey improved their performance in this field. Concerning other aspects of transparency, the NBP made no progress.

Another, more specific, measure of the transparency of central banks pursuing the inflation targeting strategy may be the content and quality of *Inflation Reports*, which constitute the main information tool used in those banks to communicate with the public. Fracasso et al. (2003) conducted a survey assessing both the above mentioned features of *Inflation Reports* published by twenty IT central banks<sup>16</sup> and found evidence that banks producing high-quality *Inflation Reports* were more predictable. However, as the authors stress, this relation does not imply causality.<sup>17</sup> The *Inflation Report* published by the NBP was evaluated below average in all categories. In the overall assessment it was placed on the 17th position, with the highest

<sup>14</sup> Each aspect of central bank transparency consists of three components. The authors assign a value from 0 to 1 to each component of the index, so the maximum score is 15.

<sup>15</sup> There were two central banks with the score of 14: the Swedish Riksbank and the Reserve Bank of New Zealand.

<sup>16</sup> Australia, Brazil, Canada, Chile, the Czech Republic, Hungary, Iceland, Israel, Mexico, New Zealand, Norway, Peru, the Philippines, Poland, South Africa, South Korea, Sweden, Switzerland, Thailand, and the UK.

<sup>17</sup> The content of *Inflation Reports* and their role in monetary policy-making in twenty inflation targeting countries is also analysed in Schmidt-Hebbel and Tapia (2002). They take into account publication frequency, coverage of past performance and projections, forecasts of variables reported, preparation and distribution issues, coincidence between monetary policy meetings and the publication of *Inflation Reports* as well as consistency between *Inflation Reports* and policy decisions.

Table 4

Measurement of policy explanations (Mahadeva and Sterne, 2000)

Questions:	Question weight	Scores	Categories of answer	Distribution of results: fraction of central banks in the sample/sub-sample			
				(94 central banks) All economies	(15 central banks) <sup>a</sup> Inflation targeters	Poland, 2000	Poland, 2005 <sup>b</sup>
<i>Explanation of policy decisions</i>							
Central bank provides explanations on day policy changed?	1.5	100 0	Yes No	80.9% 19.1%	100.0% 0.0%	◆	◆
Explanations provided when policymakers meet and do not change policy	0.3	100 50 0	Yes Sometimes No	16.0% 5.3% 78.7%	26.7% 13.3% 60.0%	◆	◆
Policy decisions discussed in standard bulletins and reports	2	100 50	At least twice a year At least annually	64.9% 12.8%	86.7% 13.3%	◆	◆
Minutes of policy meetings published	1	0 100 50	No Within a month of meeting More than a month after	22.3% 12.8% 5.3%	0.0% 46.6% 13.3%	◆ <sup>c</sup>	◆ <sup>c</sup>
Voting patterns published	0.5	0 100 0	No Yes No	81.9% 6.4% 93.6%	40.0% 20.0% 80.0%	◆	◆
<i>Published forward-looking analysis</i>							
Forward-looking analysis in standard bulletins and reports	2	100 50	More than annually At least annually	41.5% 25.6%	60.0% 26.7%	◆	◆
Form of publication	1.5	25 0 100 50	Unspecified Otherwise Words, one of numbers and graphs One of words, numbers and graphs	10.6% 22.3% 37.2% 26.6%	6.7% 6.7% 26.7% 46.7%		◆
Risks to forecasts published	1	0 100 50	Unspecified None Words and one of numbers and graphs One of words, numbers and graphs	13.8% 22.3% 9.6% 24.5%	20.0% 6.7% 20.0% 26.7%		◆
Discussion of past forecast errors	1	0 100 50 0	None Yes Sometimes No	66.0% 22.3% 9.6% 68.1%	53.3% 40.0% 20.0% 40.0%	◆	◆

(continued on next page)

Table 4 (continued)

Questions:	Question weight	Scores	Categories of answer	Distribution of results: fraction of central banks in the sample/sub-sample			
				(94 central banks) All economies	(15 central banks) <sup>a</sup> Inflation targeters	Poland, 2000	Poland, 2005 <sup>b</sup>
<i>Assessment and analysis</i>							
Analysis in standard bulletins and reports	2	100	More than annually	91.5%	100.0%	◆	◆
		50	At least annually	7.4%	0.0%		
		0	Otherwise	1.1%	0.0%		
Frequency of speeches	2	100	At least monthly	41.5%	53.3%		
		66	At least quarterly	27.7%	20.0%		
		33	Less than quarterly/occasional	30.9%	26.7%	◆	◆
		0	Never, almost never	0.0%	0.0%		
Working papers and other research publications	1	100	More than 10 each year	37.2	73.3%	◆	◆
		66	More than 5 each year	20.2%	6.7%		
		33	More than 2/occasional	19.1%	6.7%		
		0	Never	23.4%	13.3%		
Total score (percent of maximum)				59 <sup>d</sup>	73	69	85

Source: Mahadeva and Sterne (2000) and own calculations.

<sup>a</sup> Sub-sample of 15 banks describing themselves as inflation targeters. This group includes the central banks of: Albania, Armenia, Australia, Botswana, Canada, Chile, the Czech Republic, Israel, Jamaica, Mexico, Mongolia, New Zealand, Poland, Sweden, and the UK.

<sup>b</sup> In 2004 the National Bank of Poland started publishing inflation projections with a risk assessment in the form of a fan chart. Therefore, we present an updated measure of the NBP transparency: own calculations based on the Mahadeva and Sterne (2000) method.

<sup>c</sup> The NBP does not publish minutes after MPC meetings. It seems that, responding to the survey of Mahadeva and Sterne (2000), official press releases of the NBP Monetary Policy Council and its *Inflation Reports* were treated as a substitute for the minutes. Although this classification seems debatable, we decided to update Mahadeva and Sterne (2000) index in a way consistent with the scores presented for Poland in their study. With the requirement of publishing minutes interpreted in a strict manner, the transparency index for Poland is equal to approximately 66 in 2002 and 79 in 2005.

<sup>d</sup> Average value.

scores for being not intimidating to economists and for the writing style, and the lowest for completeness. As far as other categories are concerned, the Polish *Inflation Reports* performed quite well in showing the assumptions made at the decision-making time (with the exception of foreign financial conditions, financial markets, and uncertainty). On the other hand, presenting insufficient information concerning committee discussions on the policy and on objections that could be raised to decisions, and giving too few arguments for future decisions, were among its main weaknesses. These factors are very important for central bank transparency, but almost all countries achieved low scores in these areas.

Table 5

Central bank transparency — Eijffinger–Geraats index

Central bank transparency	Switzerland, 2002	Sweden, 2002	Poland, 2002 <sup>a</sup>	Poland, 2005 <sup>a</sup>
<i>1. Political</i>	2.5	3	3	3
a. Formal objectives	0.5	1	1	1
b. Quantitative targets	1	1	1	1
c. Institutional arrangements	1	1	1	1
<i>2. Economic</i>	1.5	2	1	3
a. Economic data	1	1	1	1
b. Policy models	0	0	0 <sup>b</sup>	1
c. Central bank forecasts	0.5	1	0	1
<i>3. Procedural</i>	1	3	2	2
a. Explicit strategy	1	1	1	1
b. Minutes	0	1	0	0
c. Voting records	0	1	1	1
<i>4. Policy</i>	2	3	3	3
a. Prompt announcement	1	1	1	1
b. Policy Explanation	1	1	1	1
c. Policy inclination	0	1	1	1
<i>5. Operational</i>	0.5	3	2	2
a. Control errors	0.5	1	1	1
b. Transmission disturbances	0	1	0.5	0.5
c. Evaluation policy outcome	0	1	0.5	0.5
Total	7.5	14	11	13

Source: Eijffinger and Geraats (2006) and own calculations.

<sup>a</sup> Own calculations.<sup>b</sup> Models used in monetary policy-making were described in different publications, although their role in the decision process was not clear.

At the time the Fracasso et al. (2003) survey was conducted, the National Bank of Poland was the only central bank participating in the questionnaire that did not report its forecasts. Moreover, there were delays in publishing *Inflation Reports* and little information about models used for inflation forecasts was provided, which is indicated as a possible cause of the low transparency at that time (Zieliński, 2001). As the first publication of inflation projection in August 2004 coincided with considerable changes introduced to the structure of the *Inflation Report*, we may assume that its assessment now would be more favourable.

All the measures analysed above suggest, either explicitly or implicitly, that there was an increase in the transparency of the NBP monetary policy framework.

#### 4.2. Predictability of interest rate decisions

In this section we refer to Winkler's (2000) concept of transparency, which implies that other things being unchanged, greater transparency of monetary policy should lead to greater ability of the private sector to predict interest rate changes. The predictability of interest rate decisions in Poland has been examined in previous studies that analysed the influence of the NBP interest rate

Table 6

Measures of interest rate forecast accuracy and dispersion

	01.1996–12.2004	Sub-sample: 01.1996–09.1998	Sub-sample: 10.1998–12.2004
<i>Measures of forecast accuracy</i>			
ME	−0.10	−0.18	−0.07
MAE	0.42	0.62	0.33
MAPE	2.7%	2.7%	2.7%
RMSE	0.67	0.87	0.55
<i>Measures of forecast dispersion</i>			
Mean forecast dispersion	0.29	0.37	0.26
Mean relative forecast dispersion	2.1%	1.6%	2.3%

Source: own calculations based on NBP and Reuters data.

announcements on various financial instruments. Zieliński (2001) finds that the surprise element of these events observed in the short end of the yield curve decreased slightly after the IT adoption, but the diminishing effect was statistically insignificant. However, the results of a similar study conducted by Jarmużek et al. (2004) for a longer sample suggest substantial improvement in the monetary policy transparency. This might indicate that the improvement in interest rate predictability appeared with some lag.

We take a different approach, similar to that of Swanson (2004), and compare the performance of short-term interest rate forecasts made by commercial bank analysts in two sub-samples: before and after the introduction of IT. For this purpose we employ data derived from the Reuters survey, in which bank analysts are asked about their macroeconomic forecasts,<sup>18</sup> including the 3-month interbank interest rate (WIBOR 3M) for the end of the current month. As interbank interest rates depend heavily on the NBP headline interest rates, greater predictability of MPC decisions should result in greater accuracy of WIBOR 3M forecasts. Basic measures of forecast performance are provided in Table 6. In the full sample period commercial bank analysts, on average, underestimated future short-term rates. The mean error (ME) amounted to minus 18 basis points in the first sub-sample and minus 7 basis points in the second one. Taking into consideration the mean absolute forecast error (MAE) and root mean square error (RMSE), a clear improvement in the forecast accuracy under inflation-targeting regime can be observed. However, due to serious changes in the level and volatility of interest rates (the monthly average WIBOR 3M moved down from 26.1% to 5.2% and the standard deviation from 1 pp to 0.01 pp), it is probably more appropriate to evaluate relative errors. The mean absolute percentage error (MAPE) remained unchanged after the IT adoption, suggesting no improvement in the accuracy of commercial bank analysts' forecasts.

Verification of the unbiasedness requirement of the rational expectations hypothesis (REH) reveals that the hypothesis that, in the cointegrating relationship between the expected interest rate ( $i^e$ ) and the actual one ( $i$ ):

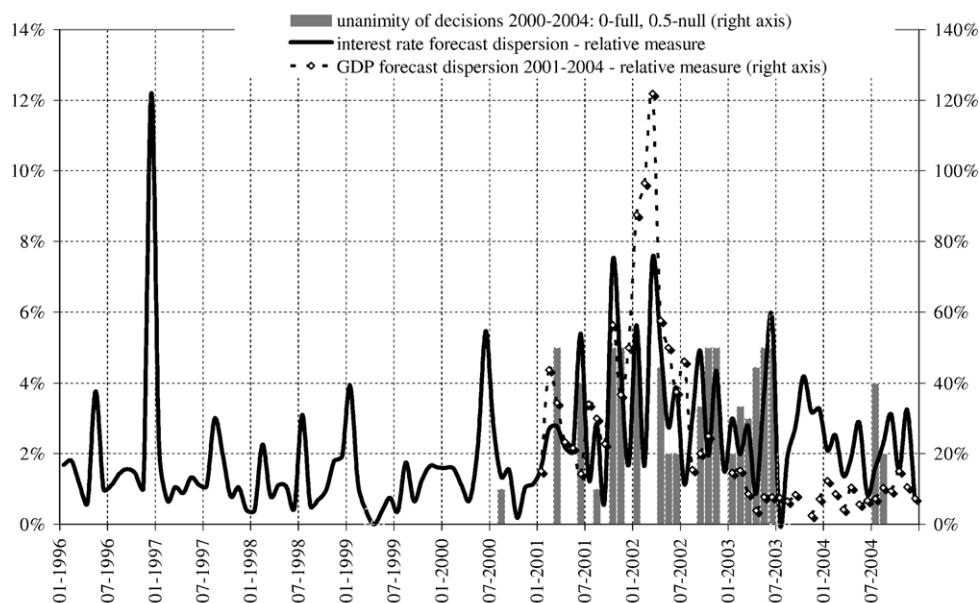
$$i_{t|t+1}^e = \alpha + \beta \cdot i_t, \quad (2)$$

the estimated coefficients satisfy the condition:

$$(\alpha, \beta) = (0, 1) \quad (3)$$

<sup>18</sup> Reuters has conducted its survey on a monthly basis since 1994. About 30 bank analysts participate in the survey. Respondents are asked for predictions of several economic variables, like CPI, PPI, WIBOR, exchange rates, industrial output, etc., typically for the end of the current month, for the end of the year, and for the next 12 months. The number of participants and questions has been changing over time.





Source: own calculations based on NBP and Reuters data.

Fig. 3. Factors influencing interest rate forecast dispersion.

is rejected ( $\chi^2$  statistics equal to 20.65). It indicates that interest rate predictions of commercial bank analysts are biased.

When predicting interest rates becomes easier, the heterogeneity of individual forecasts should diminish. Therefore we investigate whether the degree of forecasters' heterogeneity, measured as a difference between the 3rd and the 1st quartile forecasts, has reduced over time. Table 6 presents such a measure in absolute and relative terms (as a percentage of the median). It can be noted that — similarly to the case of prediction errors presented above — the absolute measure of forecasts dispersion decreases over time, but the relative one does not. It seems that three important factors, two of which are directly related to the NBP's monetary policy, contributed significantly to the increase of interest rate uncertainty in the IT period, particularly in 2001–2002 (Fig. 3). Firstly, there was a shift in the direction of interest rate decisions in March 2001: after monetary policy tightening in 1999–2001, a long period of gradual interest rate cuts was initiated. It lasted until July 2004. Secondly, the increase of interest rate forecast uncertainty under IT coincided with an increase of the overall degree of uncertainty concerning macroeconomic performance, proxied by the dispersion of commercial bank analysts' GDP forecasts. It puts additional constraint on predicting monetary policy decisions. Thirdly, the speed at which interest rates were lowered was subject to controversies among MPC members, reflected in the fact that many of the decisions were taken with the Committee split into a similar number of votes for and against, which could affect uncertainty concerning likely decisions on interest rate changes.

To what extent could mistakes in interest rate predictions affect commercial bank analysts' inflation expectations and the degree of credibility of the NBP inflation target in this group of agents? To answer this question, we derived an additional measure of commercial bank analysts' inflation expectations, filtering out the effects of interest rate forecast errors. In doing this, we assumed that in the 12-month horizon the increase of the short-term interest rate by 1 pp would make annual price

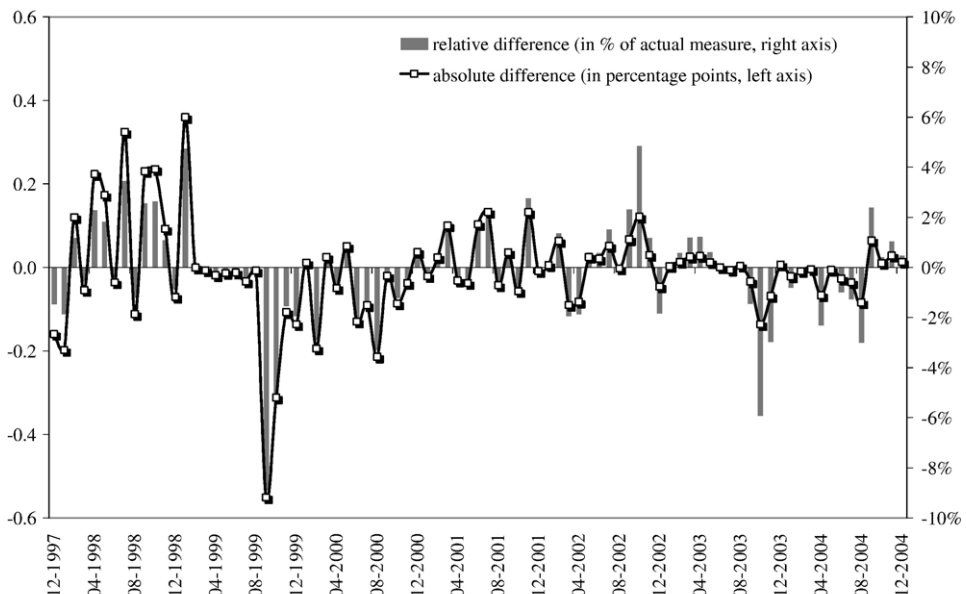
dynamics forecasted by bank analysts decrease by 0.2 pp. This elasticity is consistent with estimates of the inflation response to the interest rate impulse obtained from the small structural model of inflation, used by the NBP and known publicly (Kłos et al., 2005). Given the relatively small forecast errors, as assessed from the point of view of their macroeconomic implications, differences between actual and adjusted measures of commercial bank analysts' inflation expectations appear to be negligible (Fig. 4). It means that even if analysts had made no mistakes in predicting NBP interest rate decisions, their inflation expectations would have been broadly consistent with the NBP target, deviating considerably from the actual inflation figures.

#### 4.3. Efficiency of interest rate expectations

Efficiency of interest rate expectations would entail that while forming their predictions, commercial bank analysts take all available information into account. To test this feature, we use the method proposed by Forsells and Kenny (2004) and estimate a sequence of equations of the following structure:

$$e_t = \alpha + \beta \cdot \Omega_t + u_t, \quad (4)$$

where  $e$  denotes expectational errors and  $\Omega$  represents the set of information variables that are relevant for predicted variable and are available at the time when expectations are formed. Due to possible problems with multicollinearity that could appear while estimating the test equation in a multivariate context, univariate regressions are run. A statistically significant  $\beta$  suggests that agents failed to take account of the selected information variable in the optimal way in setting their expectations. Because of the autocorrelation of forecast errors, we estimate



Source: own calculations based on NBP and Reuters data.

Fig. 4. Differences between actual and adjusted measure of commercial bank inflation expectations.

Table 7

Macroeconomic efficiency of interest rate expectations — test results

	Jan 1996–Dec 2004		Sub-sample Jan 1996–Sep 1998		Sub-sample Oct 1998–Dec 2004	
	$\beta$	Prob.	$\beta$	Prob.	$\beta$	Prob.
<i>Eq. (1): <math>e_t = \alpha + \beta Q_t + u_t</math></i>						
$\Delta$ WIBOR 3M <sup>a</sup>	−0.21	0.01***	−0.17	0.14	−0.25	0.03**
$\Delta$ WIBOR 1M <sup>a</sup>	−0.08	0.30	−0.09	0.36	−0.07	0.49
SPREAD <sup>a</sup>	−0.48	0.00***	−0.48	0.11	−0.47	0.00***
$\Delta$ CPI <sup>a</sup>	−0.14	0.20	0.15	0.53	−0.26	0.01***
$\Delta$ PPI <sup>a</sup>	−0.12	0.07*	−0.07	0.45	−0.22	0.02**
$\Delta$ FOOD <sup>a</sup>	−0.07	0.07*	0.00	0.99	−0.11	0.02**
$\Delta$ FUEL <sup>a</sup>	−0.01	0.54	0.03	0.52	−0.02	0.25
$\Delta$ PLN/EUR <sup>a</sup>	−0.55	0.61	−1.48	0.62	−0.35	0.73
$\Delta$ PLN/USD <sup>a</sup>	−0.97	0.13	−3.06	0.45	−0.70	0.22
$\Delta U$ <sup>a</sup>	0.07	0.68	0.50	0.35	−0.05	0.56
$\Delta$ IOUT <sup>a</sup>	0.00	0.79	0.01	0.53	−0.02	0.06*
$\Delta$ RS <sup>a</sup>	−0.01	0.33	−0.02	0.32	0.00	0.73
$\Delta\pi$ <sup>c a</sup>	0.02	0.96	0.47	0.22	−0.66	0.00***
$\Delta$ CPI(+1) <sup>b</sup>	−0.42	0.01***	−0.50	0.26	−0.44	0.01***
$\Delta$ PPI(+1) <sup>b</sup>	−0.12	0.04**	−0.09	0.14	−0.19	0.03**
$\Delta$ IOUT(+1) <sup>b</sup>	−0.02	0.28	−0.03	0.30	−0.01	0.62
$\Delta$ RS(+1) <sup>b</sup>	0.00	0.87	0.00	0.83	0.00	0.57
<i>Eq. (2): <math>e_t = \alpha + \alpha_1 e_{t-1} + \beta Q_t + v_t</math></i>						
$\Delta$ WIBOR 3M <sup>a</sup>	−0.16	0.18	−0.24	0.36	−0.14	0.24
$\Delta$ WIBOR 1M <sup>a</sup>	0.01	0.92	−0.09	0.69	0.03	0.75
SPREAD <sup>a</sup>	−0.42	0.00***	−0.50	0.08*	−0.38	0.01***
$\Delta$ CPI <sup>a</sup>	−0.05	0.65	0.21	0.47	−0.15	0.15
$\Delta$ PPI <sup>a</sup>	−0.09	0.11	−0.06	0.49	−0.17	0.03**
$\Delta$ FOOD <sup>a</sup>	−0.03	0.49	0.01	0.91	−0.05	0.34
$\Delta$ FUEL <sup>a</sup>	0.00	0.72	0.02	0.52	−0.01	0.35
$\Delta$ PLN/EUR <sup>a</sup>	−0.49	0.62	−1.08	0.73	−0.40	0.66
$\Delta$ PLN/USD <sup>a</sup>	−0.75	0.15	−3.50	0.50	−0.57	0.18
$\Delta U$ <sup>a</sup>	0.05	0.73	0.42	0.43	−0.07	0.41
$\Delta$ IOUT <sup>a</sup>	0.00	0.91	0.02	0.45	−0.01	0.10*
$\Delta$ RS <sup>a</sup>	−0.01	0.37	−0.02	0.35	0.00	0.63
$\Delta\pi$ <sup>c a</sup>	0.13	0.71	0.53	0.24	−0.44	0.19
$\Delta$ CPI(+1) <sup>b</sup>	−0.37	0.01***	−0.51	0.26	−0.38	0.02**
$\Delta$ PPI(+1) <sup>b</sup>	−0.07	0.21	−0.05	0.41	−0.13	0.06*
$\Delta$ IOUT(+1) <sup>b</sup>	−0.01	0.40	−0.03	0.41	0.00	0.93
$\Delta$ RS(+1) <sup>b</sup>	0.00	0.75	0.00	0.92	0.01	0.38

\*Denotes significance at 0.1 level, \*\*denotes significance at 0.05 level, \*\*\*denotes significance at 0.01 level.

WIBOR 3M — 3 month interbank offer rate; WIBOR 1M — 1 month interbank offer rate; SPREAD — spread between WIBOR 3M and WIBOR 1M; CPI — consumer price index (y/y); PPI — producer price index (y/y); FOOD — food prices index (y/y); FUEL — fuel prices index (y/y); PLN/EUR — PLN against EURO exchange rate; PLN/USD — PLN against USD exchange rate;  $U$  — unemployment rate; IOUT — industrial output (y/y); RS — retail sale (y/y);  $\pi^c$  — bank analysts' inflation expectations;  $\Delta$  — first difference operator.

The data is monthly. All equations are estimated using OLS with the Newey and West (1987) variance–covariance correction matrix.

Source: own calculations based on GUS, NBP, and Reuters data.

<sup>a</sup> Variable known both to commercial bank analysts while forming expectations and the MPC while taking interest rate decisions.

<sup>b</sup> The most recent figures known to MPC while taking interest rate decisions but not available at the time when commercial bank analysts form their expectations.

additionally an extended version of the test equation, with the lagged forecast error on its right-hand side.

In both versions of the test equation, short-term interest rate expectational errors are explained by an information set that includes variables effectively known to the agents at the time when the expectations are formed (we make allowance for delays in the publication of variables). The results presented in Table 7 indicate that commercial bank analysts and the MPC interpret macroeconomic data in a different manner. Expectational errors can be explained by price indices (CPI, PPI, food price changes), past interest rates and industrial output; however the results are sensitive to the equation specification. It suggests that bank analysts in a systematic way wrongly assess influence of these pieces of information on the MPC decisions, e.g. the significance of spread variable in the test equation means that bank analysts could improve their forecasts if they properly took into account short-term interest rate expectations of the financial market. It seems important to note that in one of the test equations banks' inflation expectations are statistically significant. This may suggest that differences in actual and predicted interest rates result, among other causes, from different inflation predictions of banks and of the NBP. Commercial banks interpret data on fuel prices, zloty exchange rates against the dollar and the euro, unemployment and retail sale, consistently with the policymakers.

Since bank analysts form their expectations without knowing the latest data, such as last month CPI, PPI, industrial output or retail sale, which is, however, available when the MPC takes a decision about interest rates, we include also these variables in our test. As some of them are found to be statistically significant, a part of the forecast error can be attributed to different information sets applied by bank analysts and the MPC.<sup>19</sup>

The results obtained do not support the hypothesis that transparency has increased after adoption of IT in Poland. Compared with the pre-IT period, when the efficiency hypothesis was not rejected<sup>20</sup>, the IT period is characterized by a deterioration in the way commercial bank analysts form their expectations.

## 5. Conclusion

Central bank transparency and credibility are closely related. Theoretical literature suggests that higher transparency should lead to higher credibility. This hypothesis is confirmed by empirical studies showing that the process of building credibility through transparency works in reality. It may be observed particularly in the performance of central banks operating within the inflation-targeting regime. As indicated in our study, the Polish experience with IT is not so convincing.

In verifying the transparency of the NBP monetary policy, we inspected separately the transparency of the monetary policy framework and the predictability of monetary policy decisions. In the case of the former, our study, based on several indicators suggested in the literature, leads to the conclusion that the transparency of the National Bank of Poland is relatively high. It increased sizably after changes introduced to NBP *Inflation Reports* in August 2004, when the NBP staff inflation projection was published for the first time. On the

<sup>19</sup> It is difficult to assess the contribution of different sets of information to the forecast error. However it does not seem to be large: in 2002 Reuters started to repeat the survey after publication of new statistical data by GUS and it turned out that corrections of analysts' forecasts are minor.

<sup>20</sup> It should be noted that the first of sub-periods analysed is very short, thus the results obtained may be insufficiently reliable.

other hand, our study suggests that the accuracy of interest rates expectations formed by commercial bank analysts did not improve under the IT as compared with the pre-IT period, so the transparency of monetary policy decisions seems to be fairly low.<sup>21</sup> Moreover, macro-economic efficiency of interest rate expectations has deteriorated after adoption of IT and the uncertainty concerning monetary policy decisions increased. These results may suggest that the quality of information shared by the NBP with the public was unsatisfactory. One should bear in mind that major improvements in the NBP communication with the public, such as the publication of the NBP staff inflation projection with a formal risk assessment and related changes in the *Inflation Report*, making it more focused and forward-looking, occurred in 2004. Release of new pieces of information is reflected automatically in indicators of the framework transparency, while the public needs time to verify and understand the impact of inflation projections of NBP staff on MPC decisions, given that these projections are only one of the factors taken into account by policymakers, and that MPC members are not involved in the preparation of the forecast.

The credibility of monetary policy is usually measured as the deviation of inflation expectations from the central bank inflation target or forecast. In the empirical part of our paper we estimated the weight attached to the NBP inflation target in the formation of inflation expectations of consumers and commercial bank analysts. There is a sharp difference between both groups of agents. In the case of commercial banks, the inflation target constitutes an important information variable taken into account while forming inflation predictions. It holds true even if the effects of interest rate forecast errors are filtered. Polish consumers do not pay attention to the NBP inflation target while forming their expectations. The probability attached by consumers to inflation remaining within the NBP inflation target range is significantly lower compared with opinions of bank analysts. It was characterized, however, by a positive trend, indicating a gradual increase of credibility of NBP inflation targets. Two major exceptions from this tendency were related to the fast disinflation 2002–2003 and the effects of accession to the EU in 2004.

As the theoretical literature suggests, increased transparency of the monetary policy framework, reflected in the improvement of communication patterns, should lead to better predictability of monetary policy actions. From that point of view, relatively high transparency indices characterizing the IT framework of the National Bank of Poland and the low predictability of the NBP interest rates are puzzling, especially taking into account the high credibility of inflation targets resulting from the assessment of commercial bank analysts' inflation expectations. It occurs that despite repeated inflation target misses and interest rate decisions being inconsistent with their expectations, commercial bank analysts' trust in the NBP inflation targets was unexpectedly stable.

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<sup>21</sup> Extending our study, it would be necessary to check whether our results based on surveys carried out among commercial bank analysts would be confirmed by analogous tests based on financial market data. Moreover, it would be necessary to consider other groups of economic agents to verify their understanding of information released by the National Bank of Poland and its monetary policy actions.

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