

# Inflation expectations of Polish entrepreneurs. Does the central bank communication matter?

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## Abstract

The widespread increase in the central banks' transparency is driven by the belief that it can improve monetary policy effectiveness, primarily through inducing favourable changes in the formation of inflation expectations. This study is the first attempt to investigate the evolution of the inflation expectations of Polish entrepreneurs and analyse them in relation to developments in the communication strategies of the National Bank of Poland. In this paper a new methodology to evaluate the rationality of inflation expectations is proposed. This method is then applied to make a tentative assessment of the possible impact of the NBP's communication on corporate expectations. The results indicate that although Polish entrepreneurs pay much attention to the information released by the central bank, the increase in the openness of the NBP has not, as yet, translated into a sustainable improvement in the rationality of inflation expectations in the enterprise sector.

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# Introduction

Since the beginning of the nineteen-nineties, a worldwide trend towards greater monetary policy transparency has been observed<sup>1</sup>. Central banks in both industrialized and developing countries have been disclosing more and more information and improving their communication with the public. Monetary policy transparency has also become a subject of extensive research. Nowadays, among both policy makers and academics, there is a widespread belief that central bank transparency can be a useful tool for increasing the effectiveness of monetary policy.

Central bank's transparency exerts an influence on the effectiveness of monetary policy primarily through the inflation expectations channel. One of the major barriers to stabilising prices is the adaptive nature of economic agents' inflation expectations. Studies show that expectations concerning future price developments, in particular those of non-professional forecasters, tend to be strongly based on current and past inflation figures<sup>2</sup>. This may be due to the fact that most economic agents do not possess the relevant information and knowledge necessary to analyse developments in the economy and devote relatively few resources to form their economic forecasts. In consequence, high inflation usually induces high inflation expectations, which in turn stimulates increase in wages and prices. Therefore, in the case of high price dynamics, adaptive expectations make it costly for the central bank to reduce inflation. Monetary policy transparency can decrease the degree to which high inflation translates into high expectations of future price growth. First of all, transparency may increase the credibility of monetary policy. When the central bank announces its inflation target, explains any deviations from the target and makes it clear to the public that its policy is oriented towards stabilising prices, inflation expectations do not follow every rise in inflation but are anchored on the inflation target instead. This improves the trade-off between inflation and output variability in the long term and hence increases the effectiveness of monetary policy. Furthermore, by disclosing information relevant for monetary policy and providing a clear and accurate assessment of future developments in the economy, economic agents following central bank communication are in a better position to be less adaptive and more forward-looking and rational.

The literature on the relation between central bank transparency and monetary policy effectiveness is predominantly of a theoretical nature. So far, little empirical research has been available, especially on the influence of monetary policy transparency on the formation of inflation expectations. In Poland monetary policy transparency has hardly been investigated. In the last few years, the National Bank of Poland (NBP) has made consid-

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<sup>1</sup>As described in the following section, monetary policy transparency can be defined in different ways. In this paper transparency refers to the disclosure of information relevant for monetary policy and its communication in a clear and intelligible way, which improves public understanding of a central bank's policy.

<sup>2</sup>A more thorough analysis of the formation expectations of economic agents is presented in section 5.

erable efforts to increase its transparency. The question arises whether this has translated into an improvement in the effectiveness of monetary policy. In particular, it is interesting whether changes in central bank openness and communication have improved transparency and affected the formation of inflation expectations in Poland.

The purpose of this paper is to analyze the formation of Polish entrepreneurs' inflation expectations. The investigation into the expectations of private businesses is motivated by the fact that they play a significant role in the monetary policy transmission mechanism by affecting wages and corporate investment decisions. Furthermore, unlike the inflation expectations of Polish households and professional forecasters, research on the formation of Polish entrepreneurs' inflation expectations has been very limited. This paper aims to fill this gap. The analysis is based on corporate inflation expectations data obtained from quarterly surveys conducted by the NBP among Polish enterprises.

In this study, a new method of evaluating the rationality of inflation expectations is proposed. This method yields a probability distribution of the degree of expectations' rationality in each time period and it is applied to examine how the formation of the corporate inflation expectations evolved over time.

The formation of inflation expectations is influenced by many different factors. In our study we focus on the potential link between inflation expectations and central bank communication and closely follow the developments in these two areas. On the basis of this analysis a tentative assessment is made concerning the impact of NBP openness and communication on Polish entrepreneurs' inflation expectations.

The outline of the paper is as follows. In the first section a brief literature overview on the relation between central bank transparency, monetary policy effectiveness and inflation expectations is given. The second section presents the developments in the NBP transparency and communication over the last decade. In the third section, the survey data used in the analysis are described. On the basis of this survey, the fourth section analyzes the perception of the NBP communication by Polish enterprises. The fifth section examines the formation of Polish entrepreneurs' inflation expectations. In this section, a new measure of the rationality of inflation expectations is constructed. This measure is then used to examine the evolution of the formation of inflation expectations in the Polish corporate sector over time and to study the differences among various groups of enterprises. The description of the results is extended by an attempt to identify the factors influencing the developments in the degree of corporate inflation expectations' rationality with special regard to monetary policy transparency. The final section concludes.

# 1 Transparency, monetary policy and inflation expectations – literature overview

The widespread increase in monetary policy transparency during recent years has been accompanied by a growing body of research on the relation between transparency and the effectiveness of monetary policy. Studies on this subject encounter many difficulties, as monetary policy transparency is not easy to define and even more difficult to measure.

The first approach to evaluating transparency is to identify it with openness in disclosure. In this concept, transparency is determined by the institutional arrangements of the monetary policy regime and the characteristics of the information policy of the central bank. According to this approach, the more information on monetary policy available to the public, the more transparent the central bank is. In this framework of analysis many different types of transparency may be distinguished, depending on what kind of information is released by the central bank. To give an example, according to the classification adopted by Hahn (2002), there are goal, knowledge and operational transparencies. Geerats (2001), in contrast, listed political, economic, procedural, policy and operational transparency. Transparency defined in this way can be measured by indices based on the characteristics of the monetary policy framework and the release of information by the central bank. There are many studies in which transparency is assessed with the use of such indices, including: Fry et al. (2000), Bini-Smaghi and Gros (2001), De Haan and Amtenbrink (2002), Eijffinger and Geraats (2004).

However, this method of understanding and measuring transparency has serious drawbacks. If transparency is to have any effect on policy outcomes, it should remove asymmetric information and reduce uncertainty in general. Winkler (2002) pointed to the fact that the provision of more information by central banks does not always improve public understanding of monetary policy. He proposed a broader definition of transparency, encompassing its different and potentially conflicting aspects: *openness*, *clarity* and *common understanding*. Winkler argued: *When there are frictions in communication and imperfections in the processing of information, openness in the release of information needs to be reconciled with the need for clarity in central bank communication. In this perspective transparency primarily hinges on a shared mode of interpretation (common understanding) between the central bank and its audience.* (Winkler, 2002, p. 423).

The recognition that it is the perception of information disclosed by the central bank that matters for the effectiveness of monetary policy prompted many studies to investigate the extent to which the public understands monetary policy. In these studies, which included Haldane and Read (2000), Poole et al. (2002), Lange et al. (2003), Hardy (1998), Muller and Zelmer (1999), monetary policy transparency was measured as the degree of the anticipation of policy decisions by the financial markets. This kind of research confirms that openness in disclosure and public understanding of monetary policy do not necessarily ac-

company each other (Howells, Mariscal 2003). Not only the release of information but also effective communication are necessary to diminish uncertainty concerning monetary policy. For central banks the question is thus not only whether but how to be transparent. Concerning the latter, studies show that there are many roads to transparency and different communication strategies may bring similar results (Carpenter, 2004; Ehrmann, Fratzscher, 2005).

The literature on monetary policy transparency is mostly theoretical. The results of theoretical studies depend critically on the modelling framework adopted, especially concerning the treatment of uncertainty, the monetary policy transmission mechanism and the form of central bank's objectives (Edey, Stone, 2004). A comprehensive overview of the theoretical studies on central bank transparency is presented in Geraats (2002) and Carpenter (2004). Eijffinger and Hoeberichts (2002) showed that transparency may be of crucial importance in low-credibility central banks, whereas monetary authorities enjoying high credibility can afford to be more opaque. In many theoretical studies central bank transparency exerts an impact on policy outcomes by influencing inflation expectations (Eijffinger et al., 2000; Svensson, 2003; Orphanides, Williams, 2004).

Empirical research on the influence of transparency on monetary policy effectiveness is limited and leads to mixed results. Demertis and Hallett (2002) analysed the effects of central bank transparency on inflation and output gap in several industrialized countries. They found that while transparency does not affect average levels of output and inflation, it influences their variability. Chortages et al. (2002) showed that an increase in the details with which central banks publish forecasts is related to lower average inflation. Eijffinger and Geraats (2004) studied the relation between transparency and interest rates and found that, controlling for economic conditions, improvements in transparency are associated with significantly lower interest rates. There are also empirical studies investigating the effects of the introduction of the direct inflation strategy, in which transparency plays a key role. Cecchetti and Krause (2002) provided some evidence that monetary policy transparency improves macroeconomic performance measured in terms of the trade-off between inflation and output variability. Ball and Sheridan (2003) found no clear evidence that inflation targeting is associated with superior policy outcomes.

In Poland little research on transparency in monetary policy has been undertaken so far. Zieliński (2001) tested whether the introduction of the direct inflation targeting strategy in Poland increased monetary policy transparency as measured by the market's reactions to the changes in NBP's interest rates. He found no evidence that transparency had been improved significantly during the first two years of the direct inflation targeting regime. Jarmużek et al. (2004) examined monetary policy transparency in the Czech Republic, Hungary and Poland. They measured both institutional transparency, using the Eijffinger-Geraats index, and behavioural transparency, defined as the degree of financial markets' anticipation of the central bank's interest rates changes. They came to the conclusion that the adoption of direct inflation targeting had significantly increased the monetary policy

transparency in the three countries analysed and that in all these countries transparency is comparable to that of the ECB.

While the links between central bank transparency, monetary policy effectiveness and inflation expectations have been widely recognised in the theoretical literature, to our knowledge empirical research on the influence of transparency on the formation of inflation expectations has been very limited. Whereas it is acknowledged that inflation expectations play a critical role in the monetary policy transmission mechanism, there is no consensus on which kind of expectations are crucial for the central bank. Studies show that inflation expectations of different groups of economic agents differ substantially (Figlewski, Wachtel 1981; Gramlich 1983; Mankiw et al. 2003). Research on the formation of inflation expectations is dominated by studies of the expectations of households and professional forecasters.

In this study we examine the formation of inflation expectations by Polish enterprises for several reasons. First, corporate inflation expectations play an important role in the monetary policy transmission mechanism. They determine enterprises' investment decisions and strongly influence wage negotiations and price setting, exerting a strong bearing on inflation. Second, the National Bank of Poland has a large database on the inflation expectations of enterprises, which comes from quarterly surveys. This data has the advantage over the data on Polish households that the inflation expectations are expressed *quantitatively* rather than *qualitatively*<sup>3</sup>. Corporate inflation expectations have also an advantage compared to bank analysts' expectations as there are many more observations for each period of the analysis. This makes it possible to account for the fact that there are significant differences in expectation formation among individuals, which is confirmed in the literature (Figlewski, Wachtel, 1981).

It may be argued that enterprises form inflation expectations on the basis of the forecasts of professional forecasters, rather than on the basis of information from the central bank. Nevertheless, as will be shown in the fourth section of this paper, enterprises in Poland do follow the information on monetary policy and, therefore, the central bank communication may influence the way in which corporate inflation expectations are formed.

## 2 The evolution of transparency and communication of the NBP

Since the beginning of the transition period the monetary policy framework in Poland has undergone significant changes, which has been accompanied by an evolution of central bank openness in disclosure and communication with the public.

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<sup>3</sup>This is favourable for two reasons. First, the quantification of the inflation expectations is a potential source of bias, when the underlying assumptions are not fulfilled. Second, quantitative survey data provides not a single value but a whole distribution of inflation expectations for each time period.

## 2.1 First years of transition

After 1989, Polish monetary policy was primarily oriented towards fighting inflation. However, the objective of the NBP was vaguely defined as *strengthening the Polish zloty in particular*, which opened the way for different interpretations. The NBP did not enjoy full independence and was subject to considerable political pressure. Parliament played a significant role in preparing *The Monetary Policy Guidelines* for each year and the NBP's *Report on Monetary Policy Implementation* had to be submitted for Parliaments' acceptance. In such circumstances the scope for monetary policy transparency was limited.

A sea change in the conduct of monetary policy in Poland was brought about by the adoption of the *Constitution of the Republic of Poland*, which came into force on 17 October 1997, and *The Act on the National Bank of Poland* of 29 August 1997. In these documents it was clearly stated that the primary objective of the NBP activity is to *maintain price stability* and the Polish central bank was granted considerable independence. The power to formulate and implement monetary policy was delegated to the Monetary Policy Council (MPC). In the light of the high degree of NBP autonomy, measures were taken to ensure central bank accountability. Both the *Constitution* and the *Act on the National Bank of Poland* have imposed a legal obligation on the MPC to draw up annual *Monetary Policy Guidelines* and submit these to the Parliament for the information thereof. The Council is also legally obliged to present to the Parliament, within five months of the end of the fiscal year, a report regarding the realisation of monetary policy guidelines. Furthermore, it is legally required that the positions taken by Council members during votes are published not earlier than six weeks and not later than three months from the date the resolution is adopted.

## 2.2 Direct inflation targeting

An important milestone on the way to greater monetary policy transparency was the introduction of *direct inflation targeting*. The plans to introduce this new regime were first announced by the MPC in a press release in June 1998. In September 1998 in the *Medium Term Monetary Policy Strategy for the Years 1999-2003* the direct inflation targeting framework was described in detail. Although the new strategy was officially introduced in 1999, the interim year 1998 can be seen as a smooth transition to the new regime.

With the introduction of direct inflation targeting, transparency has become an important element of the monetary policy strategy, which was announced in the *Medium-Term Strategy of Monetary Policy for the Years 1999-2003*. In this document the MPC acknowledged that an effective information policy is crucial for anchoring inflation expectations and minimizing disinflation costs. According to the *Strategy*, the credibility of monetary policy and the decrease in economic agents' uncertainty concerning monetary policy should

be achieved through: *a transparent commitment and public announcement of long-term targets, the means of their implementation and the interpretation of the country's economic situation. For the same purpose a detailed explanation of specific policy decisions and their impact on the target fulfilment must be provided.*

The medium-term monetary policy objectives have been announced in *Monetary Policy Strategies* whereas, as in the period preceding the establishment of the MPC, short term inflation targets and the means of their implementation have been presented in the *Monetary Policy Guidelines* for each year. Although this practice contributed to considerable goal transparency, a major deficiency was the fact that in 1999 and 2002 the inflation targets were modified throughout the year.

The interpretation of the country's economic situation has been the main subject of the *Inflation Reports*. While this document had already been published since December 1995, at first its role was very limited. The significance of the *Inflation Report* has significantly increased since the introduction of direct inflation targeting. In the *Medium-Term Strategy of Monetary Policy for the Years 1999-2003* the MPC stated that the *Inflation Report* would be the Councils' main analytical document. Initially, it was published semi-annually and since the beginning of 2000 – on a quarterly basis. The *Inflation Report* contained a thorough analysis of the economic situation and its consequences for inflation. It also provided a description and explanation of the monetary policy conducted in the period under review. A major drawback of the *Inflation Report* was the fact that it was published with a delay of several months. Therefore its content was mainly of historical value and the document seems not to have been an effective tool of NBP's communication.

An analysis of the policy conducted throughout the whole year and, in particular, explanation of deviations of inflation from the target have been presented in annual *Reports on Monetary Policy Implementation*. Monetary policy decisions have, however, been also explained directly after MPC meetings, which have been held on a monthly-basis. The meetings have been followed by press releases, in which the MPC decisions have been announced, and a press conference. Initially, press conferences were only held when the NBP interest rates changed. Since January 2001 conferences have followed every MPC meeting. In the period from January 1998 to April 2001 the communiqués after MPC meetings varied from month to month. When interest rates remained unchanged, it usually only informed of the decisions taken. When the MPC changed the monetary policy parameters, the press releases also contained a justification for these decisions. A regular publication of policy explanations after each MPC meeting has started since April 2000. The press releases focused on presenting and briefly analyzing current economic data and listing factors contributing to an increase and a decrease in inflationary pressure.

After the MPC meeting in February 2000 the concept of *monetary policy bias* was introduced. The bias has been announced together with the decision on the NBP interest rates. It should point to the future direction of monetary policy and thereby enhance monetary policy transparency. This additional communication tool did not however play the role ini-



tially assigned to it, as in the period from December 2000 to June 2003 a neutral monetary policy was accompanied by steady interest rates decreases.

It is worth noting that in January 1999 the NBP website was launched. It contained information on the NBP and Polish monetary policy, including an electronic version of NBP press releases, official MPC documents and NBP publications. This considerably increased the availability of information on monetary policy in Poland and in this way the NBP gained a very powerful channel of communication.

One of the elements of central bank transparency has been the disclosure of MPC voting records. In line with the NBP Act they have regularly been published in the *Monitor Sadowy i Gospodarczy* (*The Court and Commercial Gazette*) and since June 2001 also in the *Inflation Report*. The voting records provided an important insight into the decision-making process and have been helpful in understanding preferences of the MPC members.

In the first years after the introduction of direct inflation targeting, central bank transparency did not attract much attention from the media and it seems that the NBP and MPC did not enjoy a reputation as good communicators. In this period several articles published in leading Polish newspapers criticized the NBP communication policy. Among other criticisms, they pointed to insufficient clarity in the justification of policy decisions in the press releases after MPC meetings and also criticized the MPC for maintaining a neutral monetary policy bias while steadily decreasing interest rates.

In 2003, a report was published in which the communication of nineteen central banks conducting monetary policy in the direct inflation targeting framework was evaluated on the basis of *Inflation Reports* (Fracasso et al. 2003). The study identified significant deficiencies in the communication of the NBP and granted it a low ranking among the central banks analyzed. This stimulated discussion in the NBP on transparency and communication issues.

### **2.3 Transparency revolution at the NBP**

In 2003, measures were taken at the NBP to improve communication with the public. It was announced that the Polish central bank would publish inflation projection, which is a major communication tool used by central banks conducting monetary policy in the direct inflation targeting framework. At the same time, work on a new form of the *Inflation Report* began.

At the beginning of 2004 the newly elected MPC put the issue of central bank transparency and communication at the top of its agenda. In May 2004, the first *Inflation Report* in its new form was published. The *Report* was more forward-looking in nature and, most importantly, it was published shortly after the end of the period analyzed.

A fundamental change in the NBP's communication was introduced in August 2004 with the first publication of the NBP's inflation projection. The projection was to become the

main device to communicate the NBP assessment of future economic developments and their influence on inflation as well as the balance of risks surrounding this assessment. With the inflation projection, the NBP communication became more forward-looking and therefore consistent with the nature of monetary policy, which affects the economy with considerable time-lags. Since the first release of an inflation projection the publication of *Inflation Report* has been followed by a press conference and a meeting with financial market analysts. Two months after the first NBP inflation projection had been published the models used to prepare the projection were disclosed. It should be pointed out that although the publication of the inflation projection has significantly increased the openness in disclosure of the NBP, its influence on monetary policy transparency has been less pronounced. This is due to the fact that the projection is prepared not by the MPC but by the central bank's staff, and as such it is only one of the inputs in the decision making process.

The publication of inflation projection was accompanied by a change in the form of the communiqués after the MPC meetings. In comparison to former press releases, the communiqués now contained less statistical information and focused on a brief but comprehensive forward-looking assessment of the outlook for inflation. The *Monetary Policy Guidelines for the Year 2005*, published in September 2004, also aimed to improve central bank communication. In this document, the MPC inflation target has been clarified and a new definition of the monetary policy bias was provided.

After the publication of the inflation projection, central bank transparency and communication became a topical issue in the Polish press. The NBP received a lot of criticism for the assumptions underlying the projection. Nevertheless, publication of the projection has altered the discussion on monetary policy in Poland. The accompanying efforts of the NBP and MPC to improve the *Inflation Report* and press releases after the MPC meetings did not remain unnoticed by professional economists. Although the predictability of the MPC decisions still remains low, the new NBP communication framework constitutes a good basis for its improvement.

To conclude, during recent years the NBP has considerably increased its openness in disclosure and made much effort to improve its communication with the public. Initially, the trend towards greater monetary policy transparency was primarily accountability driven. With the introduction of direct inflation targeting, the influence of the effective communication of the central bank on monetary policy effectiveness was recognized. Especially during the last two years, NBP transparency and communication has been a major concern of Polish monetary authorities. However, despite the fact that the NBP disclosed even more information, it does not have a reputation of an effective communicator. There is thus still much scope for improving public understanding of monetary policy.

### 3 Description of the survey data

The analysis of both the assessment of the NBP's communication by Polish entrepreneurs and the formation of the inflation expectations in the corporate sector have been based on the results of surveys conducted by the NBP among the firms operating in Poland<sup>4</sup>. The main purpose of undertaking the surveys was to get insight into the firms' sentiment as to the future developments of business conditions as well as to monitor more closely the monetary transmission through corporate sector. The survey questionnaire contains among others a set of questions about the entrepreneurs' inflation expectations. This data is used to examine the rationality of these expectations.

The survey is conducted on a quarterly basis and takes place during the first weeks of a calendar quarter. The number of firms surveyed has been increasing over time. In 2001 there were about 230 answers to the inflation expectations question – the number has risen to 475 in 2005q1. The sample selection does not comply with the formal requirements of the representative method, so the issue arises of whether the firms chosen for investigation do cover the population of Polish enterprises proportionally. The reason for not using the representative sampling is that these would require proportional coverage of all the numerous dimensions the survey is meant to keep track of and as such result in problems with finding enough firms falling within the intersection of all the conditions. This may be considered as a flaw of the data. However, the empirical evidence supports the use of this survey. For the years when the survey has been conducted it proved to be a very good real-time indicator of trends in the real economy in Poland<sup>5</sup>. Therefore there are reasons to assume that these surveys also provide useful information regarding the nominal side of the economy and hence their application to investigating the formation of inflation expectations in particular also seems to be justified.

To gain a feeling about how the survey sample deviates from the structure of the entire population one can compare some of the survey sample properties with the properties of F01 survey conducted by the Central Statistical Office<sup>6</sup>. The structure indicated by the F01 can be regarded as representative. As far as the size of the enterprise is concerned, big firms are overrepresented in the NBP sample, the size measured both in terms of revenues and employment (Figure 1). In a sectoral breakdown, the overrepresentation is also recorded for the manufacturing sector (Figure 2) and for the exporting sector.

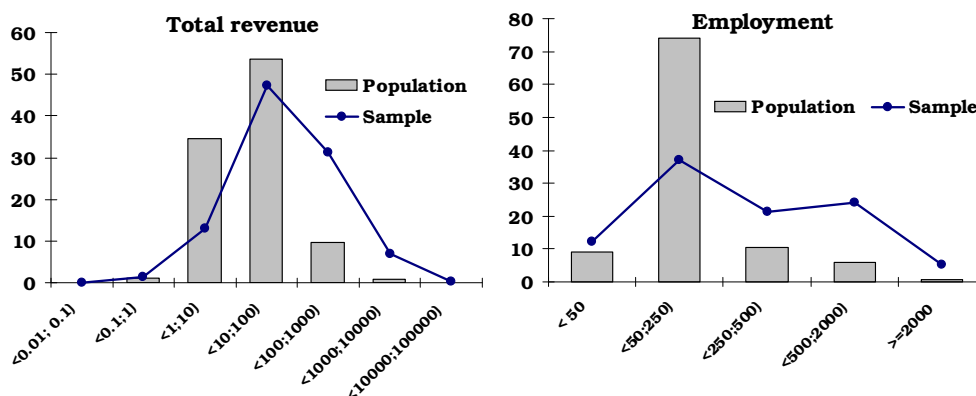
The survey question about the inflation expectations is as follows: *The enterprise expects the growth in the CPI prices over the following 12 months to be . . . percent.* Enterprises respond

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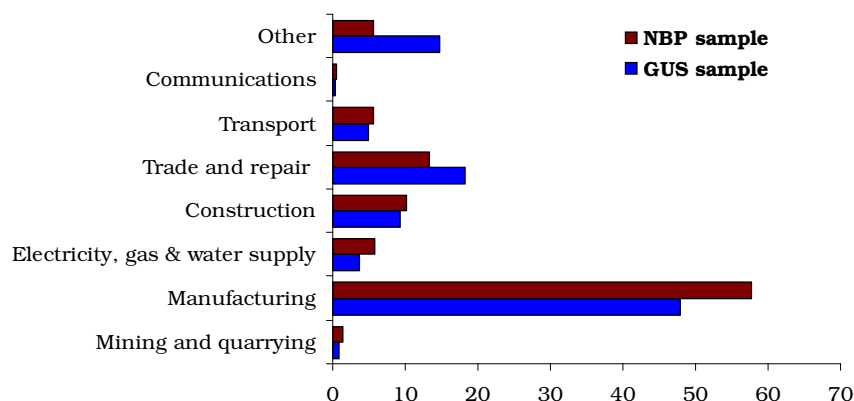
<sup>4</sup>The reports on the results of the surveys can be found at [www.nbp.pl](http://www.nbp.pl)

<sup>5</sup>Good statistical properties of the survey capability to indicate the changes in the main macro variables have been confirmed in *Questionnaire survey of the corporate sector at the National Bank of Poland – current status and proposed modifications*, NBP, Statistics Department, October 2003, mimeo.

<sup>6</sup>The sample covered by the F01 survey encompasses all non-financial sector enterprises (with the exception of the sections: *agriculture, hunting and forestry, and fishing and fish farming*), employing more than 49 people.



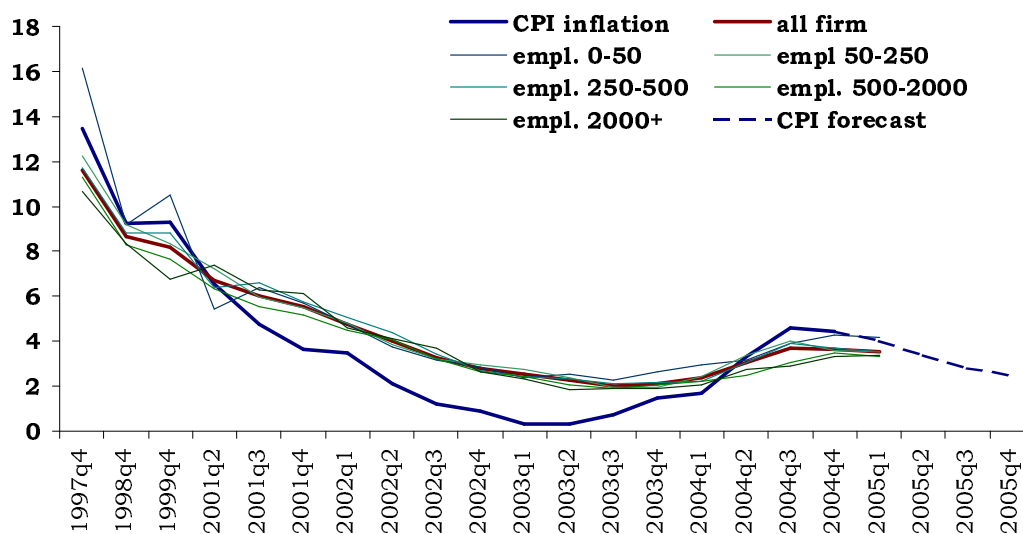
**Figure 1:** NBP survey versus GUS F01 survey – comparison of the structure of revenues (left panel, in mln PLN) and employment (right panel, in persons), data for the end of 2003



**Figure 2:** NBP survey versus GUS F01 survey – breakdown by sectors comparison, data for 2004q3

*quantitatively* by providing the expected annual CPI inflation expressed as a number. This is an important difference compared to many other surveys of inflation expectations, in particular those directed to households. The answers to the inflation expectations question are available since the end of 1997, with annual frequency till 1999, and with quarterly frequency since 2001q1 till now. There is a gap in continuity of the data in 2000 since the survey was not conducted that year. Figure 3 plots the average expected inflation and the actual annual CPI for the period for which the survey data on inflation expectations are available. The average expected inflation is presented for all the firms in the sample (the solid brown line) as well as for the subgroups of firms with regard to the number of employees (employing less than 50 people, 50-250 people, 250-500 people, 500-2000 people and more than 2000 people). The number of employees is a *proxy measure* for the firm size.

The average expected inflation has to a significant extent mimicked the developments of



**Figure 3:** Current CPI inflation and inflation expected by firms

the current inflation. Over the period 2001-2002 it was falling; however, the slide was slower compared to that of actual inflation. The expectations have never decreased to the record-low values of less than 0.5 per cent, whereas the actual inflation did. The corporate expectations went up at the beginning of 2004 along with the increase in inflation figures and the fears of price rises after Poland's EU-accession. However, the upward trend was halted already in 2004q4: a concurrent decrease in inflation expectations and actual inflation has been recorded since then. Enterprises did not wait to see declining inflation before revising their expectations downwards.

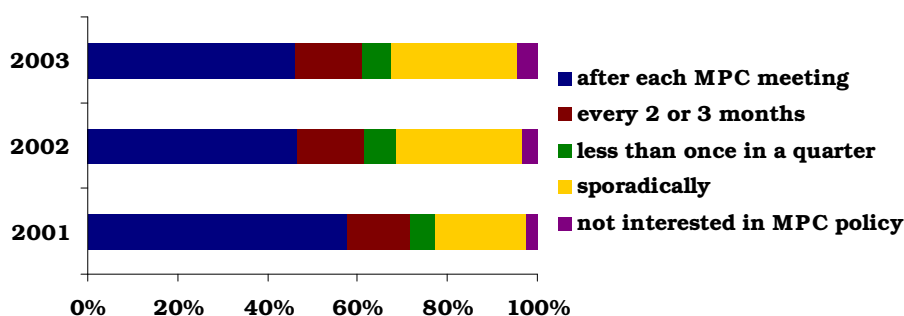
It is interesting to compare the developments of the expectations across the size of the firm. The differences in the average expected inflation were virtually invisible over the majority of period under inspection. This can be easily seen from the Figure 3 – the bundle of curves representing the average of expectations in the subgroups is relatively close to the brown line computed for the entire sample. The situation seems to be changing at the turn of 2003 and 2004, when the inflation expectations of enterprises with employment of less than 50 start to exceed expectations of all the other subgroups. The differentials of expectations among the subgroups strengthen in 2004. Big firms (employing 500-2000 and over 2000 people) tend to expect lower inflation than small firms. The expectations remain the highest in the subgroup of smallest firms, employing up to 50 people.

## 4 How do Polish firms perceive the communication of the NBP?

The National Bank of Poland began to monitor the perception of its monetary policy among enterprises in 2001. For this purpose survey data on the following issues are collected<sup>7</sup>:

- enterprises' interest in monetary policy,
- opinions of enterprises concerning the information policy of the central bank,
- anticipation of the MPC's decisions on interest rate changes.

The survey results suggest that almost all enterprises take interest in monetary policy and usually have up-to-date knowledge on the latest developments in this field. In 2003 almost one in every two respondents followed the MPC's decisions concerning monetary policy regularly, i.e. after each MPC meeting, while the remaining enterprises also analysed the situation in this respect, although not so frequently. The cases of enterprises reporting a lack of any interest in monetary policy developments were scarce, though it has to be admitted that their share has been on the rise since the beginning of the survey (in 2003 such cases accounted for 5% of the sample with half of these companies being non-investing enterprises insensitive to the impact of interest rate levels).



**Figure 4:** Frequency of consulting the press releases from MPC meetings and NBP publications concerning monetary policy (horizontal axis: percentage of the sample)

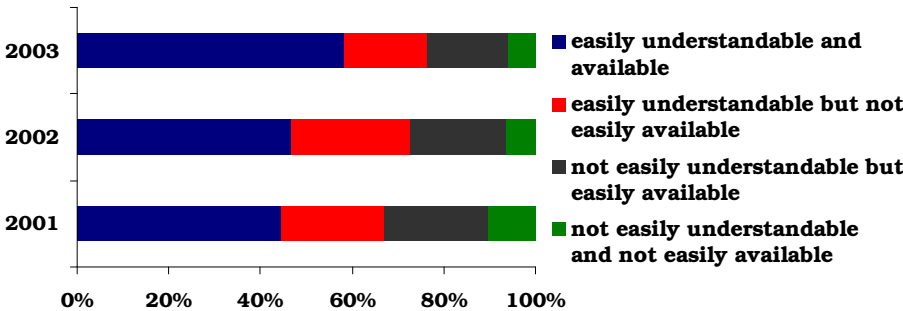
The share of enterprises expressing interest in monetary policy developments was recorded the highest in 2001, i.e. the first year of the survey. The results from the following year indicate a substantial fall (Figure 4), though this was not due to companies abandoning analysis of this field, but rather because the frequency of such analysis decreased. The

<sup>7</sup>It should be noted that due to the fact that the survey is conducted by the NBP, answers concerning monetary policy may be biased and the results should be interpreted with caution.

decrease in the attention put to monetary policy may be partly due to the fact that enterprises reported to become more impervious to interest rate developments. In 2002 and 2003 the enterprises' interest in monetary policy was stable. The interest in monetary policy, as measured by the share of enterprises claiming to follow Monetary Policy Council's decisions and the relevant NBP announcements on a regular basis, varied particularly with the form of ownership, market position, size of workforce and age of the enterprise. In 2003, the best-versed in monetary policy were primarily the largest enterprises, both in the terms of their employment level and the market position, in contrast to the very low level of interest in monetary policy in the group of the smallest entities. . Similarly, non-investors tended to display a relatively weaker interest in monetary policy issues.

### 4.1 The assessment of the NBP's information policy

While in the period 2001 – 2003 there was some fall in enterprises' interest in monetary policy, the assessment of the central bank's information policy has improved since the subject began to be investigated. Enterprises claimed that while in 2002 they saw a particular improvement in the intelligibility of the central bank's public message, 2003 marked a progress in the availability of the published information. In 2003 as much as 3/4 of the surveyed sample positively assessed the way of distributing and publicising news concerning monetary policy, and a similar percentage of enterprises did not report any trouble with understanding these announcements (as compared to the first year of the survey each of these shares rose by about 9 percentage points)<sup>8</sup>.

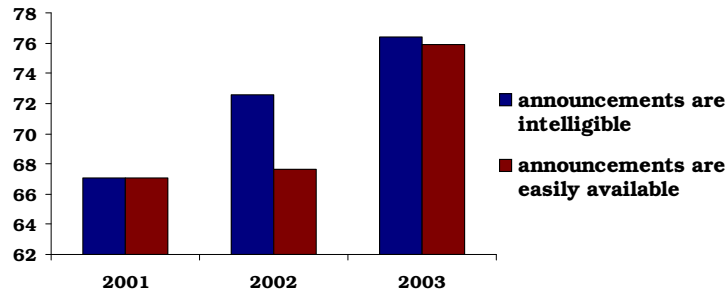


**Figure 5:** Assessment of way of informing on monetary policy (horizontal axis: percentage of the sample)

The greatest differentiation in the perception of the NBP's information policy was revealed by breaking down the survey results according to the form of ownership, the number of employees and the age of the responding enterprise. The survey responses received suggest

<sup>8</sup>It is worth noting that the perception of the intelligibility of the central bank's announcement depends not only on the clarity of NBP's communication but also on the economic literacy of enterprises, which may increase over time

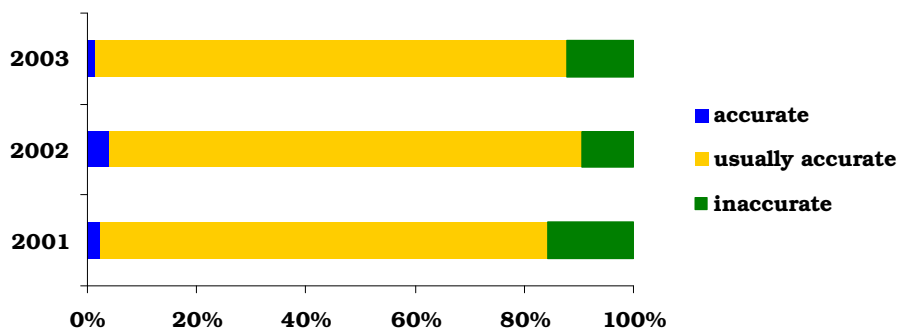
that understanding the monetary policy announcements of the NBP was more difficult for private sector companies, enterprises with smaller workforce and younger companies.



**Figure 6:** Assessment of the central bank communication (vertical axis: percentage of the sample)

## 4.2 Predictability of MPC interest rate decisions

The improvement in the flow of information between the NBP and the market as well as its greater intelligibility have not as yet helped enterprises to predict central bank's decisions as regards interest rate levels more accurately. The accuracy of companies' expectations of MPC decisions was assessed by respondents themselves (forecast was treated as accurate if MPC decision proved consistent with the company's expectations). After some improvement in the forecast accuracy observed in 2002, in 2003 the respondents again found it more difficult to predict the interest rate decisions accurately (Figure 7). Thus, despite the rise of some positive factors such as better information policy of the NBP, there are no noticeable signs of a permanent improvement in the predictability of the MPC's decisions. This supports the hypothesis that despite considerable increase in the openness of the NBP, monetary policy transparency still lags behind.



**Figure 7:** Accuracy of enterprises' expectations of MPC decisions on interest rates (horizontal axis: the percentage of the subgroup of companies analysing MPC decisions)



In the view of the surveyed enterprises the MPC's decisions regarding the interest rate policy are broadly predictable. The respondents usually tended to predict MPC decisions correctly ("usually accurate" forecasts were made by 88% respondents out of those who made such predictions, and by 60% of the full sample). The actual decisions on interest rates were relatively more often consistent with expectations in the group of enterprises which were following monetary policy developments on a regular basis – the percentage of inaccurate forecasts was the lowest in this group.

With an overall high capacity of the surveyed enterprises to accurately predict MPC decisions on interest rate levels, the sample was clearly varied in terms of enterprises' prediction performance. These differences were particularly evident in breakdowns into the workforce size and age of the company. Better ability to accurately predict MPC decisions as regards interest rate levels was recorded in medium-sized and large enterprises as well as in those with longer history, of at least 20 years of operation. Difficulties with accurate forecasting usually occurred in the group of small companies.

Summing up, the surveyed enterprises display a considerable interest in monetary policy pursued by the MPC, which is supported by the improving perception of the central bank's information policy. Enterprises reported that in both 2002 and 2003 the availability of information publicised by the NBP increased and in 2002 they observed an improvement in the comprehensibility of the central bank's announcements.

The improvement in the flow of information between the NBP and the market as well as its greater intelligibility has not translated into a further increase in the predictability of the MPC decisions as regards interest rate movements. In the case of the surveyed enterprises the capacity of predicting MPC decisions concerning shifts in interest rate levels should, nevertheless, be judged as high, as they usually manage to accurately foresee the central bank's decision in this respect.

The survey results reveal certain areas which would require more education about monetary policy as well as better information distribution. These areas of low awareness, which also experience greater difficulties with digesting the information from central bank's, include the sector of small and young enterprises as well as the group of non-investing companies.

## **5 The formation of inflation expectations of Polish entrepreneurs**

### **5.1 Theoretical framework of the analysis**

There are two major types of inflation expectations distinguished in the economic literature: adaptive and rational. Adaptive expectations are formed on the basis of past inflation

figures, without analysing economic developments and outlook for inflation. Thus, an enterprise with adaptive expectations expect the future inflation to be a projection of its past inflation values or, equivalently, to remain at a similar level to that in the past. In practice adaptive expectations are usually assumed to have the form of a distributed lag of past inflation (Sargent 2002).

Rational expectations are more "demanding". According to the literature (Orphanides 2004, Lyziak 2003), a rational agent is able to properly and fully exploit all information available to upgrade the simple adaptive forecast of future inflation and make it closer to the actual future inflation outcome. The assessment whether expectations are rational or not causes serious difficulties. By definition rational agents should perfectly understand the mechanics of the economy and be able to make efficient use of this knowledge. This is a very strong claim. With regard to such meaning of rationality of expectations Sargent has pointed out that: *rational expectations models impute much more knowledge to the agents within the model ... than is possessed by an econometrician, who faces estimation and inference problems that the agents in the model have somehow solved* (Sargent 1993, p. 3).

Hence, it is hard to expect anyone in the real world to have such rational expectations. However, economists still make attempts to test the *rational expectations hypothesis*. There are virtually two approaches applied for that purpose (Croushore, 1997). The first one assumes the expectations to be rational when they are on average in line with the actual inflation outcomes. The second one is based on complex models forecasting inflation. If the differences between the expected inflation and inflation forecasted by the models are orthogonal to all the variables in the models, then it is believed that agents forming their expectations do it rationally, i.e. making use of the same information set as the model does. The two approaches seem to have shortcomings, however. The first one has embedded an assumption that all the shocks influencing inflation net out, which seems true only for long time periods. In the second one, it is claimed that the models of economy are perfect, encompassing all important factors driving inflation. But, by definition, models are only an approximation of reality, not able to map its entire complexity.

Identification of rationality in the inflation expectations literature draws heavily from the time series analysis. One of the main reasons for that seems to be the fact that the questions asked in the inflation expectations surveys, especially those addressing households, are usually *qualitative*<sup>9</sup>. Thus, all the data collected for particular moment in time has to be used for constructing the *quantitative* estimates of the expected inflation. A serious practical limitation in applying such an approach to investigate rationality is the availability of the data. Having too short data series makes it impossible to assess the type of the expectations. As the coefficients in estimated equations are typically assumed to be constant over time, the analysis of the changes in rationality over time is even more difficult.

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<sup>9</sup>Contrary to households, in the case of surveys conducted among professional economists the question regarding inflation expectations takes usually a *quantitative* form.

The time series on inflation expectations of Polish enterprises are rather short. Therefore applying the time series approach is not an option in order to get insight into the process of the formation of these expectations. On the other hand the survey question is *quantitative* so the cross-section dimension remains available as there is no need to exploit it for constructing the expectations' figures. It is thus tempting to take advantage of this and use cross-section data for the purpose of the analysis of expectations rationality.

Taking into account the above mentioned difficulties this study modifies the standard definition of rationality and develops a new approach to measure it. It views an expected inflation as a resultant of interaction of two "attractors" of inflation,  $i_a$  and  $i_f$ . The first attractor,  $i_a$ , is past inflation, the second one,  $i_f$ , is future inflation that could be predicted applying all information available for the enterprise at the moment of formulating the expectation. So  $i_f$  is the rationally expected inflation consistent with the standard definition of rationality. When an inflation expectation is based exclusively on the past inflation outcomes, or in other words is completely attracted by  $i_a$ , then it can be labelled a backward-looking or adaptive expectation. When, while formulating its expectations, an agent uses all information available and allows for the possibility that inflation comes out different than in the past, then he or she behaves more rationally compared to the backward-looking case. The inflation expectation is thus more attracted by  $i_f$ ; the more  $i_f$  attracts the expectation, the higher is the degree of its rationality. When the expectation is completely attracted by  $i_f$ , i.e. equals  $i_f$ , than it can be called fully rational. It is further assumed that an expectation can be treated as rational only if it is closer to the real future inflation outcome than to  $i_a$ . In the opposite case, i.e. when expected inflation falls at the other side of  $i_a$  than  $i_f$ , it is treated as adaptive.

With the above set-up  $i_f$  refers to rationally expected future inflation. The future is, however, uncertain, and every enterprise can be in the possession of slightly different information set, therefore some fluctuations of  $i_f$  around the true actual value of future inflation  $i_r$  are permissible. When a firm expects the inflation to be  $i_f$ , which at the end of the day turns out to be slightly different from  $i_r$ , its expectation still can be treated as a rational one. Therefore, in the further analysis a random distribution is permitted for the rational attractor of expectations  $i_f$ . Contrary, the past is already known, so there is no need for stochasticity for the adaptive attractor  $i_a$ . In other words, the study does not require enterprises to expect the exact future inflation outcome  $i_r$  to be named rational expectators; it is however required that the average of rationally expected inflation figures in the sample equals the true outcome  $i_r$ <sup>10</sup>.

Empirical studies on adaptive and rational expectations indicate that neither of the two extremes is supported by the real data (Wolter 1993). The expectations observed in reality

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<sup>10</sup>It should be stated that this is a fairly strong assumption, which can be avoided by denoting by  $i_r$  a consensus forecast for inflation formed at the same time and for the same period as corporate inflation expectations. Such forecasts may be considered to be rational in the sense of effective use of all the relevant information available at that time.

are usually a mix of the two. It is thus justified to model inflation expectations as a weighted average of their attractors  $i_a$  and  $i_f$ . Comparing the attracting intensities of  $i_a$  and  $i_f$  provides a measure of the degree to which the expectations are rational. The more rational the expectations, the more strongly the predicted future inflation  $i_f$  attracts the expectations. In the adaptive case the dominant is the attracting power of  $i_a$ .

As mentioned above, inflation expectations are resultants of the drawing power of adaptive and rational expectations. Thus, for an arbitrary firm  $j$ , its expected inflation  $\pi_j^e$  is given by a weighted average:

$$\pi_j^e = \alpha_j i_f + (1 - \alpha_j) i_a \quad (1)$$

where  $\alpha_j \in [0, 1]$ . In such a setting the parameter  $\alpha_j$  measures the relative power of  $i_f$  versus  $i_a$  and can be interpreted as a *degree of rationality* of  $j$ -th firm. If  $\alpha_j = 1$ , then firm  $j$  is fully rational in forming its inflation expectations, as the inflation expected by it is  $\pi_j^e = i_f$ . If  $\alpha_j = 0$ , then the firm is fully adaptive, with its expected inflation  $\pi_j^e = i_a$ .

A formal model of the formation of inflation expectations is presented below. Let a random variable  $\alpha$  be beta-distributed with parameters  $a$  and  $b$ . The probability density of  $\alpha$  is thus given by

$$f(\alpha) = \frac{\Gamma(a+b)}{\Gamma(a)\Gamma(b)} (1-\alpha)^{b-1} \alpha^{a-1} \quad (2)$$

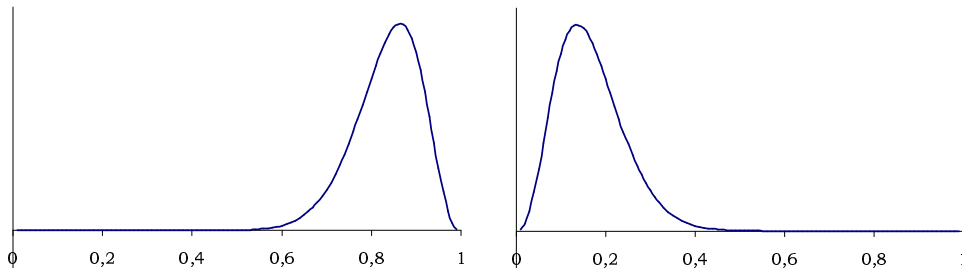
According to the properties of beta distribution,  $f(\alpha)$  has domain  $[0, 1]$ , which is consistent with it being the weight in (1). Having no any prior information as to what particular type of distribution should be assigned to  $\alpha$ , the family of beta distributions has been chosen for its flexibility – when changing the parameters  $a$  and  $b$  it is possible to obtain virtually any shape of unimodal probability density on  $[0, 1]$  domain. The variable  $\alpha$  stands for the degree of the rationality of entrepreneurs' inflation expectations. The degree of rationality is allowed to differ across firms; the assessment of rationality is based on the properties of its probability distribution. Past or adaptive inflation is denoted with  $i_a$ . It is not stochastic. The rationally expected inflation  $i_f$  is allowed to randomly fluctuate around the true future outcome  $i_r$ . Put a normal distribution on  $i_f$  with mean  $i_r$  and standard deviation  $\sigma_r$ :

$$i_f \sim N(i_r, \sigma_r) \quad (3)$$

With the above notation, the inflation figure expected by firm  $j$  is still given by (1); now however it may be interpreted as a draw from a random distribution.

The rationality of expectations can be assessed on the basis of the distribution of  $\alpha$ . The more the distribution is moved towards zero, the less rational the expectations are. Figure 8 presents an example of the distribution of  $\alpha$  for rational (left panel) and adaptive (right panel) expectations. A practical problem to apply the model arises in a situation when  $i_a = i_f$  or is very near. Then the model is not able to distinguish between adaptive and rational expectations. However, this limitation seems not to be binding in the case of Polish

data, since the inflation and inflation expectations have exhibited a significant variability over the last few years<sup>11</sup>.



**Figure 8:** Example distribution of  $\alpha$ . Left panel: expectations highly rational, right panel: expectations highly adaptive

Based on survey answers the model parameters are estimated. When asked about their inflation expectations, the adaptive enterprises provide the last inflation figures known to them. It is assumed that their perception of inflation may be lagged and based on a set of recently released figures. Therefore the weighted average of four inflation figures directly preceding the quarter in which the survey was conducted is substituted for  $i_a$ . The weights applied are presented in Table 1<sup>12</sup>. For the  $i_r$  the annual inflation figures for the year ahead are used. The remaining model parameters  $a$ ,  $b$  and  $\sigma_r$  are estimated from the survey results. Estimation is based on numerical fitting of the cumulative distribution function of expected inflation  $\pi_e$  to the cumulative distribution function empirically observed in the data.

quarter	$t - 1$	$t - 2$	$t - 3$	$t - 4$
weight	0.44	0.31	0.18	0.07

**Table 1:** Weights used in computation of adaptive inflation  $i_a$

Because for any  $\gamma > 0$  and any  $s \in \mathbb{R}$

$$P(\gamma i_f + (1 - \gamma)i_a < s) = P\left(i_f < \frac{s - (1 - \gamma)i_a}{\gamma}\right) = \Phi_{i_f}\left(\frac{s - (1 - \gamma)i_a}{\gamma}\right) \quad (4)$$

where  $\Phi_{i_f}$  stands for the cumulative distribution of  $i_f$ , the cumulative distribution function

<sup>11</sup>The methodology applied in this paper would probably yield confusing results in countries where, as for example in Sweden, inflation is stable and inflation expectations are adhered to the inflation target.

<sup>12</sup>A robustness test for the weights has been performed proving that the results of estimation are stable. The model parameters have been estimated for a different sets of weights, that were exponentially decreasing with the lag; also the lag length was subject to change from 2 quarters up to 5 quarters. The resulting densities of  $\alpha$  were virtually the same. As it turned out that the choice of weights is not crucial for the results, it was decided to proceed with the weights presented in Table 1.

$F$  of  $\pi^e$  is given by:

$$F(s) = P(\pi^e < s) = \int_0^1 P(\alpha i_f + (1 - \alpha)i_a < s) f(\alpha) d\alpha = \int_0^1 \Phi_{i_f} \left( \frac{s - (1 - \alpha)i_a}{\alpha} \right) f(\alpha) d\alpha \quad (5)$$

The estimation algorithm searches for such  $a$ ,  $b$  and  $\sigma_r$  that minimize

$$\sum_j (F(\pi_j^e) - G(\pi_j^e))^2 \quad (6)$$

where  $G(\cdot)$  stands for the empirical cumulative distribution of expected inflation, and  $\pi_j^e$  is the  $j$ -th firm inflation expectation recorded in the sample.

## 5.2 Empirical results on expectations' rationality

Based on the above-outlined methodology the model parameters are estimated for the survey data for the period from 2001q2 to 2005q1<sup>13</sup>.

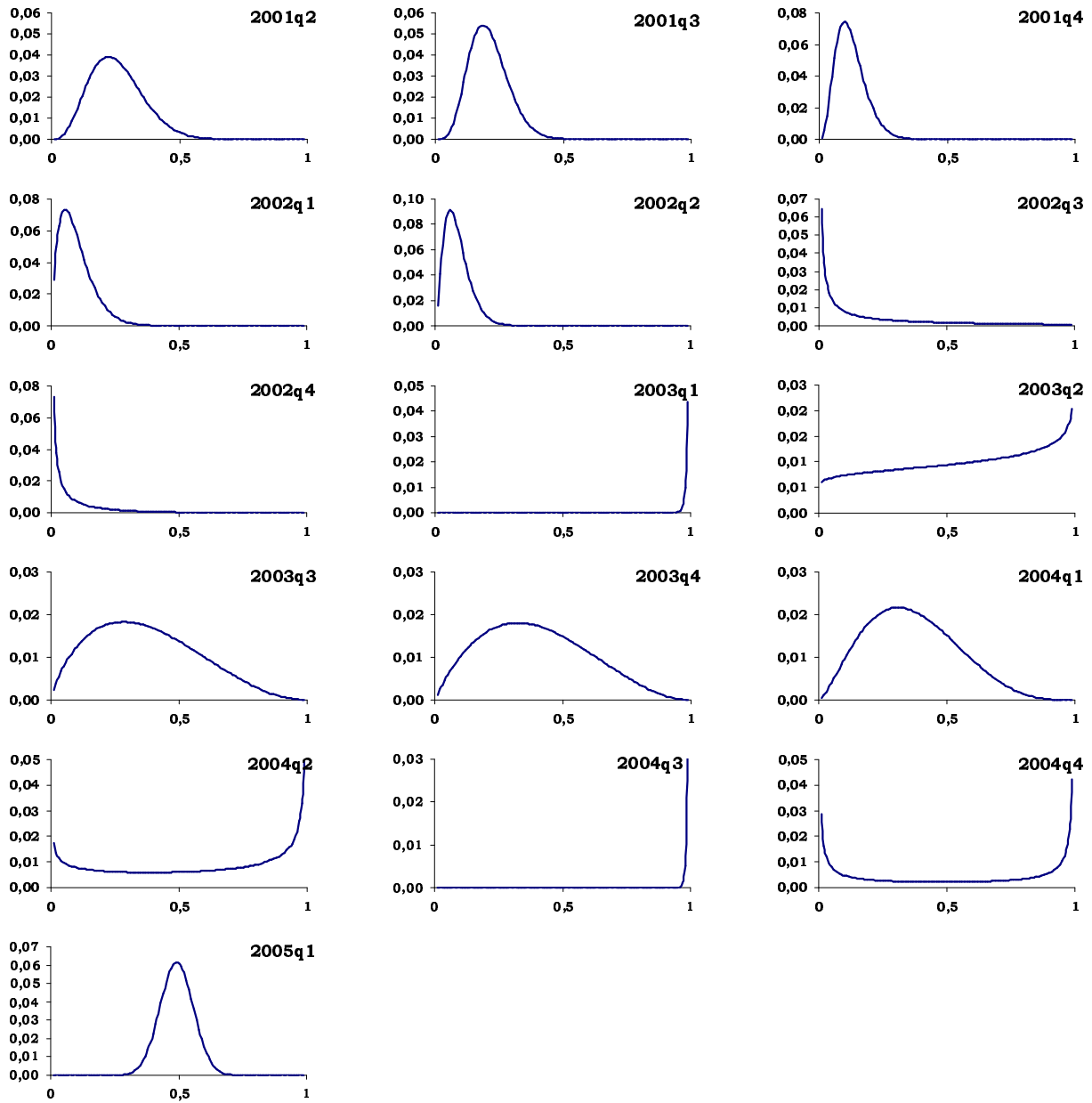
One of the properties of the model is that it restricts  $\alpha$  to stay within the unit interval only. Therefore the model does not allow the realizations of  $\pi_j^e$  being smaller than  $i_a$  when  $i_a < i_r$  or greater than  $i_a$  when  $i_a > i_r$ . Should this constraint be removed,  $\sigma_r$  would increase. If a firm expects inflation to be greater than  $i_a$  and the actual future outcome  $i_r$  falls below  $i_a$ , we will assume that this enterprise is fully adaptive. The same assumption is made in the opposite situation, when  $\pi_j^e < i_a$  and  $i_r$  turns out to be above  $i_a$ . Therefore prior to the estimation procedure the data was preset with the following mapping:

$$\begin{aligned} \text{if } (\pi_j^e < i_a) \text{ and } (i_a < i_r) \text{ then } \pi_j^e &:= i_a \\ \text{if } (\pi_j^e > i_a) \text{ and } (i_a > i_r) \text{ then } \pi_j^e &:= i_a \end{aligned} \quad (7)$$

The purpose of the model is to provide insights into the degree of rationality of inflation expectations. In particular, the model examines what attracts the expectations more: the past inflation or the actual future inflation. This relative strength of these two attractors is most difficult to assess when inflation remains stable or when the trend in inflation changes. In the case when inflation is stable for a longer period of time, enterprises that expect inflation to stay at the past level happen to be right and hence the adaptive expectations turn out to be rational as well. This may also hold in a situation when between the moment of formulating inflation expectations and the moment for which the expectations are given there is a turning point in the inflation series. The model proposed in this study is not robust in such situations. It may suggest that expectations are highly rational when in fact

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<sup>13</sup>Although the NBP survey has been conducted since 1995, the data on corporate inflation expectations of Polish enterprises are available on quarterly basis only starting from 2001q2.



**Figure 9:** Density functions of  $\alpha$  – results of estimations for the entire sample

they are adaptive, or that they are highly adaptive when the opposite is true. This property may be considered as a flaw of the approach applied, however it seems hardly possible to find any satisfactory way to disentangle the rationality from adaptiveness when the trend changes. Bearing this in mind, the model estimates for the turning points in inflation have to be interpreted with caution.

	adaptive	rational	$\alpha$		$\sigma_r$
	inflation	inflation	distribution parameters		
	$i_a$	$i_r$	$a$	$b$	
2001Q2	8,4	2,1	4,5	13,1	5,3
2001Q3	7,4	1,2	6,0	22,8	6,4
2001Q4	6,0	0,9	4,0	28,5	7,8
2002Q1	4,7	0,3	2,0	18,6	7,2
2002Q2	4,0	0,3	2,8	29,6	7,8
2002Q3	3,0	0,8	0,1	1,2	0,1
2002Q4	2,1	1,5	0,1	4,0	1,3
2003Q1	1,4	1,7	87,0	0,1	0,7
2003Q2	0,8	3,3	1,1	0,8	1,4
2003Q3	0,5	4,6	1,8	3,1	1,8
2003Q4	0,6	4,4	2,0	3,1	1,9
2004Q1	1,0	4,7	2,5	4,4	2,4
2004Q2	1,4	3,7	0,6	0,4	1,6
2004Q3	2,3	2,8	120,0	0,1	1,3
2004Q4	3,5	2,8	0,2	0,1	1,4
2005Q1	4,1	2,8	29,2	30,2	2,2

**Table 2:** Model estimation results for the entire sample of firms. The assumptions regarding inflation outcomes in 2005 and 2006q1 have been made on the basis of inflation forecasts available at the beginning of 2005.

The estimates of the model parameters are presented in Table 2. Figure 9 plots the distribution densities of  $\alpha$  for the entire sample of firms for all the quarters under analysis. A regular pattern is easily seen for 2001 and 2002. The density functions move closer and closer to zero. This suggests that over this period the rationality of corporate inflation expectations systematically diminished, and the expectations got fully adaptive in 2002q3 and 2002q4. The question arises as to what were the driving forces behind such a tendency. In the years 2001 and 2002 inflation decreased rapidly, primarily due to economic slowdown and a strong commitment of the MPC to fight inflation. However, enterprises had been used to high price dynamics and on the basis of the experience of the past few years they must have considered it very unlikely that in the near future inflation rate would fall below 2% or even 1%. This view was supported by the information released by the NBP, which only moderately pointed to the diminishing inflationary pressure.

In 2000 the NBP inflation target was not achieved. In December 2000 the 12-month CPI inflation in Poland amounted to 8.5% and hence it was 1.7 percentage points higher than the upper bound of the inflation target<sup>14</sup>. The deviation from the target was attributed to external shocks, most importantly the rise in fuel and food prices (MPC, 2001). The

<sup>14</sup>Up to 2003 the NBP inflation targets were determined in terms of the annual rate of growth of the



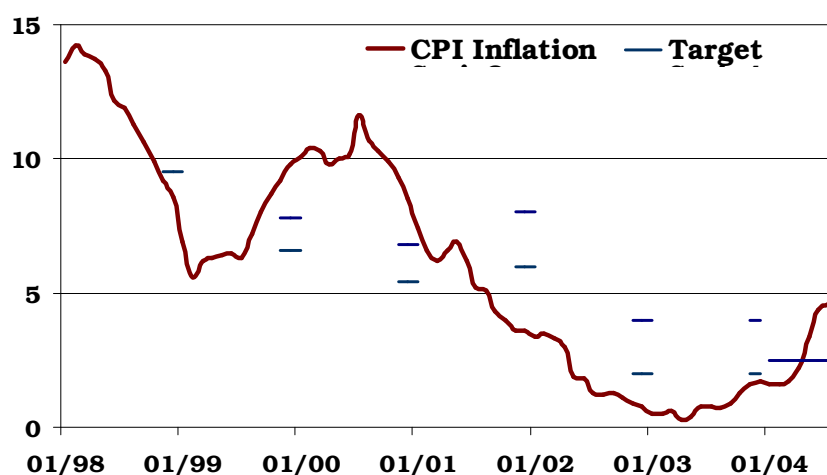


Figure 10: Actual year-on-year CPI inflation and MPC inflation targets

NBP inflation target for the year 2001 was set at the level of 6.0-8.0%. Although in 2001 inflation rate was falling and the outlook for inflation was improving, the NBP was careful in reducing interest rates. While recognizing the receding inflationary pressures, in its press releases the MPC paid also much attention to potential risks and uncertainty surrounding the inflation path. These were primarily related to fiscal policy which, according to the MPC, put constraints on monetary policy. Over the year 2001 inflation rate decreased from 7.4% in January to 3.6% in December, falling 2.4 percentage points below the lower band of the inflation target set for this year. In 2002 the situation was similar. The press releases after MPC testified to the decreasing inflationary pressure, due to *inter alia* low domestic demand dynamics and difficult situation in the labour market. However, it also regularly repeated that fiscal policy posed serious risks to low inflation. At the same time inflation decreased rapidly from 3.4% in January to the record low of 0.8% in December 2002, below the inflation target again. This was even though the inflation target was reduced in June to 3.0% +/-1.0 percentage points from the initial value of 5.0% +/-1.0 percentage point. NBP explained that the deviation of inflation from the short-term target set for 2002 was caused by factors independent of monetary policy such as unexpected decrease in food and regulated prices as well as weaker than predicted growth of the world economy (MPC, 2003).

The rapid decrease in inflation over the years 2001 and 2002 seems to have been surprising for both the enterprises and the central bank, which is reflected in the adaptive factor in the expectations gaining more importance. In the last two quarters of 2002, when the current inflation rate remained below 1.3%, virtually no enterprises predicted it to fall further and expectations became fully adaptive.

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Consumer Price Index in December.

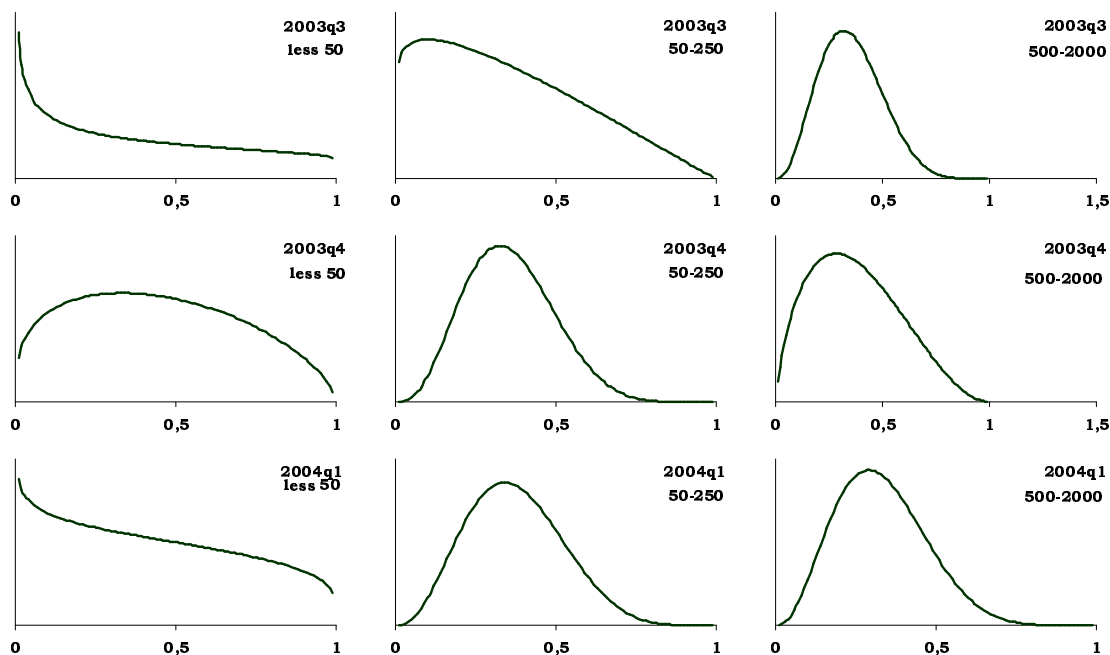
A more disaggregated analysis based on estimating the model on the enterprises' subgroups with the number of employees as a differencing factor yields similar results. Over the period 2001q2-2002q4 inflation expectations of enterprises were getting more and more adaptive and the distributions of  $\alpha$  are virtually the same regardless of the size of the firm.

The decline in the rationality of expectations coincided with the period of a fall of enterprises' interest in monetary policy. At the same time an improvement in the assessment of the intelligibility of the central bank communication was observed. However, it seems highly unlikely that the rationality of enterprises would have increased if they had put more attention to the central bank communication in the period analysed. This is because at that time the NBP did not point to a plummet in inflation in the future, which later materialized, but rather stressed the risks surrounding the downward trend in inflation.

2003q1 was a typical turning point, at which distinguishing between rational and adaptive expectations is hardly possible. After a long period of time when current inflation rate was higher than inflation one year ahead, starting from the end of 2002 the relation changed. Year 2002 ended with inflation at about 1% y/y on a downward trend; in 2003 prices increased by about 1.5%. Therefore, enterprises looking at the past inflation and expecting price rate of growth to remain at 2002 level happened to be right. The model parameters estimated for 2003q1 suggest full rationality of firms' expectations. This, however, may equally be interpreted as full adaptiveness. The entire sample estimation results hold tightly for all the firms-size subgroups. Similar results have been obtained for 2003q2, indicating high rationality of expectations in all the subgroups investigated. But again, the degree of rationality seems to have surged only by coincidence and, in reality, the entrepreneurs kept formulating their expectations on an adaptive basis.

In the remaining quarters of 2003 and in 2004q1 the rationality of inflation expectations is greater than in 2001-2002 and for all these three quarters it remains at a similar level. At the same time estimates for that period, presented in Figure 9, indicate that the dispersion of rationality increased – the density functions are much wider than in 2001 and 2002. Furthermore, the size of the firm becomes a differentiating factor – see Figure 11. Small firms are set apart with their expectations being more adaptive than those of bigger firms. The difference seems to be most pronounced in 2003q3. Those employing more people proved to have better results in predicting the significant rise in prices that materialized after Poland's EU-accession.

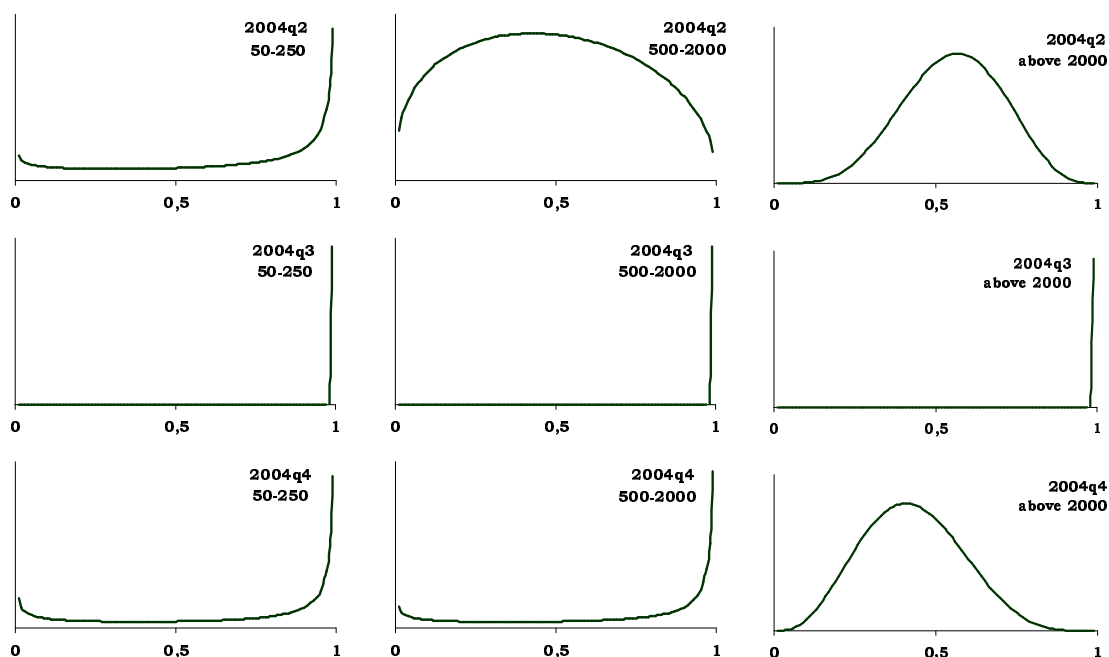
In 2003 the press releases after the MPC meetings presented a balanced view of the inflationary processes in the economy, listing factors conducive to maintaining low inflation and those driving inflationary pressure. Interestingly, in its communication with the public in 2003 and in 2004q1 in the press releases after MPC meetings the NBP did not devote much attention to comments on the future Poland's EU accession and its influence on prices. Therefore, the central bank did not help the enterprises to predict the inflation increase related to the EU entry.



**Figure 11:** Density functions of  $\alpha$  – comparison of estimation results for firms with less than 50 employees, 50-250 employees and 500-200 employees over the period 2003q2-2004q1

The 2004q2 survey has been conducted just before the EU-entry, when the prices had already begun to go up quickly. The results point to a split among the firms into two groups (Figure 9). The first one can be labelled rational, the second adaptive. Rational firms expected inflation to remain at the increased level in the mid-2005, adaptive believed it would quickly fall down to the levels recorded about half a year earlier. In the period preceding Poland's EU membership there was much confusion as to what the inflation developments after the accession would be. According to the NBP, the rise in prices would be small and short-lived<sup>15</sup>. Those who believed this seem to have been misguided. Nevertheless, it should be emphasised that professional forecasters other than the central bank did not predict the sharp price rises observed after EU accession, either. The estimates for the subgroups suggest that this time small firms were more rational than the biggest, employing over 2000 people. It might have been the case that the small companies bought the rumours

<sup>15</sup>At the beginning of 2004 the NBP together with the Office for Competition and Consumer Protection engaged in a large-scale media campaign to calm the fears that after the EU entry prices would go up significantly. The campaign was aimed to prevent the rise in inflation expectations of households and its influence on inflation. According to NBP estimates, the rise in CPI inflation induced by Poland's EU entry should not exceed 0.9 percentage points. These estimates, however, related only to direct effects of the EU accession on prices (changes in VAT and excise tax rates and the adoption of Common External Tariff and Common Agricultural Policy). They did not take into account the effect of increased external demand for Polish products resulting from trade liberalization. The fact that price rises after the EU accession proved considerably higher seems to have had a negative effect on the central bank reputation.



**Figure 12:** Density functions of  $\alpha$  – comparison of estimation results for firms with 50-250 employees, 500-2000 employees and more than 2000 employees over the period 2004q2-2004q4

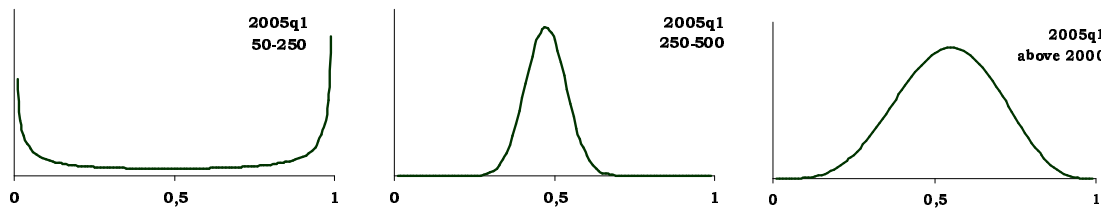
about the inevitably high inflation after the entry while the biggest paid more attention to the official statements calming down the inflation fears. This claim is supported by the results presented in Section 4, indicating that for bigger companies information from the NBP is more easily available and understandable and that they pay more attention to it. The next quarter, 2004q3, saw the expectations fully rational in all the subgroups analyzed<sup>16</sup>. Although the prices were still increasing quickly, the enterprises expected the pace of growth to ease.

In August 2004 the NBP published its inflation projection for the first time. Enterprises knew the projection while surveyed in 2004q4. The projection was pointing to the risk of further growth in inflation. Although it was strongly emphasized that the projection is not a forecast and that the probability of its materialisation is small, it seems that some economic agents might have taken it as a forecast<sup>17</sup>. Additionally in its communication with the public the NBP emphasized the risks of high inflation. The estimation results indicate again that the entire sample could be split into two groups: rational and adaptive (see Figure 12). Similarly to 2004q2, the biggest firms turned out to be most adaptive while

<sup>16</sup>It should, however, be stressed that the results for the period 2004q1-2005q1 are based not on the actual inflation but professional inflation forecasts. They are comparable with results for the previous quarters only to the extent to which these forecasts will materialize.

<sup>17</sup>In fact due to the time lags in the monetary policy transmission mechanism, in a short time period a projection is *de facto* a forecast, conditioned on the external assumptions.

in case of other subgroups the split has been maintained, i.e. in every subgroup except for the one with firms having more than 2000 employees, it was possible to distinguish sub-subgroups of rational and adaptive enterprises, the latter group being smaller. Assuming the biggest enterprises pay relatively much attention to the central bank's announcements and publications, which is indicated by the survey results presented in section 4, it seems that likely misinterpretation of the August 2004 inflation projection could have added to the decrease in rationality of their inflation expectations in autumn last year.



**Figure 13:** Density functions of  $\alpha$  – comparison of estimation results for firms with 50-250 employees, 250-500 employees and more than 2000 employees for 2005q1

According to the estimates for 2005q1, the measure of rationality  $\alpha$  is concentrated around 0.5. The result for the entire sample are determined by the estimates for the subgroups of bigger firms, employing above 250 persons. In the group of smaller firms there is still a split between rational and adaptive sub-subgroups (Figure 13). With  $\alpha \simeq \frac{1}{2}$  the entrepreneurs seem not to fully trust the MPC that the inflation will go down to the inflation target at the beginning of 2006. They rather think that the true value will be in the half-way from high Dec2004/Jan2005 inflation to the target 2.5 percent. Nevertheless the significant rise in the rationality of the inflation expectations in 2005q1 may be the first sign that the new communication strategy based on inflation projection and forward-looking press releases have transformed the process of inflation expectations of enterprises by making them less oriented towards the past and more accurate<sup>18</sup>. However, still not enough data is available to assess whether these changes are sustainable.

While interpreting the results it must be stressed that transparency and communication of the NBP are not the only factors affecting the formation of inflation expectations. The purpose of the analysis is not to identify the major determinants entrepreneurs' inflation expectations but rather to highlight the potential links between these expectations and transparency. Therefore, the conclusions derived should be treated with due caution.

<sup>18</sup>Once again it should be noted that due to the fact that the estimates of rationality for 2005q1 depend on inflation forecasts for 2006q1, the results should be interpreted with caution.

## Conclusions

Surveys show that Polish enterprises pay much attention to information released by the NBP and therefore it seems that the central bank has the potential to influence the formation of corporate inflation expectations through transparency. Since the adoption of the direct inflation targeting strategy, the NBP has acknowledged that transparency plays a crucial role in anchoring expectations and that it may increase monetary policy effectiveness. During recent years, the Polish central bank has made efforts to increase openness in disclosure and improve communication with the public. There is some evidence that over time, perceptions of the NBP's communication in the enterprise sector have improved. Nevertheless, the study shows that in the period 2001-2005 developments in the formation of Polish entrepreneurs' inflation expectations have not been favourable. The degree of rationality of these expectations seems relatively low and there is no evidence that it has been increasing over time. On the contrary, in some periods it even decreased. In our study we provide a tentative interpretation of this phenomenon.

In the first years of direct inflation targeting the Polish central bank had many communication tools in place; however, it seems that the NBP announcements and publications did not help the entrepreneurs to accurately predict inflation developments. Press releases were backward-looking and contained many statistics with little interpretation of the outlook for growth and inflation. *Inflation Reports* were published long after the end of the period analyzed and were also backward-looking in nature. This situation could be one of the factors behind the low and even diminishing degree of rationality in the inflation expectations of enterprises.

In the years 2004-2005, monetary policy transparency has become an important priority for the NBP and in this period the Polish central bank has worked intensively on improving its communication with the public. Since May 2004 *Inflation Reports* have been published without a delay and since August press releases have become forward-looking and, most importantly, the NBP inflation projection has been disclosed to the public. These efforts did not bring immediate results, however. It seems that in the first period after the inflation projection had been published, there was much confusion in the enterprise sector regarding the future course of the economy. This may have resulted partly from the increased uncertainty associated with Poland's EU adoption and partly from a possible misinterpretation of the projection. In 2005q1 the rationality of inflation expectations improved significantly, which may be the first signal that the change in NBP communication might have added to the increase in the rationality of corporate inflation expectations. So far, however, it is too early to draw firm conclusions.

The lesson for the NBP is that openness in disclosure and an appropriate form of the central bank communication are not sufficient to ensure public understanding of monetary policy and foster rational inflation expectations. It is crucial that the central bank provides a forward-looking analysis of the economic situation and does not over- or underestimate

the risks surrounding future inflation developments. At present, when the communication strategy of the Polish central bank follows the standards set by the best communicators, the NBP should concentrate on providing a clear vision of future economic developments and ensure that monetary policy is consistent with the information released by the central bank.

This study is the first attempt to give insights into the formation of inflation expectations in the Polish corporate sector and shed light on the relation between these expectations and the communication of the National Bank of Poland. These issues remain open to further investigation. In particular, it is worth pointing to one possible extension of this analysis. Namely, due to the short time series available, this study applies a non-standard methodology to assess the rationality of inflation expectations, which is based on the assumption that enterprises on average are able to accurately predict inflation one year in advance (the average of  $i_f$ 's be equal to  $i_r$ ). This may not hold when enterprises are hit by parallel shocks. The risk of violating this assumption can be avoided by assuming that  $i_r$  is equal to the consensus forecasts of inflation rather than actual inflation.

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