Comparative Economic Research, Volume 18, Number 4, 2015
10.1515/cer-2015-0033

MAGDALENA SZYSZKO*

Inflation Forecasts Versus Shaping Inflation Expectations. Comparative Analysis[1]

Abstract

This article jointly analyzes inflation expectations of consumers and inflation forecasts. Its starting point is the predominant role of expectations in monetary policy. This is crucial market information in the decision-making process of the central bankers as it may show the actual future inflation. On the other hand, the central bank wants to influence expectations in order to facilitate achieving the main goals of monetary policy. Inflation forecasting is a tool for shaping public expectations. In the research, covering four central banks (the National Bank of Hungary, National Bank of Poland, the Czech National Bank, Sveriges Riksbank), the author analyzes the interdependencies of inflation forecasts and inflation expectations of consumers. Data on expectations are derived from the surveys and quantified. Then non-parametric measures of association are calculated. The results confirm the hypothesis on the existence of such relationships. The strength of this interdependence varies among countries, from weak to strong. The study opens the field for further discussions on strengthening this relationship.

Keywords: *inflation forecasts, inflation forecast targeting, inflation expectations*

* Ph.D., Poznan School of Banking, Finance and Banking Department

[1] The article presents the results of research financed by the National Science Center: Interdependences of Inflation Forecasts and Inflation Expectations of Market Participants. Implications for the Central Banks contract No.: 2011/03/B/HS4/03705.

1. Introduction

Inflation expectations are at the center of central bankers' interests. A wide range of literature confirms the importance of inflation expectations in monetary policy. Expectations constitute specific market information that the central bank (1) uses in its analyses and in decision-making and (2), wishes to influence, as well-anchored expectations facilitate the conduct of monetary policy. This paper focuses on the tools for shaping inflation expectations, especially inflation forecasts. The production and publication of inflation forecasts should support economic agents in the formation of expectations. The paper covers the inflation expectations of consumers. In comparison with firms and specialists, they have a quite low awareness of the economic situation. At the same time, this group of economic agents has a great impact on economic performance, including inflation.

The main research question of this paper is whether a central bank can affect market information, i.e. consumers' inflation expectations, by the use of inflation forecasts. **The hypothesis assumes that there are interdependencies between the inflation forecast of the central bank and the inflation expectations of households** The main objective of this research is to verify this hypothesis.

The research covers four countries: Hungary (the National Bank of Hungary, NBH), Poland (National Bank of Poland, NBP) the Czech Republic (the Czech National Bank, CNB), and Sweden (SverigesRiksbank, SR). They are all inflation targeting (IT) countries which have produced and published inflation forecasts for some time. The scope of this research enables comparative analysis. The choice of CNB, NBH and NBP is obvious: they are the central banks of young market economies; they started to implement inflation targeting in the late 1990s (Hungary[2] in 2001); and several years later they started to produce and publish inflation forecasts. They all declare that the forecasting of inflation is an input in decision making, however the strength of this declaration and its execution differs among the countries. The inclusion of the Sveriges Riksbank – one of the most experienced inflation targeters worldwide – makes it possible to compare the results. The research period varies because the starting point depends on the development of a forecasting system in the countries covered by the research. It finishes in 2014 for all countries.

The research covers quantification of expectations and interdependencies of the forecasts and consumer expectations. The results are explained by analysis of the implementation of inflation forecast targeting (IFT).

[2] Hungarian monetary policy strategy in 2001-2011 was rather eclectic. Frameworks of inflation targeting were accompanied by a fixed exchange rate.

The paper is divided into three sections. The following section presents an overview of the literature on expectations in monetary policy and how the forecasting of inflation functions. The next section describes the research methodology. In the last section the results are presented and analysed. The paper contributes to the literature on IT as well as on the role of market information in monetary policy.

2. Modern monetary theory and the role of expectations in monetary policy

The expectations of economic agents are crucial for monetary policy makers as they are a pivotal variable in the monetary transmission mechanism. Inflation expectations drive inflation directly. They are also decisive for the output gap, which is the second determinant of inflation. The reaction function of the central banker also refers to inflation expectations.

Table 1. New Neoclassical Synthesis – basic equation

	Equation	Interpretation
Dynamic IS curve	$y_t = -1/\sigma\,(i_t - E_t\{\pi_{t+1}\} - i_n) + E_t\{y_{t+1}\}$ y – output gap π - inflation i – nominal interest rate E_t expected i_n – natural interest rate,	The DIS curve expresses relationships of production (in terms of the output gap) and the interest rate. The equation is derived as an optimization procedure made by the representative household that seeks to maximize the objective function while choosing between spare time and working hours.
Inflation equation	$\pi_t = \alpha\, E_t\{\pi_{t+1}\} + \beta y_{t+1}$	Inflation depends on inflation expectations and the output gap (DIS). The equation is derived from the staggered prices model (Calvo model).
Monetary policy rule	$i_t = i_n + E_t\{\pi_{t+1}\} + \gamma y_t + \lambda[E_t\{\pi_{t+1}\} - \pi^*]$ π^* - central bank's inflation goal	Central banks' reaction function. The nominal interest rate depends on the output gap and inflation gap.

Source: Galí 2008, pp. 41–52.

Acceptance of the New Neoclassical Synthesis as the theory that captures the cause and effect relations in the economy results in a special role of expectations in modern monetary policy. Successful monetary policy should shape market expectations in a way in which interest rates, inflation and income are likely to evolve over the upcoming year and later. As summarized in (Woodford 2003, pp. 15-18), an optimizing model implies that private sector behaviour should be forward looking; hence expectations about future market conditions should be a significant determinant of current behaviour. If the central bank is able to affect expectations, it will have more opportunities to achieve the goals that have been set. One of the most concise descriptions of expectations role in monetary policy was given by (Woodford 2003, p. 15): not only do expectations about policy matter, but, at least under current conditions, very little else matters.

This is why expectations are at the centre of monetary policy research. Research questions focus on several aspects: the fulfilment of the rational expectations hypothesis (are the expectations of a forward-looking nature?); consistency with the inflation target, and insensitivity to changes in current inflation (are the expectations well anchored?); and the role of expectations in affecting actual price dynamics in the economy (Łyziak 2014, p. 7).

When considering the purpose of this paper, the most important question is of a practical nature: how can a central bank support the formation of expectations? Inflation targeting is a monetary policy framework designed to support the shaping of inflation expectations. This framework encompasses five main elements: (1) the public announcement of medium-term numerical targets for inflation; (2) an institutional commitment to price stability as the primary goal of monetary policy, to which other goals are subordinated; (3) an information-inclusive strategy in which many variables, and not just monetary aggregates or the exchange rate, are used in order to set policy instruments; (4) increased transparency of the monetary policy strategy through communications with the public and the markets about the plans, objectives, and decisions of the monetary authorities; and (5) increased accountability of the central bank for attaining its inflation objectives (Bernanke, Laubach, Mishkin, Posen 2001, pp. 4-9). Fully fledged inflation targeting also requires a floating exchange rate (which enables the central bank to maintain an independent interest rate policy) and inflation forecasting as a quite important support of the conduct of monetary policy. Such preconditions, if implemented by monetary authorities, enable the central bank to manage expectations.

Except for institutional preconditions and creating a credible nominal anchor, one of the most important tools of expectations management is the central bank's inflation forecast. The forecasts are produced, used as the input in

decision making, and then published. Inflation targeting may become **inflation forecast targeting** (IFT), where the inflation forecast is an intermediate objective of monetary policy. Subscribing the function of an intermediate target to the inflation forecast simplifies the implemention and monitoring of monetary policy (Svensson 1996, p. 3). Inflation forecast targeting is a simple rule of monetary policy. The central bank's inflation forecast for the period of the inflation forecast targeting horizon becomes an intermediate target. Hence the instrument should be set so as to make the inflation forecast equal to the inflation target. If the inflation forecast is above (or below) the target, the main rate of the monetary policy should be raised (or lowered). Adherence to this rule is claimed to be a best practice of a central bank. Ex post inflation may differ from the targeted level because of the forecast errors (Svensson 1996, p. 9). The decision-making procedure of IFT is repeated by the monetary committee at any decision point. The forecasts and interest rate level are brought up to date if necessary. This is why IFT becomes a dynamic optimization procedure. The central bank's inflation forecast can be perceived as a quite good intermediate target. It is by definition the current variable which is the most correlated with the final goal, it is more controllable than the final goal, and it can be made more observable. It can also be made very transparent and facilitate the central bank's communications with the public (Debelle 1997, p. 19, Svensson 1996, p. 3). Forecast targeting is perceived as policy rule that involves a commitment to a particular decision procedure for monetary policy and distinctive approach to communication policy (regular publication of quantitative projections together with extensive discussion of the reasoning underlying these projections) (Woodford 2012, p. 185).

Moreover, inflation forecasts integrate a broad set of historical and current data, as well as expectations. This means that one variable – the forecast – includes the analysis of various data, which makes following the intermediate target commitment much easier, simultaneously giving the simplicity of following an intermediate target commitment (Szyszko 2011, p. 13).

Inflation forecasts fulfil several functions, including the most important one: **shaping inflation expectations**. The inflation forecast may shape expectations both directly and indirectly. And indirect effect occurs when the central bank does not publish the forecast, but uses it in internal analysis. This affects the monetary policy committee's deliberations and decisions. The public gets to know the decision itself, and can adjust their economic decisions to the new (or unchanged) monetary conditions. The most obvious role in shaping expectations appears when the forecast is revealed: it opens the possibility to influence longer term rates. When making decisions, economic agents are taking into consideration the entire expected interest rate path. It is relatively easy to

manage short term interest rates and more difficult to anchor longer term expectations on interest rates. Inflation forecasts can also anchor expectations when the inflation target is temporarily missed. It can serve as such a temporary anchor, especially in situations where the target is missed because of shocks that are outside the control of the central bank. An anticipated course of inflation shown by a credible central bank may limit the expectations' growth (Skořepa, Kotlán 2003, pp. 154-155).

Nowadays the advantages of publishing inflation forecasts prevail. They are numerous, and they directly or indirectly touch the aspect of the formation of expectations, by means of helping to understand the central bank's actions and the way and how it sets its instruments, which helps to reduce uncertainty (Mishkin 2007, p. 514). The practice of central banks is in line with the theory and mainstream research: central banks do publish forecasts. However, there are papers underlining the drawbacks of forecasts' publication. The central bank can be bound more tightly by the publication of an inflation forecast than is actually warranted by the quality of that forecast. In practice, a forecast cannot amount to a complete summary of all the information relevant to the monetary policy decisions, mainly because there is no universally optimal forecasting method (Remsperger, Worms 1999, p. 5). However, the discussion on the forecast disclosure is not so vivid nowadays. Instead it rather concerns the extent to which the future path of the economy should be revealed (the forecast itself, or the policy path as well).

As a summary of the discussion on forecast publishing it may be stated that a majority of the central banks publish their inflation forecasts. In this way they mean to influence the inflation expectations of consumers. If they are efficient in doing so, an interdependency between the forecast and inflation expectations should exist. The hypothesis given in the introduction is thus justified.

From the central banks' point of view, these expectations should be analysed from two different angles. The first concerns the **ability to influence expectations** by the policymakers, and the second refers to the **information value of the expectations themselves** – they are used as input in the decision-making process and as the measure of the central bank's credibility. Both approaches need a sound measure of expectations that are not directly observable. This is why the next question concerns their measurement. Expectations can be derived from financial market data (prices and yields of bonds, for example) or they can be examined in surveys. They can be also inferred from a macroeconomic model.

The survey-based approach to the quantification of expectations is broadly accepted. Its advantages include: the forecast's accuracy (specialists and consumers expectations are better predictors of inflation a year ahead); dispensing with the need for an *a priori* assumption (which is needed in model based

forecasts); no contamination of the data by transaction costs, risk premium, taxation (which is characteristic of financial assets prices) (Ang, Bekaert, Wei 2007, pp. 1203-1206). There is however research in the literature which uses all the measures of expectations, including numerous positions on survey-based expectations, and several texts covering the subject can be found in (Sinclair 2009). Survey-based expectations are also used in this study. The use of these expectations is also justified by the choice of reference group: expectations of consumers are referred to in the following study. One needs to bear in mind that consumers are a less qualified group in the economy.

3. Research methodology

The empirical research covers four countries: the Czech Republic, Hungary, Poland and Sweden. Details on the sample are given in Table 2 below.

Table 2. Description of the Sample

Central bank	CNB	NBH	NBP	SR
Number of forecasts	50*	54	33	46
Months	151	161	125	96
Period	July 2002-2014	August 2001-2014	August 2004-2014	2007-2014*

Source: own work.

The research is divided into three specific steps. The first covers the **quantification of the expectations**. This was necessary here because the surveys on expectations are of a qualitative nature (quantitative surveys for consumers with direct questions on the expected level of inflation were either abandoned or were never held). The survey data on expected inflation is taken from the Business and Consumers Surveys – The European Commission survey on business and household situations. The surveys are held monthly. Consumers answer questions on their inflation perception and expectations. Inflation perception refers to the past inflation and is not the subject of this research (in the quantification procedure it is represented by last known inflation figure). The question for inflation expectations is as follows: By comparison with the past 12 months, how do you expect that consumer prices will develop in the next 12 months? The answers to choose from are: They will…increase more rapidly, increase at the same rate, increase at a slower rate, stay about the same, fall, don't know (The Joint Harmonized… 2007, p. 51). The answers can then be used in two ways. First of all, a balance of the answers is calculated. The balance

of answers does not however directly measure the inflation expectations, thus it cannot be interpreted in a straightforward way. For example, when it is positive, it means that the number of respondents who expected the prices to increase more rapidly over the next 12 months than in the past exceeded the number of those who expected prices to remain the same or increase more slowly than in the past (The Joint Harmonized… 2007, p. 18).

The answers to the survey's question on expected inflation are the starting point for quantifying inflation expectations, using the adjusted Carlson–Parkin probability method (Crlson, Parkin 1975, pp. 123-138). It assumes that if the number of respondents is sufficiently large, the expected rate of price change is normally distributed. The quantification of qualitative responses makes use of the fact that, in replying to the survey question regarding inflation expectations, respondents compare their predictions with the rate of price change as perceived when the survey is carried out (Łyziak 2003, pp. 11-13). The latest inflation figure remains here for inflation perception.

The second step in the research procedure was **encoding the forecast results**. The data on the inflation forecast is encoded for two reasons. First of all, consumers' inflation expectations are considered. Consumers are not specialists. They do not read the forecasts on their own. They do not understand sophisticated information on inflation forecasts. It is enough to say that qualitative surveys on expectations were abandoned by the central banks, as the awareness of households concerning the economic situation was poor and the results of surveys were not reliable. The second reason for encoding the data is connected with the way in which the forecast is revealed. No detailed information on levels was given at the beginning of the research period. The forecast and the policy path were presented in the Inflation Report in a descriptive way. Some central banks avoid revealing additional information. The encoding procedure ensures a comparable set of data for all four countries. The way of encoding the message of the forecast is given in Table 3. Five options are distinguished. This encoding procedure assumes that the central bank establishes the accepted boundary of the inflation fluctuation around the target of +/- 1 p.p. This is not necessarily true however, as the SR does not establish such a corridor (it did so up until 2010). However, the assumption of giving the central bank the freedom to respond (or not) to the inflation fluctuation is justified.

The central path of the forecast was compared to the inflation target at the beginning of the monetary policy horizon – a year ahead after publishing the forecast. This is consistent with the survey question on expected inflation.

Table 3. The options for inflation forecasting

Forecast of:	Options:	Timing
Central path of inflation (CP)	- the central path is below the lower boundary of the fluctuation band, - the central path t is below the inflation target, but within the fluctuation band; - it is at the inflation target level; - it is above the inflation target, but within the fluctuation band; - the central path is above the upper boundary of the fluctuation band	Beginning of the monetary transmission horizon

Source: own work.

As the forecasts are produced 3-6 times per year[3] and the expectations are examined monthly, the research assumes that one forecast message may influence the formation of expectations three times. This is why the central path was repeated for the months following the month in which the forecast was produced (called here the 'central projection repeated', or CRP). Lags are also assumed: the forecast may influence expectations in the month of its disclosure as well as during the following months.

The last step of the research is the examination of the **interdependencies of inflation forecasts and the inflation expectations of consumers**. The theory assumes that an inflation forecast may be an important factor in the formation of expectations. On the other hand, inflation expectations are the input to the decision making process of the monetary policy committee and – sometimes – to the forecast itself. The research is limited to the correlation of both variables and does not refer to the cause and effect relation. Non-parametric correlation measures are used. Under a null hypothesis there is no monotonic association between inflation forecast results and expectations, or the two variables are independent at $\alpha = 0.05$.

Auxiliary (qualitative) research will be carried out to explain the quantitative findings. It will cover analysis of the IFT implementation according to four factors (Szyszko 2013, pp. 22-23):

- formal declaration on the importance of inflation forecasts;
- consistency of the decision of the Monetary Policy Committee (MPC) with the inflation forecast result: the rule of thumb is that when the central path of inflation in the monetary policy horizon is above (or below) the target, the interest rates are to be raised (or lowered); when the forecasted inflation is

[3] The number of forecasts produced yearly varies among countries and over time.

within the fluctuation band of the target, any MPC reaction is consistent with the IFT implementation; the central path of inflation at the targeted level means that the rates should remain unchanged;

- timing of the decision: this shows whether the central bank perceives the forecast as the best information on the future state of the economy. If it does, it makes decisions consistent with the forecast message just after the forecast is made;
- justification of the decision: this shows the main rationale behind the decision on the interest rate; the central bank sends a message on the importance of forecast to the public if it refers to the forecast's message in its justification.

4. Results

The empirical results are presented below in Table 4. They are clear for the CNB, the NBH the NBP and SR: the null hypothesis at $\alpha = 0.05$ is rejected – there is a monotonic relationship between the inflation forecast and expectations. The strength of interdependencies varies among countries. The weakest correlation is observed for the Czech Republic, a moderate one for Hungary and Poland, and it may be interpreted as moderate-to-strong for Sweden.[4] Sweden, which was a reference country in the research, proved to be correctly chosen: its longest history in targeting inflation and in forecasting inflation, as well as its consistency in implementing inflation forecast targeting, brought about strong interdependencies between the forecast and expectations. The reason for such a strong correlation may also be of a technical nature – the time series for Sweden was shortened to observations starting in January 2007. This is the date when a technical change was introduced: endogenization of the interest rates.

The strength of interdependencies rises if the lag is longer. This is acceptable because consumers are included in the scope of the research. Households need time to digest the information on such sophisticated topics as inflation forecasts. The charts presented below show the time series (central path for inflation and inflation expectation t+3) for the countries covered by the research.

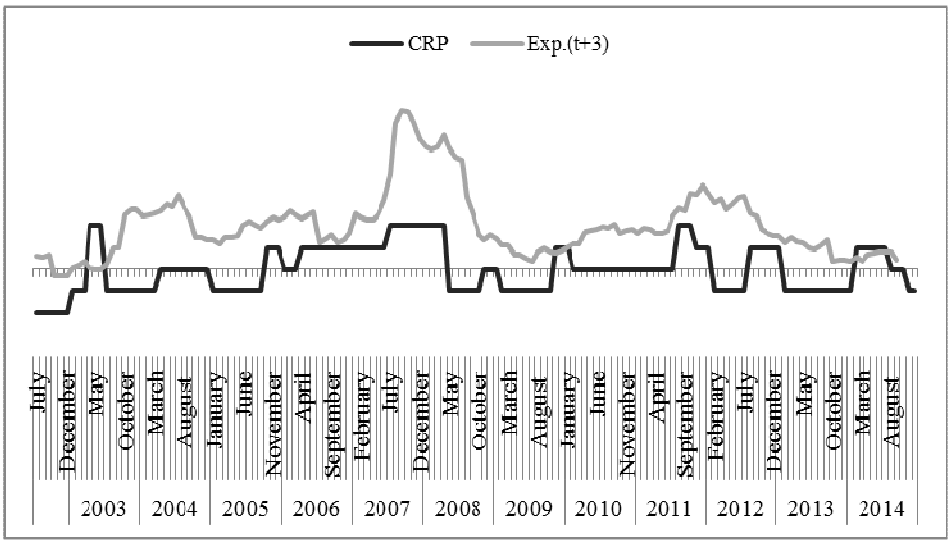
[4] The interpretation of the strength of correlation depends on the variables and the context of the research. Here it is acceptable to assume that a coefficient above 0.7 determines a strong correlation.

Table 4. Interdependencies of the inflation forecast and expectations

CNB	CPR/Exp(t)	CPR/Exp(t+1)	CPR/Exp(t+2)	CPR/Exp(t+3)
r_s	**0.300223**	**0.315742**	**0.323945**	**0.344746**
Gamma	**0.278290**	**0.294854**	**0.302782**	**0.319144**
τ	**0.238926**	**0.253425**	**0.260584**	**0.274611**
NBH				
r_s	**0.406887**	**0.427387**	**0.439394**	**0.436730**
Gamma	**0.361664**	**0.381515**	**0.393794**	**0.394843**
τ	**0.304825**	**0.320833**	**0.331060**	**0.331826**
NBP				
r_s	**0.571530**	**0.590092**	**0.588259**	**0.589018**
Gamma	**0.523190**	**0.539947**	**0.537704**	**0.542294**
τ	**0.449249**	**0.463943**	**0.461651**	**0.464771**
SR				
r_s	**0.703830**	**0.730024**	**0.751113**	**0.754107**
Gamma	**0.736215**	**0.765329**	**0.781538**	**0.780297**
τ	**0.564824**	**0.588714**	**0.602763**	**0.603379**

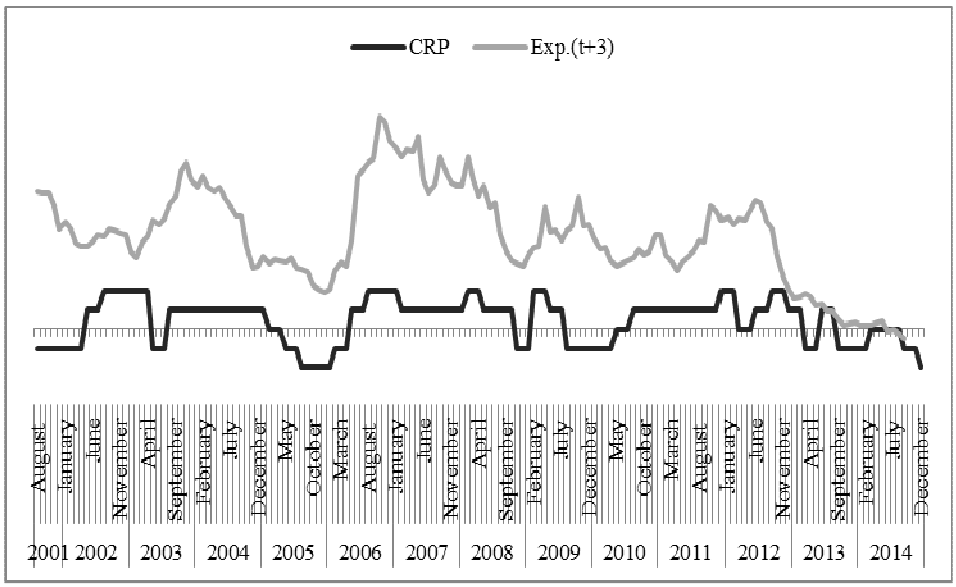
Source: own calculations.

Chart 1. Interdependencies of inflation forecasts and expectations – the Czech Republic



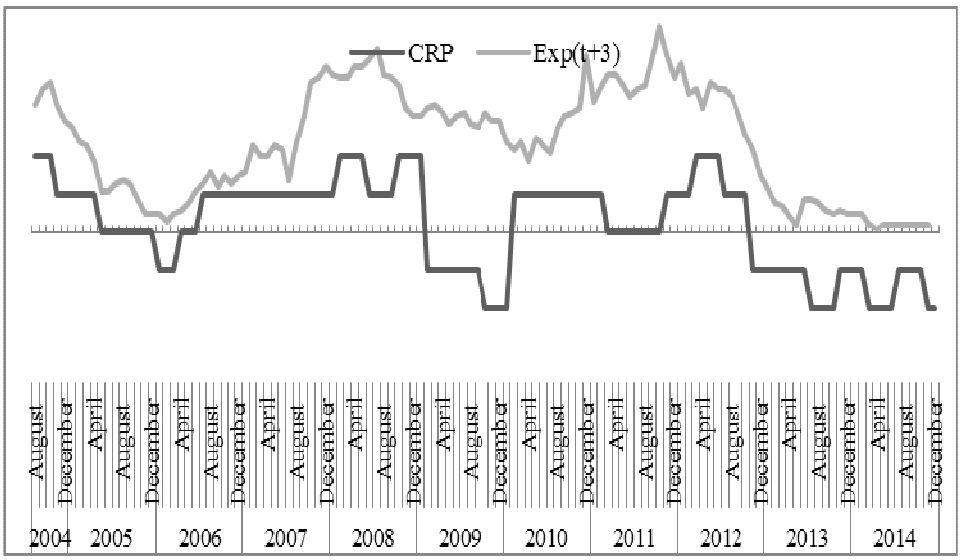
Source: own work.

Chart 2. Interdependencies of inflation forecasts and expectations – Hungary



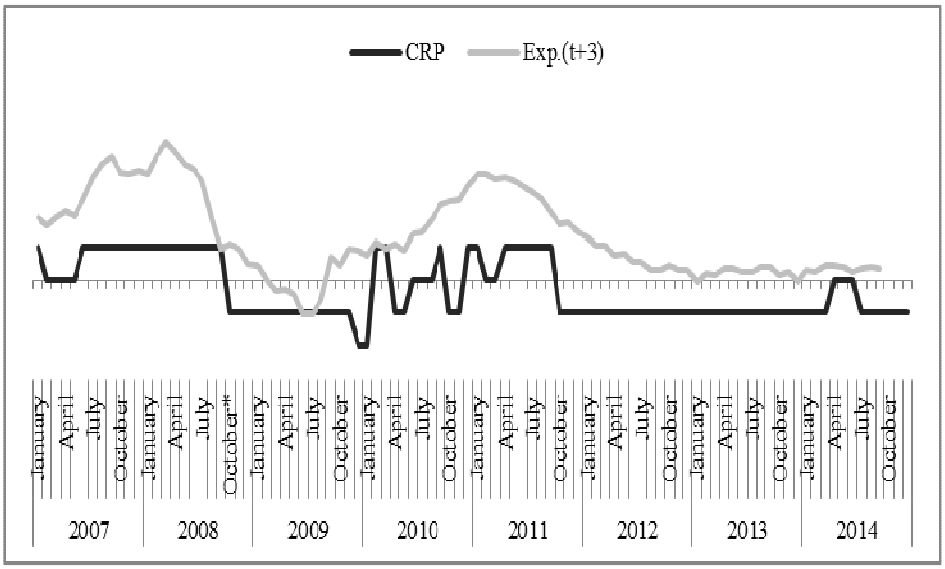
Source: own work.

Chart 3. Interdependencies of inflation forecasts and expectations – Poland



Source: own work.

Chart 4. Interdependencies of inflation forecasts and expectations – Sweden



Source: own work.

The results do not exhibit any relation between the forecast methodology and the strength of the interdependencies. The CNB and SR produce unconditional forecasts (endogenous interest rates). Except for the central path for inflation, the policy path of interest rates is produced and revealed. A policy path consistent with the forecast should result in the projected inflation attaining the goal. In a conditional forecast (in the sample the case of Poland, and Hungary until 2011), there is a counterfactual assumption of a constant interest rate of the central bank. The way in which the public can assess the next step of the central bank and the development of future inflation depends on the conditionality of the forecast. If it is conditional, the relation between the central projection and the inflation goal should be compared. When the forecast is higher that the goal – the public might raise their inflation expectations. If the interest rates decisions of the monetary committee are endogenous within the model, the policy path indicates the possible next decision of the central banker. However, the central path of inflation is also important – if the policy path does not bring inflation back to the target in the monetary policy horizon, it demonstrates to the public that the central bank may not be able to fulfill its goal. In the research there is no answer to the question: Which kind of the forecast better supports expectations?. They both do. The weakest and the strongest interdependencies were observed for unconditional forecasts.

Regarding the results, the next research question concerns the other factors which may influence expectations. There are several possible answers to this question. The first question concerns the central bank's consistency in implementing inflation forecast targeting. If the central bank announces that the forecast is (the most) important input in the decision-making process, and follows this commitment, the public is more inclined to change their expectations. Table 5 briefly describes the qualitative analysis of central banks' consistency in implementing IFT. It presents four factors which help to assess the real significance of the forecast in the decision-making process.

Table 5. Inflation forecast targeting implementation in practice

	The Czech Republic	**Hungary**	**Poland**	**Sweden**
Declaration on the forecast's role in monetary policy	The forecast is of greatest relevance in decision-making	Partial input in decision-making process; reviously: intermediate objective	Partial input in decision-making process	Very important input, together with other information on the future development of the economy
Consistency in IFT implementation	On four occasions the MPC did not follow the message of the forecast; each time this was due to exogenous factors and clearly explained; when the CNB hit zero bound it had to ease monetary conditions via the exchange rate channel	Low - numerous decisions were not in line with the forecast result; they were explained by the current economic situation	The MPC's decisions were in line with the message of the forecast; however a flexible approach to input in the decision-making process was dominant.	The decisions were in line with the message of the forecast except for two cases, which were explained by inflation pressures
Timing of decision-making	Just after the forecast is made	A wait and see position	A wait and see position	Just after the forecast is made
The forecast in explanation of the decision	The main factor, even in the months when the new forecast was not revealed	One of numerous factors; sometimes neglected	One of numerous factors; sometimes neglected	One of numerous factors; sometimes neglected

Source: own work.

There is no simple way to rank the countries considering their consistency in IFT implementation. The CNB was showing the best practice here (in the sense of consistency), however in 2012 it lowered its main rate to 0.05%, which made the process of further lowering of the interest rate impossible. And this is counterintuitive as the interdependencies for the CNB are the weakest. The results are in line with the findings for the other countries – the consistent implementation of the IFT for Sweden resulted in a high correlation coefficient, and the moderate results confirm the attitudes of the NBH and NBP.

There are other possible explanations for the strength of the interdependencies: central bank transparency, including forecasting transparency, and a central bank's credibility. The search for relationships here will be the subject and scope for further research.

5. Conclusions

This paper contributes to the literature on modern monetary policy strategy and its implementation. It focuses on the interdependencies of the inflation forecast results and inflation expectations of consumers. A broad theoretical background shows the importance of inflation expectations in modern monetary policy, as well as the usefulness of the inflation forecast in managing the expectations. These theoretical underpinnings, accompanied with the behaviour of the central banks (producing and revealing inflation forecasts) led to presentation of the hypothesis that assumes the existence of associations between the inflation forecast and consumers' expectations. The empirical analysis proved that for the countries covered by the examination such relationships exist and are statistically significant. For Sweden, which was a reference country here, they are quite strong, while being moderate for Poland and Hungary and the weakest for the Czech Republic.

The main conclusion here is that central banks may use inflation forecasts to influence market information on inflation expectations. This result is remarkable because the research covers the unqualified group of economic agents – consumers. In the first instance, consumers represent the households. However, they are also owners of small and medium-sized enterprises that establish their prices in line with the staggered-prices model (Calvo 1985, p. 384-393). The possibility of managing their expectations brings benefits to a central bank, as was described in the theoretical section.

The research led to further research questions. The first concerns the deeper justification of the differences between the countries. Qualitative analysis of IFT consistency allows for the preparation of some draft conclusions, but there are other factors explaining the situation. One of the crucial factors here may be the mechanism of forming the expectations. The results show the actual hybrid nature of expectations - partly adaptive and partly forward-looking - which is in line with the literature (Gerberding 2001, Forsells, Kenny 2002). The composition of expectations is reflected in the Hybrid New Keynesian Phillips Curve (the idea of bounded rationality, the adaptive learning hypothesis).

The issue of whether households understand the central bank forecast and its communications as a whole was not the subject of this study. Possible differences in interdependencies might lay beneath the forecast interpretation and the interpretation's correctness. Transparency (not only understood as the scope of information revealed but also as the understanding of the information) might be another explanatory factor here.

The other source of the differing results is the quality of the forecast. It was not the scope of research here, but *ex ante* (a model's adequacy) and *ex post* errors of the forecast differ among the countries. The central banks implement different methods of forecasting. As the research covered the period of turbulence on the financial markets and in the economies, one can assume that the model's inadequacy was higher. Some central banks reoriented their policy during the crisis and thereafter, while others hit the zero bound problem. The input to the decision making could be (temporarily) changed.

Inflation expectations play a dual role in monetary policy. On one hand they constitute crucial market information which should be considered by the central bank, while on the other hand this is the information that can be actively shaped by the central bankers. The efficiency of the central banks in shaping expectations via inflation forecasts was assessed here.

References

Ang A., G. Bekaert, M. Wei (2007) *Do Macro Variables, Asset Markets or Surveys Forecasts Inflation Better?* 'Journal of Monetary Economics', Elsevier Vol. 54, Issue 4.

Bernanke B., Laubach T., Mishkin F.S., Posen A.S. (2001), *Inflation Targeting: Lessons from the international Experience*, Princeton University Press, Princeton.

Calvo, G. (1983) *Staggered Prices in Utility-Maximizing Frameworks*, 'Journal of Monetary Economics', Elsevier, Vol. 12.

Carlson J. A., Parkin J. M. (1975) *Inflation Expectations*, 'Economica', Wiley-Blackwell, Hoboken, No. 42.

Debelle G. (1997), *Inflation Targeting in Practice*, Working Paper No. 35, International Monetary Fund, Washington, D.C.

Forsells M., Kenny G. (2001) *The Rationality of Consumers' Inflation Expectations: Survey-Based Evidence for the Euro Area*, ECB Working Papers Series, Working Paper No. 163.

Łyziak T. (2003) *Consumer Inflation Expectations in Poland*, European Central Bank Working Paper Series, Working Paper no. 287, ECB, Frankfurt am Main.

Łyziak T. (2014) *Inflation Expectations in Poland, 2001-2013. Measurement and Economic Testing*, National Bank of Poland Working Paper No. 178, NBP, Warsaw.

Galí J. (2008) *Monetary Policy, Inflation, and the Business Cycle, An Introduction to the New Keynesian Framework*, Princeton University Press, Princeton.

Gerberding Ch. (2001) *The Information Content of Survey Data on Expected Price Developments for Monetary Policy*, Discussion Paper 9/01 Economic Research Centre of the Deutsche Bundesbank, Deutsche Bundesbank, Frankfurt am Main.

Mishkin F.S. (2007) *Monetary Policy Strategy*, The MIT Press, Cambridge.

Remsperger H., Worms A. (1999) *Transparency in Monetary Policy*, Center for Financial Studies Working Paper No. 16, Center for Financial Studies, Frankfurt am Main.

Sinclair P. (2010) (ed.), *Inflation Expectations*, Routledge, Oxford, New York.

Skořepa M., Kotlán V. (2003) *Assessing Future Inflation in Inflation Targeting: Forecasts or Simulations*, [in:] *Monetary Policy in Changing Environment*, Bank for International Settlements Paper No. 19, Bank for International Settlements, Basel.

Svensson L.E.O. (1996) *Inflation Forecast Targeting: Implementing and Monitoring Inflation Targets*, National Bureau of Economic Research Working Paper No. 5797, Cambridge.

Szyszko M. (2011) *The Interdependences of Central Bank's Forecasts and Economic Agents Inflation Expectations. Empirical Study*, National Bank of Poland Working Paper Series No. 105, NBP, Warsaw.

Woodford M. (2012), *Forecast Targeting as a Monetary Policy Strategy: Policy Rules in Practice*, [in:] *The Taylor Rule and the Transformation of Monetary Policy*, E.F. Koeing, R. Leeson, G.A. Kahn (ed.), Hoover Institution Press Publication, Stanford.

Woodford M. (2003) *Interest and Prices. Foundations of Theory of Monetary Policy*, Princeton University Press, Princeton.

The Joint Harmonised EU Programme of Business and Consumer Surveys, User Guide, (2007), European Commission.

Streszczenie

PROGNOZA INFLACJI WOBEC KSZTAŁTOWANIA OCZEKIWAŃ INFLACYJNYCH. ANALIZA PORÓWNAWCZA

W artykule przedstawiono problematykę oczekiwań inflacyjnych konsumentów i prognoz inflacji banku centralnego. Punktem wyjścia w analizie jest istotna rola oczekiwań inflacyjnych w polityce pieniężnej. To ważka zmienna uwzględniania w procesie decyzyjnym przez komitety monetarne, gdyż obrazuje ona przyszły poziom inflacji. Banki centralne chcą również wpływać na poziom oczekiwań, gdyż kontrola nad nimi ułatwia osiąganie celu nadrzędnego polityki pieniężnej.

Prognoza inflacji jest narzędziem, którego główną funkcją jest kształtowanie oczekiwań inflacyjnych uczestników życia gospodarczego. W obejmującym 4 banki centralne porównawczym badaniu empirycznym (Narodowy Bank Węgier, Narodowy Bank Polski, Narodowy Bank Czech, Bank Szwecji), autorka analizowała istnienie współzależności między prognozami inflacji banków centralnych a oczekiwaniami inflacyjnymi konsumentów. Dane o oczekiwaniach pozyskane są z sondaży i skwantyfikowane. Do badań ilościowych wykorzystano nieparametryczne miary współzależności. Wyniki badań potwierdzają istnienie takich współzależności. Ich siła jest różna w badanych krajach i zmienia się od słabej do umiarkowanej. Badanie otwiera pole do poszukiwań dalszych współzależności.

Słowa kluczowe: *prognoza inflacji, celowanie w prognozę, oczekiwania inflacyjne*