University of Economics in Katowice

Journal of Economics and Management

ISSN 1732-1948 Vol. 21 (3) • 2015

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The impact of non-conventional monetary policy of NBP on short term money market

Abstract

In the situation of financial crisis large numbers of central banks have started to ease monetary conditions. The National Bank of Poland, following central banks of biggest economies, started to offer unconventional methods to increase liquidity: foreign exchange swaps. The aim of the paper is twofold: to calculate the risk premium understood as a difference between an implied forward rate and a reference rate. The second is to show the sensitivity of the risk premium (a difference between) to market disturbances and than to monetary policy easing.

Keywords: market expectations, monetary policy.
JEL Classification: E43, E58, C54.

Introduction

In the situation of financial crisis large numbers of central banks have started to ease monetary conditions. The main purpose of these operations was to calm internal market in the situation when traditional channels of transmission mechanism were not be able to fulfil their tasks. Following central banks of biggest economies the National Bank of Poland started to offer additional possibilities to increase liquidity: foreign exchange swaps and purchasing securities on a wider scale. In Poland and Hungary as well as in the whole euro area there was the largest Swiss frank shortage [Allen 2014, p. 92-93] and the providing swap let ease the situation on money market.

Because one of the main goals of the monetary policy is to stabilise the short term money market, a modern approach to monetary policy transmission

mechanism [Bank of England 1999] stands that an expectation channel is a key element of this process. Through the market expectations hidden in the forward rates the central bank can analyse the behaviour of market participants, especially a risk premium understood as a difference between an implied forward rate and a reference rate. The way how to receive market expectations has become one of the most important problems in monetary policy management [Bernanke et al. 1999; Bernanke and Woodford 2005; Mishkin 2007].

The central bank extracts the expectations from the instantaneous term structure which is understood as the relationship between the yield of the investment with the same credit quality but different term to maturity [Nawalkha, Soto and Beliaeva 2004]. Because financial markets offer only discrete data, the crucial role is the model selection to fit the data and build the yield curve (the plot, the graphical representation). There are a lot of ways how to create yield curves [James, Weber 2000], but in countries with well developed monetary policy central banks use either parsimonious models [Nelson and Siegel 1987; Svensson 1994] or cubic splines models [McCulloch 1975; Fisher, Nychka and Zervos 1995; Waggoner 1996].

A central bank compares these extracted rates with its interest rate policy. To do this it usually applies one of the expectation theories [Fama 1984; Modigliani and Sutch 1966; Cox, Ingersoll and Ross 1981]. According to one of them – the risk premium theory – the market expectations of future interest rates include the contingency of new information coming into market (reflect the risk premium required by the market).

The aim of the paper is twofold: to calculate the risk premium understood as a difference between an implied forward rate and a reference rate. The second is to show the sensitivity of the risk premium (a difference between) to market disturbances and than to monetary policy easing [Martellini, P. Priaulet and S. Priaulet 2003].

1. Methodology

A forward rate $f_\tau(s,t)$ extracted at time τ is an agreement made to lend money at some future date s and maturity t [Tuckman 2002]. There is the strong connection between forward and spot rates based on the expectation hypotheses (EH). Generally all of them accept that the forward rates reflect market expectation. According to the risk premium theory the forward rate includes market expectations of future interest rates $E_\tau[i(s,t)]$ with a bias called a risk premium $\Phi_\tau(s,t)$.

$$\begin{cases} f_\tau(s,t) = E_\tau[i(s,t)] + \Phi_\tau(s,t) \\ \Phi_\tau(s,t) \in \Re \end{cases} \tag{1}$$

where:

$f_\tau(s,t)$ – the forward rate calculated at time τ for period $t-s$,

$E_\tau[i(s,t)]$ – expected at moment τ the level of the interest rate $i(s,t)$,

$\Phi_\tau(s,t)$ – a risk premium calculated at time τ.

Monetary policy is interesting in extracting market expectations to analyse the predictive power of market participants. That knowledge, received before the monetary policy decision is taken, let understand the behaviour of market participants.

Because of the distance between expected level of reference rate and its real value reflects market uncertainty and varies over time, it is usually called a risk premium. When the central bank is interesting how market participants estimate its future moves it analyses the risk premium. The lower is its level, the lower is uncertainty and better the communication with the market participants.

To make the calculations comparable the time between the date of establishing of the implied forward rate and the monetary policy decision should be fixed. The shorter is the period $s-\tau$, the lower should be the risk premium (market participants have more and more information about future moves of the reference rate). If the period $s-\tau$ is close to zero it could be assumed that financial market participants correctly anticipate the future monetary policy decisions of the central bank and there are no additional factors causing an increase of the risk premium [ECB 2006].

The risk premium may be analysed after monetary policy decision (at time *s*), when:

$$E_\tau[i(s,t)] = i(s,t) \tag{2}$$

where:

$E_\tau[i(s,t)]$ – expected at moment τ the level of the central bank rate,

$i(s,t)$ – the key central bank rate.

Then the risk premium $\Phi_\tau(s,t)$ could be shown as:

$$\begin{cases} \Phi_\tau(s,t) = f_\tau(s,t) - i(s,t) \\ \Phi_\tau(s,t) \to 0 \end{cases} \tag{3}$$

The lower the difference between forward and spot rate is, the more transparent is the monetary policy before a decision-making meeting and lower uncertainty on the market. If the difference is high, the question arises about the circumstances – sometimes it is an inefficiency of the market (illiquidity), sometimes a risk premium caused by lack of trust or a decision of the central bank which surprised the market [Goodfriend 1998]. It is also possible that market participants could overestimate the scale of central bank decisions as an effect of misunderstandings of the monetary policy. Being familiar with determinants that shaped the term structure, the central bank is able to improve its transparency through official and unofficial messages covering information about future interest rates movements to keep the inter-bank rates as stable as possible [Choudhry 2002].

Let us assume that the central bank is interesting how market participants estimate its future move in interest rates. Because the key interest rate of the National Bank of Poland (NBP) – the reference rate – has 7-days duration $i_{NBP}(s, s+\frac{7}{360})$ the risk premium should be calculated from the forward rate $f_\tau(s, s+\frac{7}{365})$ following the formula:

$$\Phi_\tau(s, s+\tfrac{7}{365}) = f_\tau(s, s+\tfrac{7}{365}) - i_{NBP}(s, s+\tfrac{7}{360}) \tag{4}$$

Additionally, the term of extracting 7-days forward rate is assumed to be 7-days before monetary policy decision making to compare the level of the risk premium during the period:

$$\tau = s - \tfrac{7}{365},$$

where: s – days when meetings of the Monetary Policy Council took place.

The forward rate is calculated using two parsimonious models: Nelson-Sigel and Svennson one, with three different methods of fitting the yield to the market data (least squares method based on prices, rates and prices divided by the duration). For each date six different forward rates were calculated which caused following six levels of risk premium depending on the model type and goodness of fit methodology:

- NS_P – the level of risk calculated from the Nelson-Siegel model with the fitting criteria based on prices.
- NS_P/D – the level of risk premium calculated from the Nelson-Siegel model with the fitting criteria based on prices divided by the duration.
- NS_Y – the level of risk premium calculated from the Nelson-Siegel model with the fitting criteria based on yields.

- Sv_P – the level of risk premium calculated from the Svensson model with the fitting criteria based on prices.
- Sv_P/D – the level of risk premium calculated from the Svensson model with the fitting criteria based on prices divided by the duration.
- Sv_Y – the level of risk premium calculated from the Svensson model with the fitting criteria based on yields.

Two types of instruments are taken into account during the research: the inter-bank lending rates which are represented by WIBOR (Warsaw InterBank Offer Rate), seven in total: 1-week, 2-weeks, 1-month, 3-, 6-, 9-months and one year as well as the set of swap rates ranged from one to ten years with POLONIA index. For both instruments six yield curves are constructed.

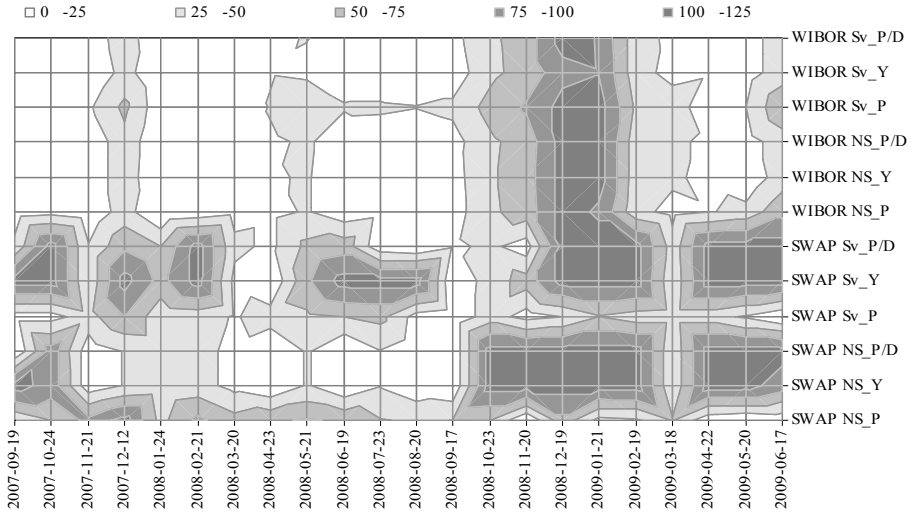
2. Data and results

The analysis takes into account the period between 2007-2012 and dates of the Monetary Policy Council (MPC) decision-making meetings. Seven days before the MPC meetings the implied 7-days forward rates were calculated and compared with the reference rate which was established during the meetings. For each day, both for WIBOR and for swap data, the implied forward 7-days rates were extracted (based on Nelson-Siegel model with three fitting methods and Svensson with three fitting methods). Because there are no strict suggestions which model and fitting procedure should be applied, the research shows the results of all of them. The figures show the difference between market forecast of the reference rate and the reference rate itself. They show – in the form of colours – how good were the expectations concerning the decision of the central bank. The lighter the colour is the better was the forecast. The analysed period was divided into two intervals: 2007-2009, the crisis period and 2009-2012, a post-crisis one.

Period 2007-2009

The results, which are shown in Figure 1, may be used as a leading indicator of market disturbances – since autumn 2008 the predicting power of market participants (for data taken from WIBOR especially) has been lowering. The risk premium started to be positive and reflected, among others circumstances, the decreasing of market mutual confidence. High interest rates volatility caused changes of asset prices and they will not be able to reflect correctly the market expectations. In the beginning of 2009 a reversal behaviour has been noticed – the risk premium started to be lower. It might be an effect of NBP's interventions (monetary policy easing) which let assure market participants that it controls the situation and helps to recover the mutual confidence.

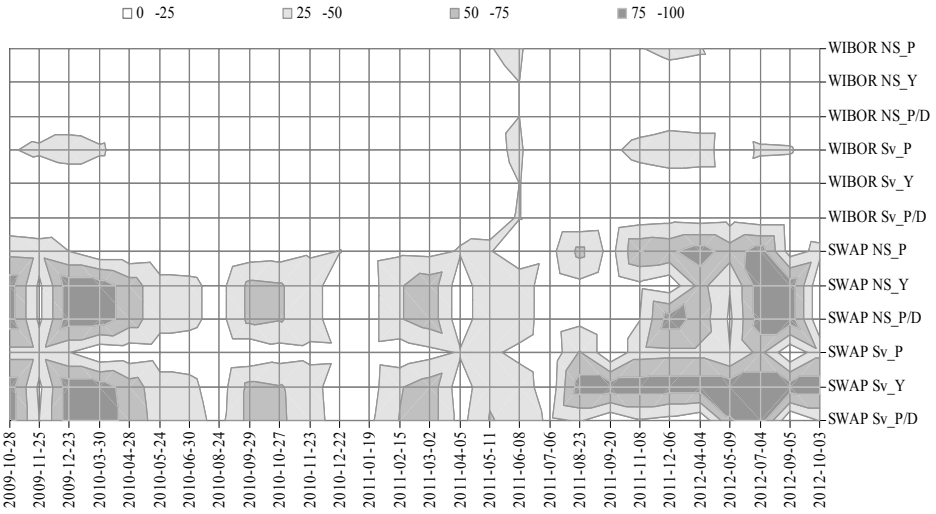
Figure 1. Risk premium for implied forward rate taken from WIBOR and SWAP – calculated 7 days before MPC's decision (2007-2009)



Source: own computations based on WIBOR and swap data.

Period 2009-2012

Figure 2. Risk premium for implied forward rate taken from WIBOR and SWAP – calculated 7 days before MPC's decision (2009-2012)



Source: own computations based on WIBOR and swap data.

Figure 2 shows the predictive power of inter-bank data during post-crisis period. A situation noticed that time was stable which may be confirmed by risk premium close to zero (for WIBOR data). It means that quantitative easing which was started during the crisis period was successful in calming down of the market.

Different results are observed for the swap data. The expectations taken from these quotations did not allow to approximate future movements of monetary policy correctly. The main reason why the results are so unsatisfying is the quality of the swap data. It is highly probable however, that this segment of the market has high potential and will offer an attractive set of information in the future (like a swap market in developed countries).

Conclusions

Central banks are interesting in extracting market expectations to analyse the risk premium. The level of the risk premium allows to understand the behaviour of market participants and their reactions on market disturbances.

For this research two segments of Polish market were used: inter-bank deposits and interest rate swaps taken from 2009-2012 period. The forward rates were calculated 7-days before decisions taken by the Monetary Policy Council and subsequently compared with these decisions. The calculated differences enabled to examine whether the market participants had correctly predicted interest rate's movements and how they reacted on monetary policy easing.

It was quite obvious that during the first, so call crisis period, a higher positive premium was noticed. Economic uncertainty, caused mainly by the bankruptcy of Lehman Brothers, disturbed market's ability for making proper prediction of interest rates' movements. The injections of liquidity entered by the NBP let lower the risk premium and build the mutual confidence during the post-crisis period.

The achievements should be interpreted with caution, because small, sensitive market (like Polish one) is still too shallow to consider these results as typical. This is why the analysis examined several types of assets to get a wider spectrum of the market's situations.

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