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DETERMINANTS OF THE SPREAD BETWEEN POLONIA RATE AND THE REFERENCE RATE – DYNAMIC MODEL AVERAGING APPROACH

CZYNNIKI DETERMINUJĄCE *SPREAD* MIĘDZY STAWKĄ POLONIA A STOPĄ REFERENCYJNĄ – PODEJŚCIE WYKORZYSTUJĄCE DYNAMICZNE UŚREDNIANIE MODELI

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Summary: In the paper, we consider the factors that determine the overnight interest rates in the Polish interbank market. Since 2008 the Polish central bank has been trying to place the POLONIA rate around the NBP reference rate, mainly by influencing the liquidity conditions through open market operations. We identify a set of factors that determine the overnight rates, namely: liquidity, expectations, confidence in the banking sector and central bank operations. To this end we have used dynamic model averaging method, which allows to identify the set of variables that provide the best description of the explanatory variable. The results reveal that before the outbreak of financial crisis in 2008 the spread between POLONIA rate and reference rate could be explained mainly by liquidity conditions. After the crisis had begun, the importance of liquidity factor decreased and the expectations played a more important role in determining the spread.

Keywords: monetary policy, POLONIA rate, interbank rates, dynamic model averaging, liquidity in the interbank market.

Streszczenie: W artykule rozważane są czynniki determinujące stopy *overnight* na polskim rynku międzybankowym, przy czym jako miernik ich wysokości przyjmuje się stawkę POLONIA. Od 2008 roku celem operacyjnym NBP jest ustalanie stawki POLONIA na poziomie zbliżonym do stopy referencyjnej NBP. Wskazano zbiór czynników wpływających na stopy *overnight*, a mianowicie płynność, oczekiwania i zaufanie na rynku międzybankowym. Starano się ustalić, w jakim stopniu każdy z tych czynników wpływał na stawkę POLONIA w latach 2006-2016. Wykorzystano w tym celu metodę dynamicznego uśredniania modeli (*dynamic model averaging*), która pozwala ustalić, jaki zbiór zmiennych niezależnych w najlepszym stopniu objaśnia zmienną objaśnianą. Wyniki pokazują, że przed wybuchem kryzysu finansowego w 2008 roku *spread* między stawką POLONIA i stopą referencyjną najlepiej wyjaśniała sytuacja płynnościowa. Po rozpoczęciu kryzysu wzrosło znaczenie oczekiwań dotyczących przyszłych stóp procentowych.

Słowa kluczowe: polityka monetarna, stawka POLONIA, stopy międzybankowe, dynamiczne uśrednianie modeli, płynność na rynku międzybankowym.

1. Introduction

In the article, we consider the factors that determine the short-term interest rate in the interbank market in Poland. In particular, we are interested in the determinant of the behaviour of the POLONIA rate – the index of the overnight interbank loans. It is considered as one of the most important interest rates, as it is believed – according to the expectation hypothesis – that the POLONIA rate determines interest rates for longer maturities. The Polish central bank has adapted the policy similar to the European Central Bank and has been trying to set the overnight interbank rate at the level near to the central bank reference rate. There are many works concerning the factor determining the overnight rates and the ability of central banks to control them. The survey of this literature is presented in the second section.

In the existing literature, the problem with identifying which factors play the most important role in determining of the overnight rates in various market circumstances is usually solved by dividing the period under research *ad hoc* into several subperiods and estimating econometric models for each of them independently. Such a method was used for example in Kliber et. al. [2016], where the behaviour of the POLONIA rate during and after the financial crisis of 2008 was analysed. In this paper, we take a more systematic approach, allowing data to choose the models. For this sake, we adapt the dynamic model averaging approach (DMA). This procedure allows us to use various models to describe the phenomena under research and dynamically choose the model which provides the best description of the dependent variable. The procedure was developed by Raftery et al. [2012] and since that time has been successfully adapted to describe and predict economic variables, like for example inflation [Koop, Korobilis 2012] or prices of raw materials [Koop, Tole 2013]. The method of mixing different models is considered the best method for forecasting. However here, it is used rather as a tool for identifying factors that give the best predictions and that can serve as ‘causes’ (in the Granger sense) of the phenomena under research.

In the article, we identify four main factors that influence the overnight rates: liquidity situation, expectations concerning the changes in the interest rates, confidence (or lack of it) in the interbank market and the actions taken by the central bank. We provide the variables describing each of these factors and build a model that explains the overnight rate with the specific factor. Then we perform the dynamic analysis to identify the periods in which the specific factor plays a significant role on the overnight rates market.

The article consists of six sections. After this introduction, we briefly describe the role of the POLONIA rate in the monetary policy of the Polish central bank and the factors and events which could have had an influence on this rate since 2006. In the third section, we describe the methodology of dynamic model averaging, which is used in the analysis. Section Four contains the description of the variables used in the analysis and the models that are considered. Section Five presents the results of the empirical analysis and Section Six contains the conclusions.

2. POLONIA rate and monetary policy

Since the beginning of the century, monetary policy of central banks in most of the developed countries has been implemented by controlling a short-term interest rate. This policy is supported by the expectation hypothesis of the yield curve of interest rates, according to which the interest rates for longer maturities are the same as shorter-term interest rates, augmented for the premium for holding an investment for a longer period. The long-term rates are thus determined by the short-rates, especially by the overnight rate. The goal of the central bank is to control and stabilize the short-term (overnight) interest rate in the interbank money market. This policy is implemented for example by the European Central Bank (ECB), which tries to stabilize the EONIA rate[1] at the level of the reference rate of the ECB.

The National Bank of Poland (NBP, Polish central bank) adopted similar policy. The main measure of the overnight interbank rates in Poland is the POLONIA rate. The POLONIA (Polish Overnight Index Average) is the overnight rate calculated as the weighted average of transactions on the unsecured deposit market. It is calculated as a weighted average of the overnight interest rates with the weights proportional to the volume of transactions. It was created in 2005 by the Financial Markets Association ACI Polska and describes 57% of all overnight transactions. It is considered the most accurate measure of the short-term interest rates in Poland.

The POLONIA rate sets the cost of money in the financial system and should have the influence on the interest rates for the longer periods. This is also considered as the first stage of the transmission mechanism, which should affect the real side of the economy. The majority of the loans of the commercial banks are given under a floating rate, which is usually the rate of 6 months' interbank uncovered loans (WIBOR6M). According to NBP, "the operational goal of monetary policy (…) was to allow the POLONIA rate to run close to the NBP reference rate. This goal was achieved mainly by means of open market operations used to manage liquidity in the banking sector" [2014, p. 14]. The task of controlling POLONIA rate was set in the year 2008, however, there is evidence that Polish central bank unofficially had been trying to control this rate since 2006.

[1] A rate computed as a weighted average of all overnight unsecured lending transactions in the interbank market in the eurozone.

The NBP controls the POLONIA rate by forming liquidity conditions in such a way that this rate is possibly close to the NPB reference rate, i.e. the minimal yield of one-week NBP money market bills. The main tool in this task are the open market operations of the central bank, especially the main ones, which are performed on the weekly basis. Every Friday NBP offers 7-day money market bills. Apart from this, the central bank can also perform fine tuning operations with different maturities.

There were two main obstacles in performing the policy of controlling the spread between the POLONIA rate and the reference rate. The first one is the continuous surplus of liquidity in the Polish banking sector. This excess liquidity stems mainly from the autonomous factors, which are beyond the control of the central bank and are independent of the current monetary policy. Among them, the positive balance of currency purchases by the central bank has the greatest impact. Other factors include the level of cash money in circulation and the level of public sector deposits in the central bank.

The second and more important problem arose with the outbreak of the financial crisis in the year 2008. After the bankruptcy of Lehman Brother there was a considerable fall of the confidence in interbank markets and the commercial banks became more averted to lending money to each other. The crisis had a significant impact on the functioning of the money market. Interest rates and volatility in this market increased substantially. This crisis was transmitted also to Poland. Although its real effects were relatively mild, it invoked a rise of uncertainty and there was a strong concern that the serious financial crisis may arise also in Poland. The crisis triggered a sudden slump in the interbank money market. The aggravating crisis of confidence caused the decrease in mutual credit limits between banks. The turnover in the unsecured interbank deposits market fell significantly and the loans in this market were given at shorter maturities. The demand for liquidity rose. In order to rebuild the confidence in the interbank market and provide commercial banks with the additional liquidity, NBP in 2008 introduced the *Confidence Pact* [see: NBP 2009, p. 16], which extended the possibility to obtain liquidity. The repo transactions with the maturity of up to 3 months were introduced. It also enabled commercial banks to obtain foreign currencies and allowed them to use a wider spectrum of assets as collateral in the transactions with the NBP. As a supplementary tool, the reserve requirement ratio was reduced by 0.5 percentage points (from 3.5% to 3.0%) for a period from May 2009 till the end of 2010.

As it was shown by Kliber and Płuciennik [2011] in this period NBP lost some of its control over POLONIA rate. The report of the central bank states that “the effectiveness of the NBP’s influence on liquidity conditions in 2009 was limited” [NBP 2010, p. 16]. This resulted mainly from the fact that banks participated less actively in the main open market operations. This was reflected by the underbidding, i.e. the situation in which the banks’ demand for NBP bills during the open market operation was lower than the supply of the central bank. The commercial banks, while managing their liquidity positions, preferred to use deposits with the maturity shorter than one week, as in the case of open market operations. Especially the overnight transactions were preferred and banks managed their liquidity using either overnight interbank deposits or one of the two instruments offered by the central bank. First, they hold more money in their current accounts at the NBP at the beginning of the reserve maintenance period, so that the reserve requirement was fulfilled relatively early. This phenomenon is called frontloading. Second, the banks, after they met reserve requirements, at the end of the maintenance periods placed the accumulated excess funds with the central bank using standing deposit facility.

Since the year 2010 the central bank has started to use fine-tuning operations with the maturity shorter than the main open market operations. The main bulk of this operation was designed to absorb liquidity. There were only five fine-tuning operations performed to supply the banking system with liquidity and all of them took place in 2010. In 2010 and 2011 the operations were performed on an *ad-hoc* basis and during the reserve maintenance period. Since 2012, the NBP started to carry out regularly fine-tuning operations regularly on the last working day of the maintenance period. Apart from that, irregular operations during the maintenance period were also performed, when the liquidity situation in the banking sector was out of balance and threatened the stability of the short-term rates. All these operations were carried out to stabilize the POLONIA rate at the level close to the reference rate. Since 2011 the average spread between POLONIA and the reference rate has been falling systematically from 43 basis points in 2011 to 11 basis points in 2014. Only in the year 2015 there was a small increase by 1 basis point. Figure 1 presents the behaviour of POLONIA rate in the years 2006-2016 together with the values of the reference rate, deposit rate and lombard rate of the NBP and the turnover of the transactions used to calculate POLONIA rate.

The problem of the influence of the central bank policy on the overnight interbank interest rate was considered in many publications. In most of the research ARMA-GARCH models were used. Wetherilt [2003] analysed the influence of the monetary policy of the Bank of England on short term interest rates. In the papers of Nautz and Offermanns [2007], Soares and Rodriges [2011], Liznert and Schmidt [2008], Abbassi and Nautz [2010], as well as of De Socio [2013] the EONIA spread was studied.

Hassler and Nautz [2008] studied the spread of EONIA analysing the integration and long memory in time series. The papers by Schianchi and Verga [2006], as well as by Hauck and Neyer [2014] provided the theoretical background for the analysis of factors determining the spread. Würtz [2003] pointed out the role of liquidity expectations in forming interbank rates.

Similar analysis for the spread of POLONIA was performed by Kliber and Płuciennik [2011] and Kliber et al. [2016]. In the last paper, econometric analysis was supported by the results of the survey directed to the headquarters of commercial banks.

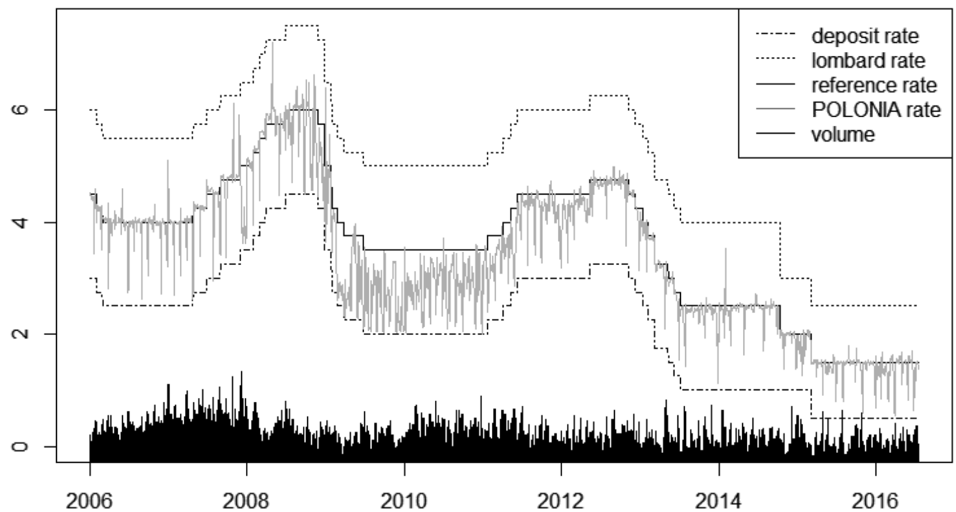

Fig. 1. POLONIA rate and the main central bank rates

Source: own study.

In this article, we take a different approach to the problem, using dynamic model averaging method. We assume that this methodology will allow us to identify the periods in which different factors influenced the POLONIA rate and to measure the impact of these factors.

3. Dynamic model averaging (DMA)

We assume that the dependent variable is described by a set of time-varying regression models, in which the coefficients can change with time. Each one of K models can be represented by the following linear state-space formulation:

$$y_t = x_t^k \theta_t^k + \epsilon_t^k, \tag{1}$$

$$\theta_t^k = \theta_t^k + \eta_t^k, \tag{2}$$

where $\epsilon_t^k \sim N(0, h_t^k)$ and $\eta_t^k \sim N(0, Q_t^k)$ are independent random disturbances (the first has a dimension of 1 and the second is a vector random variable). Here y_t is the dependent variable, k is the number of models that apply at the time t, and x_t^k is a vector of explanatory variables in the model k. It is thus assumed that at each moment a different set of variables can have an impact on the dependent variable.

If there was only one model, the estimations of the parameters θ_t^k could be performed using Kalman filter. Let L_t be the model that applies at the moment t. It is assumed that the sequence of models forms a Markov chain with the transition matrix $\Pi = (\pi_{ij})_{i,j=1...K}$, where $\pi_{ij} = P(L_t = j|L_{t-1}) = i$. Denote the probability that at the moment t model k applies by p_t^k. The probabilities can be calculated in the two-step procedure resembling the Kalman filter with a prediction step and an updating step, accompanied by the standard Kalman procedure for estimating the parameters of the model (1)-(2). The procedure allows to calculate the estimators for the probabilities of different models at the moment t:

$$p_{t|t}^k = P(L_t = k|y_1, \dots, y_t), \tag{3}$$

as well as the estimators of the coefficient vectors in different models $\theta_{t|t}^k$, when all observations up to time t are known[2]. The one-step ahead forecast of the dependent variable is given by the equation:

$$\hat{y}_{t|t-1} = \sum_{k=1}^K p_{t|t-1}^k \hat{y}_{t|t-1}^k = \sum_{k=1}^K p_{t|t-1}^k x_t^k \theta_{t|t-1}^k, \tag{4}$$

where $\hat{y}_{t|t-1}^k$ is the forecast of the model k and $\theta_{t|t-1}^k$ is the forecast of the parameters in this model. In this approach, the final forecast is the weighted average of the individual models' forecasts and the weights change dynamically – hence the name of the method.

The dynamic model averaging is one of many methods of averaging forecasts from many different models, based on diverse assumptions. As it was pointed out, for example by Silver [2012], the averaging usually improves the forecast and averaged prediction is typically better even than the prediction based on the best model in the sample. However, here we use this method to identify the factors which have influence over the short-term rate. In line with Granger [1969], we assume the factors that are present in the models which give the best prediction can be treated as "causes" of the variable under research.

4. Variables and models

The dependent variable y is the spread between POLONIA rate and the reference rate of the Polish central bank. We try to check which possible factors had an influence on this variable. The set of potential explanatory variables is given in Table 1.

The time series of POLONIA spread displays autocorrelation of the first order so we have to use lagged values of this variable, *y1*, to control it. The variables *btc_m* and *btc_f* represent the ratio of the total bid volume to total cover volume

[2] The technical details are omitted here due to limitations on the length of article. They can be found in Raftery, Karny and Ettler [2012], where the method was developed. In the later computations, instead of using the full specification of the matrices Q_t^k the estimators of covariance matrix from the prediction phase is used (multiplied by some specified forgetting index). One should note that the parameters h_t^k, the standard deviations of the error term in (1), are not constant, which allows to account for the heteroscedascity. As in Koop and Korobilis [2012] we estimate it based on the last observations and using moving average.

Table 1. Possible explanatory variables

Var. name	Description
y1	lagged dependent variable
btc_m	bid to cover ratio in main open market operations
btc_f	bid to cover ratio in fine-tuning open market operations
df_lf	difference between end of the day deposit and lombard credit
ois1w_ref	spread between OIS1W and the reference rate
var_ois1w	variance of OIS1W
wois3m	spread between WIBOR3M and OIS3M

Source: own study.

in the main and fine-tuning open market operations, respectively. These variables reflect to what degree the demand of commercial banks is met by the NBP. High values of these variables mean that the demand for liquidity was satisfied only to a low degree during the operations and banks would have to seek for liquidity in the interbank market, which tends to increase the spread. The variable *df_lf* represents the difference between the sum of deposits at the end of the day made by commercial banks in the NBP and the amount of lombard credit. This variable serves as a proxy, indicating the current liquidity situation. In a situation of loose liquidity, the demand in the overnight market is low, which tends to decrease the spread. The last three variables describe the liquidity situation.

The next two variables are connected with the expectations concerning future changes of the interest rate. The variable *ois1w_ref* represents the spread between one-week OIS rate (overnight indexed swap) and the reference rate. The OIS rate is usually lower than the reference rate because it is connected with lower risk. However, payments in the float leg in an OIS contract depend on the level of OIS in the future and – if OIS rate is well below the reference rate, it means that banks expect the POLONIA rate to rise, which should have a positive effect on the spread. The variable *var_ois1w* is a measure of uncertainty of these expectations. We defined it as a square of the first differences of OIS1W rate, which serves as a proxy for conditional volatility of this rate. This variable should have a negative impact on the spread.

The variable *wois3m* represents the spread between three months WIBOR and the OIS rate with the same maturity. The spread between the interbank rates of unsecured loans and the rates of much safer swap instruments are commonly considered as a measure of risk in the banking sector *fear index*). This variable is used to take into account the lack of confidence in the market that began with the outburst of the financial crisis.

Apart from these explanatory variables we use also a few dummy variables to control some characteristics of the dynamics of the dependent variable. They are presented in Table 2.

Table 2. Dummy variables

Var. name	Description
d_reqRes	last day of the maintenance period
d_reqRes1	second to last day of the maintenance period
d_main	day of main open market operation
d_fine	the series of fine-tuning operation has started

Source: own study.

The variables *d_reqRes* and *d_req_res1* take values of 1 in the last (or second to the last) day of the required reserve maintenance period. Otherwise they are equal to 0. They account for abnormal activity at the end of the maintenance period. These variables are present in all models we consider. The variable *d_main* represents the days of the main open market operations. The variable *d_fine* was set equal to 0 before the central bank had started using fine-tuning operations after the confidence crisis. After the first such an operation on 8.12.2010 its value is 1. These two variables model the activity of the central bank.

In the dynamic model averaging approach, one can consider various models with different sets of explanatory variables. As the number of these variables grows, the number of possible models grows even more (exponentially). Therefore, it is desirable to take into account only a limited number of models with the explanatory variables describing a specific factor that can influence the dependent variable. We consider four models which describe four different factors influencing the POLONIA spread. These aspects are: liquidity, expectations, risk (or *fear*) and central bank policy.

Table 3. The models

Model	Variables
M1 (liquidity)	*y1, btc_m, btc_f, df_lf, d_reqRes, d_reqRes1*
M2 (expectations)	*y1, ois1w_ref, var_ois1w, d_reqRes, d_reqRes1*
M3 (risk)	*y1, wois3m, d_reqRes, d_reqRes1*
M4 (policy)	*y1, d_main, d_fine, d_reqRes, d_reqRes1*

Source: own study.

The first model (M1) applies in the periods in which the liquidity situation is the main factor determining the overnight rates. This is a regime of normal circumstances. The second model (M2) describes the regime in which the overnight rates are determined mainly by the expectations concerning future changes of the interest rates. Such conditions occur for example when banks expect interest rates of the central bank to change. In some regard, it is an inconvenient situation, as it disturbs the way the banks manage their reserves during the maintenance period[3]. The third model (M3) applies in the periods of high uncertainty in the banking sector. The banks are reluctant to lend money in the interbank market over longer periods and manage their liquidity mainly through overnight deposits. The spreads between the longer term interbank rates and OIS rates, as the measure of credit risk, are the main factor determining the overnight rate. The last model (M4) is formulated to check the influence of the central bank operations on the spread.

5. Empirical results

The data in the analysis cover the period from the beginning of 2006 (2 January 2006) till the half of 2016 (the last observation is from 15 July 2016). During this period, the market survived the outburst of the financial crisis, the fall of the confidence in the interbank sector and the attempts of the central bank to calm down the market and regain control over the overnight rates.

We begin with the linear regression analysis for the proposed variables and models. The results of the regression are presented in Tables 4 and 5. Table 4 contains results for the model with all proposed explanatory variables, while Table 5 contains the results of the regression for the models with limited set of variables.

Table 4. Linear regression – all variables

Variable	Estimate	*p*-value	Variable	Estimate	*p*-value
C	–0.0490	0.0000***	*var_ois1w*	0.1608	0.0762
y1	0.4191	0.0000***	*wois3m*	0.0986	0.0000***
btc_m	–0.0075	0.3852	*d_reqRes*	0.0466	0.0604
btc_f	0.2464	0.0000***	*d_reqRes1*	–0.1592	0.0000***
df_lf	–0.0001	0.0000***	*d_main*	0.0110	0.4430
wois_ref	0.5700	0.0000***	*d_fine*	0.0302	0.0005***

Note: R^2-adj=0.7622, F-stat.=776.4.

Source: own study.

As can be seen, the proposed variables explain the dynamics of the spread – most of the variables are significant. All significant variables have the signs that were expected, except for the variable *wois3m* in the model M3, which was expected to have a positive effect on the spread. All the models seem to explain the dependent variable sufficiently well – the R^2 are high and there is no evidence to reject the model (based on the F-test). The dynamic analysis should help us to distinguish which model applies in different periods and describe the influence of different factors on the spread.

[3] For example, one of the goals of the operational framework of the European Central Bank is to eliminate the effects of expectations on EONIA rate. See for example Linzert and Schmidt [2008].

Table 5. Linear regression for different models

M1			M2		
Variable	Estimate	*p*-value	Variable	Estimate	*p*-value
C	–0.0543	0.0000***	*C*	0.0065	0.2614
y1	0.6639	0.0000***	*y1*	0.5421	0.0000***
btc_m	–0.0067	0.3155	*ois1w_ref*	0.4678	0.0000***
btc_f	0.2644	0.0000***	*var_ois1w*	–0.1169	0.2423
df_lf	–0.0001	0.0000***	*d_reqRes*	–0.0447	0.0398*
d_reqRes	0.1523	0.0000***	*d_reqRes1*	–0.2540	0.0000***
d_reqRes1	–0.0838	0.0001***	R^2-adj	0.7032	
R^2-adj	0.699		F-stat	1262	<2.2e-16
F-stat	1031	<2.2e-16			
M3			M4		
Variable	Estimate	*p*-value	Variable	Estimate	*p*-value
C	0.0248	0.0014**	*C*	–0.0716	0.0000***
y1	0.6750	0.0000***	*y1*	0.7776	0.0000***
wois3m	–0.1807	0.0000***	*d_reqRes*	0.0650	0.0057**
d_reqRes	0.0217	0.3426	*d_reqRes1*	–0.1847	0.0000***
d_reqRes1	–0.2092	0.0000***	*d_main*	–0.0165	0.1739
R^2-adj	0.664		*d_fine*	0.0462	0.0000***
F-stat	1315	<2.2e-16	R^2-adj	0.664	
			F-stat	963	<2.2e-16

Source: own study.

Figure 2 presents the results of the DMA analysis. The plots depict the probabilities that a particular model applies in the specific period. Before November 2008 the POLONIA spread could be explained mainly with liquidity factors, apart from the short episode at the turn of 2007 and 2008, when the role of the perceived credit risk in the interbank market (M3) grew. From November 2008, the spread was driven by the expectations concerning future rates (M2). This regime had lasted till the second half of 2011, when the importance of the expectations fell and the spread could be again explained mainly by liquidity factors. The restored ‘liquidity regime’ has been lasting since then. Only at the beginning of 2016 the situation began to change and there was a significant increase in the importance of expectations.

The results reveal also that the operations of the central bank alone (M4) do not allow to explain the dynamics of the POLONIA rate. The central bank policy should be analysed in the context of market conditions – either the current liquidity situation or the expectations of the commercial banks.

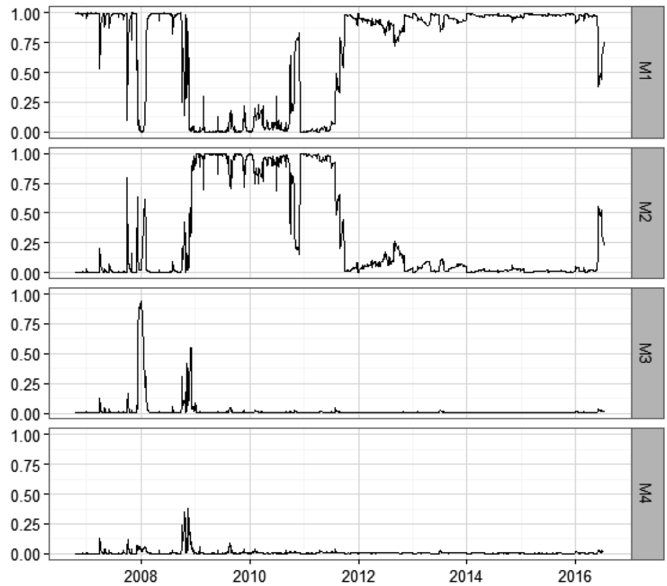

Fig. 2. Probabilities of different models

Source: own study.

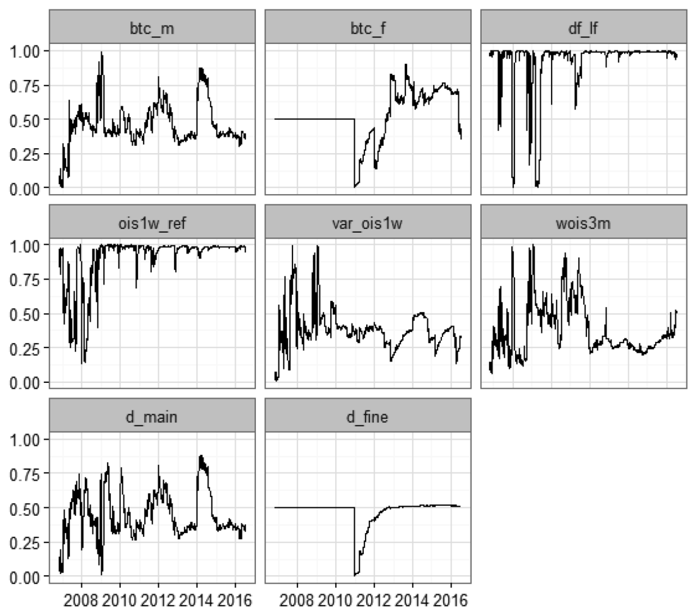

Fig. 3. Posterior probabilities of explanatory variables to be included in the model

Source: own study.

To check the robustness of the results we have also considered different sets of models. In particular, we have checked the sets of models without M3 model and with models M1 and M4 or M2 and M4 combined together. In this case M1+M4 can be interpreted as central bank policy in the context of liquidity situation and M2+M4 represents central bank interventions given the banks' expectations. The results have proven to be similar to these in the four models set. To check the influence of particular variables in the full setting we have estimations for the sets of all possible models. We have assumed that the variables *y1*, *d_reqRes* and *d_reqRes1* are mandatory for each model, to account for autocorrelation and abnormal behaviour of the overnight rate at the end of the maintenance period. Then we have considered all possible models that can be formulated using the remaining eight variables (there are $2^8 = 256$ such models). Figure 3 presents the results of this analysis. The graph presents probabilities *a posteriori* that a given variable is included in the model which applies in the specific period. As can be seen in the graph, in explaining the POLONIA spread usually it is better to account for more variables. The influence of the financial crisis is visible in the graph for *wois3m* variable. Its posterior probability rose at the beginning of 2008 and after the outburst of the crisis. Since the beginning of 2012 the role of this variable in explaining the POLONIA spread has decreased.

6. Conclusions

In the article, we have considered the factors determining the behaviour of the overnight rate in the Polish interbank market. To this aim we have used a dynamic model averaging approach and tried to distinguish the periods in which the dynamics of the POLONIA rate is governed by different factors. We have proposed four models and each of them contains a set of variables that represent different aspects of the forces that influence the overnight rate.

The results of the analysis are in many aspects similar to those presented by Kliber and Płuciennik [2011] and Kliber et. al. [2016]. Under normal circumstances the main factor determining the spread is liquidity. This is in accordance with the operational objectives of the Polish central bank, according to which the bank should control the overnight rate by setting liquidity situation in the banking sector. After the beginning of the financial crisis the liquidity situation ceased to be the main factor explaining the overnight rate. Instead, the rate was determined by the expectations concerning future changes in the central bank interest rates. The uncertainty rose and the guesses concerning the future policy of the central bank were the main factor determining the overnight rates. The role of liquidity fell dramatically, which is understandable in the situation of systematic surplus liquidity of the banking sectors, augmented by the introduction of the *Confidence Pact*. The *fear factor*, concerning the risk of default in the banking sector, was not very strong. Its importance rose at the beginning of 2008 and during the initial period of the crisis. At the end of 2011, probably due to fine tuning operations of the NBP, there was a return to normal circumstances in which the liquidity is the main factor determining the spread.

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