A MODEL OF THE INTERBANK INTEREST RATE AND ITS APPLICATION IN LIQUIDITY MANAGEMENT BY THE NATIONAL BANK OF BELARUS

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Abstract

On the basis of the theoretical model proposed by W.Poole an econometric model of the Belarsian interbank market interest rate is formulated and estimated. The empirical results are used to conduct the analysis of the Belarusian interbank market, as well as to formulate policy recommendations for the liquidity management by the National Bank of Belarus.

1 Introduction

The interbank market serves as the primary element of the monetary policy transmission mechanism. With this respect central bank control over its operational target on the interbank rate is essential for effective monetary policy realization (e.g., see [1]). This establishes the importance of the interbank market modelling and analysis.

2 Theoretical Model and Approaches to its Estimation

On the micro level the interbank market is the place where a bank can offset its liquidity imbalance by providing or attaining the interbank credit. The path-breaking approach to the interbank market modelling was provided in [2], who elaborated a model for risk-neutral, profit-maximizing banks under the condition of uncertainty. Under some simplification and allowing for some extention of the model, the solution of the model, which indicates the equilibrium on the interbank market, can be represented as (e.g., see [3]):

$$iIB^e = C_1\frac{iDep + iOver}{2} + C_2 iNB - C_3(iOver - iDep)\frac{excNA}{Dep} - C_4 iNB\frac{excA}{Dep}, \quad (1)$$

where iIB^e is the equilibrium interbank interest rate, $iDep$, $iOver$ are the interest rates on the central banks standing facilities (for liquidity absorption and supply operations correspondingly), iNB is the main refinancing interest rate, $excNA$, $excA$ are the net volumes of the banking sustem liquidity in the absorption ($excNA, excA > 0$)

or supply ($excNA, excA < 0$) instruments (for standing facilities and open-market operations correspondingly), Dep is the volume of deposits in the banking system, C_1, C_2, C_3, C_4 are parameters.

The model (1) is reprsented in the linear (with respect to parameters) form. Statistical analysis of the time series iIB, iNB and the derived time series $iMid = (iDep + iOver)/2$, $LiqNA = (iOver - iDep)excNA/Dep$, $LiqA = iNB \cdot excA/Dep$ on the basis of graphical analysis as well as augmented Dickey-Fuller test indicated that the interest rate time series iIB, iNB and $iMid$ and the liquidity imbalance time series $LiqA$ are integrated of order 1, whereas the liquidity imbalance time series $LiqNA$ is stationary. This implies that one needs to account for nonstationarity and possible cointegration in order to estimate the parameters of the model (1).

The straightforward way would be to estimate the model (1) directly, testing the residuals for stationarity using special tets, e.g. Engle-Granger test. The more efficient way, however, would be to estimate the cointegrating relation while allowing for dynamics. That is how we proceed.

Under the assumption of partial correction of past deviations of the interbank interest rate from the equilibrium level, one obtains the usual error correction representation of the model:

$$\begin{aligned}\Delta iIB_t = -\gamma[iIB_{t-1} - C_1 iMid_{t-1} - C_2 iNB_{t-1} - C_3 LiqNA_{t-1} - C_4 LiqA_{t-1}] + \\ +\alpha_1 \Delta iMid_t + \alpha_2 \Delta iNB_t + \alpha_3 \Delta LiqNA_t + \alpha_4 \Delta LiqA_t + \\ +\beta_0 \Delta iIB_{t-1} + \beta_1 \Delta iMid_{t-1} + \beta_2 \Delta iNB_{t-1} + \beta_3 \Delta LiqNA_{t-1} + \beta_4 \Delta LiqA_{t-1}. \qquad (2)\end{aligned}$$

where γ, α_i, β_i are parameters.

Economic theory on the time structure of interest rates suggests that the interest rates time series may be cointegrated in pairs and homogeneous. And indeed, using augmented Dickey-Fuller test we were able to find that the interest rate gap time series $gMid = iIB - iMid$ and $gNB = iIB - iNB$ are stationary. Moreover, we found that the series iIB and $LiqA$ are not cointegrated. These results imply two restrictions in the cointegrating combination: $C1 + C2 = 1$, $C4 = 0$, so the error correction model (2) takes the form:

$$\begin{aligned}\Delta iIB_t = -\gamma C_1[iIB_{t-1} - iMid_{t-1}] - \gamma(1 - C_1)[iIB_{t-1} - iNB_{t-1}] + \\ +\gamma C_3 LiqNA_{t-1} + \alpha_1 \Delta iMid_t + \alpha_2 \Delta iNB_t + \alpha_3 \Delta LiqNA_t + \alpha_4 \Delta LiqA_t + \\ +\beta_0 \Delta iIB_{t-1} + \beta_1 \Delta iMid_{t-1} + \beta_2 \Delta iNB_{t-1} + \beta_3 \Delta LiqNA_{t-1} + \beta_4 \Delta LiqA_{t-1}. \qquad (3)\end{aligned}$$

Note that all the factors on the right side of the model are now stationary, so the model can be correctly estimated using standard econometric methods.

3 Empirical Results and Policy Implications

Using monthly data for the period January 2001 December 2009 (108 observations) the following estimation of the interbank interest rate model (3) was obtained:

$$\begin{aligned}\Delta iIB_t = -0.47_{(0.06)}(iIB_{t-1} - 0.55_{(0.20)} iMid_{t-1} - 0.45_{(0.20)} iNB_{t-1} + \\ +5.9_{(0.5)} LiqNA_{t-1}) + 0.55_{(0.20)} \Delta iMid_t + 0.45_{(0.20)} \Delta iNB_t - 5.9_{(0.5)} \Delta LiqNA_t, \qquad (4)\end{aligned}$$

where the standard errors are provided in the brackets below the corresponding coefficients, conditional heteroscedasticity of the model residuals is allowed for.

The short-run coefficients of the model (4) were restricted to be equal to the long-run coefficients with Wald test not rejecting the restriction at 0.05 significance level. All the estimated coefficients are statistically significant at 0.05 level and have the correct sign. The determination coefficient is equal to 0.75. Autocorrelation of the residuals was not detected at 0.05 level. Thus, one may conclude that the model (4) is statistically adequate. Additional factors, including alternative external and internal factors, appeared to be statistically insignificant.

One can draw a number of conclusions and policy implications from the model (4). First, the crucial role on the interbank market is played by the National Banks operations to compensate the imbalance of the banking system liquidity rather than the imbalance of the banking system liquidity itself. Thus, using open-market operations the National Bank can ensure liquidity balance of the banking system without affecting much the interbank interest rate. On the other hand, if the open-market operations are not conducted or their volume is insufficient, banks would have to turn to the standing facilities to offset the imbalance, which would affect the interest rate.

Second, the interbank interest rate and the National Bank instruments interest rates are homogeneous. This implies that by changing its interest rates the National Bank can change the interbank interest rate accordingly, without the need to provide extra/less liquidity to banks.

Third, as expected, the interbank market is highly dynamic, so that correction to the equilibrium level is done within one month.

References

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