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Paweł Miłobędzki
University of Gdańsk

The Term Structure of the Polish Interbank Rates. A Note on the Symmetry of their Reversion to the Mean[†]

A b s t r a c t. The empirical analysis of the term structure of the Polish interbank rates has revealed that the short and the long rates from the whole spectrum of maturities have evolved almost accordingly to the expectations hypothesis. They have exhibited common stochastic trends, their spreads have had cointegrating properties as well as much predictive power. Of all interest rates considered it is only a 3 month rate that has asymmetrically been reverting to the mean.

K e y w o r d s: term structure of interest rates, expectations hypothesis, asymmetric adjustment, TVECM, Polish interbank market, Warsaw Interbank Offered Rates.

1. Introduction

The Polish interbank market is a place where short and medium term prices of money are decided. These are WIBORs (Warsaw Interbank Offered Rates), the interest rates at which banks-money market dealers lend their vis-à-vis competitors within daily limits amounts in domestic currency for periods ranging from the overnight to 12 months[1]. The WIBORs are used by commercial banks as reference rates for credit and derivatives settlement purposes. They affect the amount of credit and demand in the economy as well as the inflation rate.

The term structure of interest rates is usually explained on the ground of the expectations hypothesis (EH) (theory) originated by Fisher (1886, 1930) and Lutz (1940). It claims that rational expectations about the future short rate

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[1] Regulamin (2004).

formed by market agents is the main driver affecting long rates. If valid, as Cambell and Shiller (1987) demonstrates in their seminal paper on cointegration and present-value models, the short and the long rate are cointegrated, exhibit a common stochastic trend, and their actual spread becomes a good predictor of their changes in the future. Since then a large empirical literature has focused on cointegrating properties of the term structure and on building equilibrium correction models explaining dynamic interactions among interest rates of different maturities[2]. In more recent analyses an asymmetric and nonlinear adjustment towards equilibrium is allowed for due to factors such that as nonzero and asymmetric transaction costs, infrequent trading, and the existence of regime shifts (see Gray, 1996; Anderson, 1997; Enders, Granger, 1998; Bansal, Zhou (2002); Sarno, Thornton, 2003; Clarida et. al., 2006). It is also argued that business cycle expansions and contractions may have statistically and economically important first-order effects on expectations of inflation, monetary policy, and nominal interest rates resulting in the change of entire yield curve (see Clarida et. al., 2006).

There has been relatively little known about cointegrating properties of the interbank rates term structure in Poland. Using weekly sampled data from the period 1995-2003 Konstantinou (2005) proved cointegration within the set of interest rates ranging from one week to 6 months, and their symmetric adjustment towards equilibrium. Blangiewicz and Miłobędzki (2009, 2010) reached the same conclusions on the extended set of WIBORs including 9 and 12 month maturities and the extended sample until the end of 2007. They also found nonlinear reversion to the mean of some maturities which could be attributed to transaction costs (see Blangiewicz, Miłobędzki, 2008).

The purpose of this paper is to test for asymmetric adjustment of WIBORs towards their long run equilibrium relation. Such an adaptation is believed to be a consequence of infrequent trading and poor liquidity in markets for longer maturities, that is exceeding one month. The speed of the process is supposed to depend on maturity and the sign of deviation from equilibrium relation. The analysis is nested within a two variable vector error correction model (VECM) with the error correcting term build upon a threshold autoregressive model (TAR) of Tong (1983), developed by Enders and Granger (1998) and Enders and Siklos (2001). The threshold exhibits a term premium. The estimation and the inference are performed on the monthly sampled WIBORs of 1, 3, 6, 9 and 12 month maturity from the period January 1999-December 2007 with the use of Gauss 9.0 and Stata SE 10[3]. The data is obtained from Thomson Reuters.

[2] See Campbell, Shiller (1991), Hall, Anderson and Granger (1992), and Taylor (1992) to name few commencing this literature.

[3] The series comprised of 108 monthly observations on WIBORs from 1M to 6M and 86 observations on WIBORs 9M and 12M.

The remainder of the paper proceeds as follows. Section 2 is devoted to the EH of the term structure and the way it is tested for using the asymmetric VECM. A strategy aimed towards deriving impulse responses to unit shocks in individual equations of the system is also outlined there as well as a method of evaluating its forecasting properties. The results of testing for validity of the EH and the short run dynamics of interest rates in the Polish interbank market are reported in Section 3. The last Section briefly concludes.

2. EH of the Term Structure and its Testing for within the Asymmetric VECM

Let $P_t^{(n)}$ be the price at time t of a bond with the face value of Pln 1 that matures in n periods. According to the EH the expected one period return from holding this bond is equal to the actual rate of return on one period bond (short rate), $R_t^{(1)}$, increased by the term premium, $\theta_t^{(n)}$ (Tzavalis, Wickens, 1998; Cuthbertson, Nietzsche 2003), i.e.

$$E_t h_{t+1}^{(n)} = E_t\left[\ln P_{t+1}^{(n-1)} - \ln P_t^{(n)}\right] = R_t^{(1)} + \theta_t^{(n)}, \tag{1}$$

where E_t – expectations operator conditional on information available at time t. In case interest rates are continuously compounded, $\ln P_t^{(n)} = -nR_t^{(n)}$, where $R_t^{(n)}$ – actual rate from holding n-period bond (long rate), and

$$E_t\left[h_{t+1}^{(n)}\right] = E_t\left[nR_t^{(n)} - (n-1)R_{t+1}^{(n-1)}\right] = \frac{1}{n-1}\left[R_t^{(n)} - R_t^{(1)}\right] + \frac{1}{n-1}\theta_t^{(n)}. \tag{2}$$

Solving equation (2) forwards yields

$$R_t^{(n)} = \frac{1}{n}\sum_{i=0}^{n-1} E_t R_{t+i}^{(1)} + \Theta_t^{(n)}. \tag{3}$$

The long rate is the average of expected one period interest rates over n periods increased by a rolling over term premium, $\Theta_t^{(n)} = (1/n)\sum_{i=0}^{n-1} E_t\theta_{t+i}^{(n-i)}$.

Subtracting the short rate, $R_t^{(1)}$, from both sides of equation (3) after some manipulation results in

$$S_t^{(n,1)} = E_t\sum_{i=1}^{n-1}\left(1-\frac{i}{n}\right)\Delta R_{t+i}^{(1)} + \Theta_t^{(n)}, \tag{4}$$

which indicates that the actual spread, $S_t^{(n,1)} = R_t^{(n)} - R_t^{(1)}$, should equal the optimal forecast of a change in future short rates (perfect foresight spread, PFS) and the rolling over term premium, conditional on information available at time t.

Now that the future short rates are integrated of order one variables, and the rolling over term premium is stationary, stationary is the actual spread, and the short and the long rate are cointegrated exhibiting a common stochastic trend. In case the term premium is not time-varying $\left(\Theta_t^{(n)} = \Theta^{(n)}\right)$, the cointegrating vector becomes $\left[1 \quad -1 \quad \Theta^{(n)}\right]'$. Additionally, if the adjustment of the long and the short rate to their long run equilibrium relation is asymmetric, under the Granger representation theorem their short run behaviour is to be modelled using a two variable asymmetric VECM (Enders, Siklos, 2001)

$$\Delta R_t^{(i)} = \mu_i + \rho_{i1} I_t^{(n)} \left[S_{t-1}^{(n,1)} - \Theta^{(n)} \right] + \rho_{i2} \left[1 - I_t^{(n)} \right] \left[S_{t-1}^{(n,1)} - \Theta^{(n)} \right] + \ldots$$

$$\ldots + \sum_{j=1}^{p-1} \alpha_{nj}^i \Delta R_{t-j}^{(n)} + \sum_{j=1}^{p-1} \beta_{1j}^i \Delta R_{t-j}^{(1)} + \xi_{it}, \tag{5}$$

where: $I_t^{(n)} = 1 \Leftrightarrow S_{t-1}^{(n,1)} \geq \Theta^{(n)}$, $I_t^{(n)} = 0 \Leftrightarrow S_{t-1}^{(n,1)} < \Theta^{(n)}$, $\mu_i, \alpha_{nj}^i, \beta_{1j}^i$ – structural parameters, ρ_{ik} – parameters exhibiting the size of correction caused by the short and long rate deviations from their long run equilibrium relation, ξ_{it} – random disturbances ($t = 1, 2, \ldots, T; i = 1, 2, \ldots, n; k = 1, 2$).

The estimation of model (5) sets off with testing for the order of interest rates integration. Then a two step procedure invented by Engle and Granger (1987), and developed by Enders and Granger (1998) is run.

In the first step the actual spread, $S_t^{(n,1)}$, is regressed on a constant, $\theta^{(n)}$, using the OLS and a sequence of regression residuals, $\left\{\hat{\eta}_t^{(n)}\right\}$, is saved. The stationarity of the spread is decided upon the auxiliary regression

$$\Delta \hat{\eta}_t^{(n)} = I_{t-1}^{(n)} \rho_1^{(n)} \hat{\eta}_{t-1}^{(n)} + \left[1 - I_{t-1}^{(n)} \right] \rho_2^{(n)} \hat{\eta}_{t-1}^{(n)} + \upsilon_t^{(n)}, \tag{6}$$

where: $\upsilon_t^{(n)}$ – white noise error independent of $\eta_t^{(n)}$ for $k < t$, in which its right hand side is eventually supplemented with the lags of $\Delta \hat{\eta}_t^{(n)}$ to remove autocorrelation when needed[4]. Critical values of the relevant test statistics are taken from Enders and Granger (1998), Enders (2001), and Enders and Siklos (2001). In case the null of spread nostationarity is rejected, the symmetry of the long

[4] In case both the short and the long interest rate asymmetrically adjust to their long run equilibrium relation the sample mean is a biased estimator of the threshold. In order to circumvent the problem when running (6) the Chan method is employed, who proved that taking as a threshold its value that minimizes the sum of residual squares $\hat{\upsilon}_t^2$ results in superconsistency of the estimator (Chan, 1993). The threshold estimate is admitted from the sequence of middle 70 per cent residuals $\hat{\eta}_t$ stacked in the ascending order (Enders, 2001; Enders, Siklos, 2001).

and the short rate adjustment to their long run equilibrium relation is tested for ($\rho_1^{(n)} = \rho_2^{(n)}$)[5].

In the second step a consistent estimate of the threshold (rolling-over term premium), $\Theta^{(n)}$, is used to determine the sign of indicator $I_t^{(n)}$ and model (5) is estimated by the OLS. Then the causality in Granger sense within the interest rates is revealed through testing for the significance of zero restrictions set on parameters α_{nj}^i and β_{1j}^i.

In order to derive impulse responses to one standard error shock in individual equations their specificity in nonlinear models are taken into account (Koop, Pesaran, Potter, 1996). These are generalized impulse responses obtained perturbing the system at time $t = T$[6][7]. Then using a sequential substitution the long and the short rate levels are computed from the VECM and for each $T + l$ ($l = 1, 2, \ldots, s$) the sign of their deviation from the long run equilibrium relation is established indicating which of the adjustment parameters should be used in the next substitution. The impulse responses are estimated subtracting the individual rates observed at time $t = T$ from their calculated levels for time $T + i$.

The analysis is concluded with computing 3 types of interest rates dynamic forecasts for $(n,1)$ pairs of maturities: skeleton, bootstrap and from a Monte Carlo simulation[8].

Skeleton (naïve) forecasts are directly calculated from the VECM with an asymmetric error correcting term.

Bootstrap forecasts are arrived to by adding to dynamic forecasts residuals from the bootstrapped matrix of residuals of the estimated VECM, specific for the periods of positive and negative deviations of the long and the short rate from their long run equilibrium relation.

Monte Carlo forecasts differ from the bootstrap ones in that the residuals for both deviation regimes are drawn from a bivariate normal with a covariance matrix separately estimated in each regime.

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[5] In such circumstances the OLS estimators of $\rho_1^{(n)}$ and $\rho_2^{(n)}$ are jointly normally distributed, see Tong (1983).

[6] Orthogonalized impulse responses depend on the variables ordering in the VAR system (Pesaran, Pesaran, 1997).

[7] In models that allow for an asymmetric adjustment of variables to their long run equilibrium relation a parameter exhibiting the speed of adjustment at time $t + l$ (for which the response of the system is computed) depends on variables at time $t + l - 1$ so that for different t (time a shock hits the system) different impulse responses for $t+1, t+2, \ldots, t+l$ are obtained (Koop, Pesaran, Potter, 1996).

[8] Techniques of calculating forecasts using asymmetric models are extensively reviewed in Clements, Smith (1997), and De Gooijer, Vidiella-i-Anguera (2004).

All the forecasts are then compared to that obtained from the linear VECM with the use of such *ex-post* accuracy measures as the bias, RMSE and the averaged coefficient of variability[9].

3. Empirical Results

The WIBOR 1M-12M and their spread series are displayed in Figures 1 and 2 (see Appendix). Contrary to the spreads the WIBORs rarely pass through their mean levels which suggests they are not stationary. Such a supposition is enhanced by the results of the DF/ADF, DF-GLS and KPSS tests (see Dickey, Fuller, 1981; Hobijn, Franses, Ooms, 1998; and Kwiatkowski, Phillips, Schmidt, Shin, 1992)[10].

The estimates of the Enders-Granger test statistics F gathered in Table 1 (see Appendix) are supportive for stationarity of the spreads $S_t^{(n,1)}$ for $n = 3,6,9,12$ months. Accompanying them estimates of the χ^2 test statistics stand for symmetry of the long and the short rate adjustment to their long run equilibrium relation for all pairs of maturities but the $(12,1)$ month pair.

The rolling over term premia $\Theta^{(n)}$ for all pairs of maturities except for the $(6,1)$ month pair monotonically increase not exceeding 0.8 per cent, however.

The above findings are used in estimation of model (5). Its results with the results of symmetric VECM estimation are stacked in Table 2 (see Appendix). They indicate the following conclusions:

a) in view of the Akaike (AIC) and the Schwarz-Bayesian (SBC) information criteria for the system of equations a symmetric VECM is to be used in modelling the long and the short rate behaviour for all pairs of maturities except that of the $(3,1)$ month pair;
b) for the latter an asymmetric adjustment to the long run equilibrium relation should be accounted for since the estimate of the Wald test statistics under the null of symmetric adjustment distributed as $\chi^2(1)$ variable equals 15.3676 and exceeds its critical value at the 5 per cent significance level; both rates more strongly react to negative than to positive deviations from the long run equilibrium relation[11];
c) the short rate series ($n = 1$, equation II) for all pairs of maturities except the $(6,1)$ month pair exhibits ARCH effects up to the 6th order;

[9] This equals a square root of the Theil coefficient multiplied by 100.
[10] The results of relevant procedures are available on request to concerned readers.
[11] The results of relevant procedure are available on request.

d) the short rate Granger causes the long rate only in the $(3,1)$ month pair; the reverse also holds in the $(3,1)$ and $(6,1)$ month pairs.

Inspection of Figures 3 and 4 right panels in which the generalized impulse responses to one standard error shock in the long and the short rate equations of the asymmetric VECM for the $(3,1)$ month pair is displayed indicate that the rates behave almost accordingly to the EH of the term structure. They fall (rise) in the future in reaction to an increase in actual short (long) rate[12]. Additionally, their response to unit shocks in long rates is stronger than a response to the same shocks in short rates. Similar behaviour for the other pairs of maturities concerned is revealed on the ground of symmetric VECM.

Table 3 contains the results of 3 and 6 month long and short rate forecasts accuracy evaluation (equations I and II, respectively) obtained from the symmetric and asymmetric VECMs with the skeleton (SK) and bootstrap (BS) methods, as well as using the Monte Carlo simulation (MC). The relevant forecasts for WIBOR 1M and 3M are displayed in Figure 5.

The estimates of the classical *ex-post* accuracy measures for single variables (bias, RMSE, averaged coefficient of variability) prove that the 3 month forecasts of WIBOR 1M and 3M are more precise when asymmetry of the correction term is accounted for. For all other pairs of WIBORs the more precise forecasts are those from the symmetric VECM. On the other hand the asymmetric system produces more accurate 6 month forecasts for WIBOR 1M, 3M and 6M. Of all forecasting methods used in that case the naïve method should be preferred.

4. Conclusions

The analysis of the Polish interbank term structure has revealed that the long and the short rates from the whole spectrum of maturities have evolved almost accordingly to the EH. They have exhibited common stochastic trends, and their spreads have had cointegrating properties as well as much predictive power.

The rates from the shorter end of the term structure (1 and 3 month WIBORs) asymmetrically adjusts to their long run equilibrium relation and more strongly react to negative than to positive deviations from the equilibrium relation. The adjustment of rates from the longer end of the term structure (6, 9 and 12 month WIBORs) has been symmetric, however.

For all maturities considered in the paper an increase in the actual short (long) rate has resulted in a fall (rise) in the future long and short rates preceded by their temporary slight increases. Both interest rates have more strongly reacted to shocks in long rates than to shocks in short rates.

[12] The future fall of both rates is preceded by their temporary slight increase. Distortions resulted form an increase in the actual long rate are only transitory.

The most accurate of all 3 month forecasts from the asymmetric VECM have been those for WIBOR 1M and 3M. The same for 6 month forecasts has held for WIBOR 1M, 3M and 6M. The naïve method of forecasting has been found the most accurate when asymmetry has been accounted for. In all other cases the superior forecasts have been obtained from the symmetric system.

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Struktura terminowa stóp procentowych na rynku depozytów międzybankowych w Polsce. Uwagi o symetrii powrotu stóp do średniej

Z a r y s t r e ś c i. Wyniki empiryczne badania nad strukturą terminową stóp procentowych na rynku międzybankowym w Polsce upoważniają do stwierdzenia, że stopy krótka i długa dla wszystkich rozważanych par stóp WIBOR zmieniały się w zasadzie zgodnie z przewidywaniami wynikającymi z hipotezy (teorii) oczekiwań struktury terminowej. Stopy te znajdowały się w długookresowej równowadze, a ich spredy wykazywały własności kointegrujące i prognostyczne. Spośród rozważanych stóp procentowych tylko 3-miesięczna stopa WIBOR odchylała się asymetrycznie od relacji równowagi długookresowej ze stopą miesięczną.

S ł o w a k l u c z o w e: struktura terminowa stóp procentowych, hipoteza oczekiwań, asymetria dostosowania, model TVECM, polski rynek depozytów międzybankowych, stopy referencyjne WIBOR.

Appendix

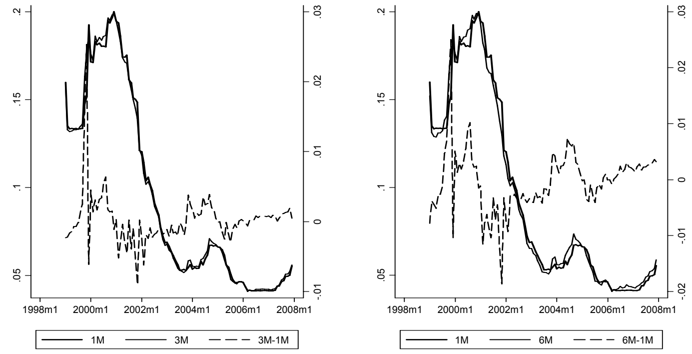

Figure 1. WIBOR 1M, 3M, 6M (left panel) and their spreads (right panel)

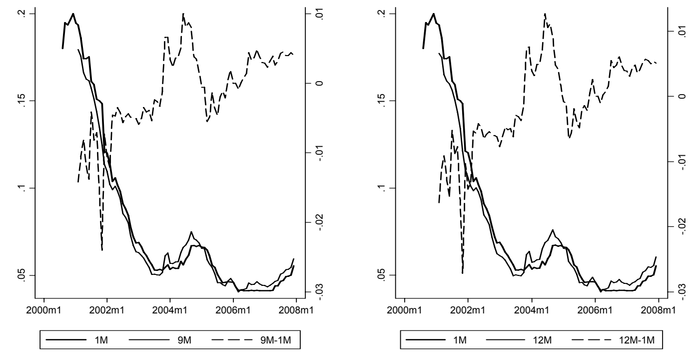

Figure 2. WIBOR 1M, 9M, 12M (left panel) and their spreads (right panel)

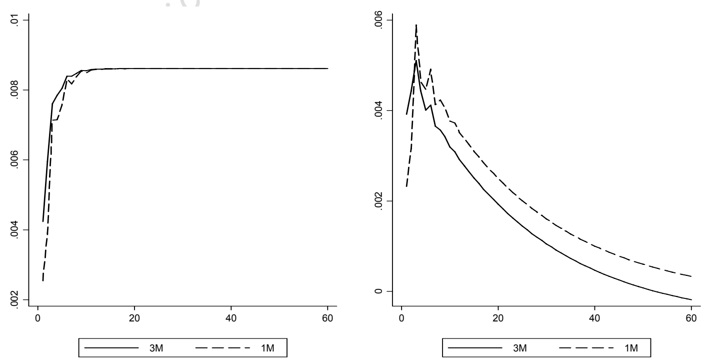

Figure 3. Generalized impulse responses to one SE shock in the equation for WIBOR 3M, symmetric (left panel) and asymmetric (right panel) VECM

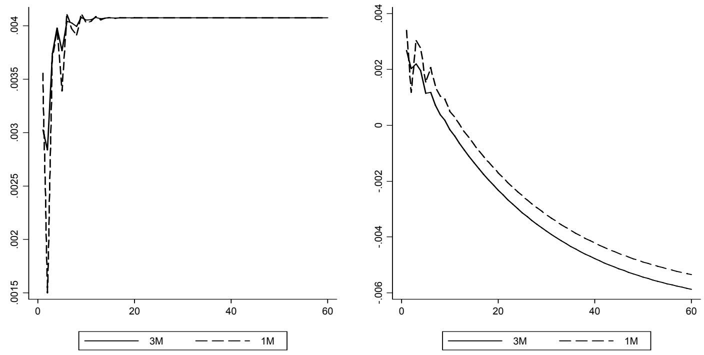

Figure 4. Generalized impulse responses to one SE shock in the equation for WIBOR 1M, symmetric (left panel) and asymmetric (right panel) VECM

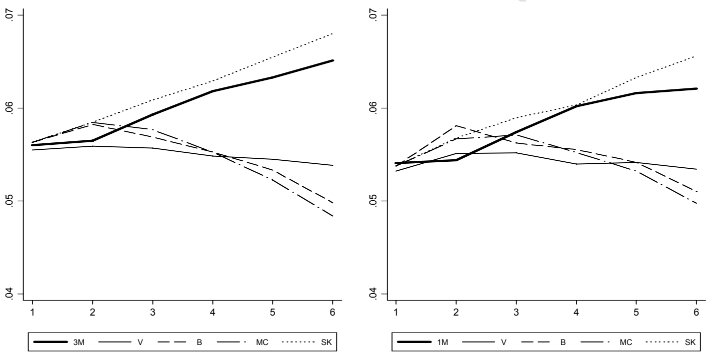

Figure 5. WIBOR 3M (left panel) and 1M (right panel) forecasts

Table 1. Testing for the unit roots and stationarity results

n,1	k	F	χ^2	Premia	AIC	SBC	Auto(12)
3,1	0	22.9530	0.6095	0.0020	455.0690	452.3961	8.2504
6,1	0	14.5028	1.5892	-0.0032	427.9093	425.2365	16.6340
9,1	0	5.6835	2.0762	0.0044	356.0740	353.6673	19.5290
12,1	0	6.0330	3.7919	0.0077	349.8999	347.4932	13.2154

Note: critical values of the Enders-Granger F test statistics: $F_{0,05} = 6.06$ i $F_{0,1} = 5.08$ ($n = 100$, augmentation lag $k = 0$), see Enders (2001), table 1; critical values $\chi^2_{0,05}(1) = 3.84$, $\chi^2_{0,1}(1) = 2.71$, $\chi^2_{0,05}(12) = 21.03$ and $\chi^2_{0,1}(12) = 18.55$; figures in bold – significant at 5 per cent significance level.

Table 2. VECM characteristics

VECM		Symmetric				Asymmetric			
Spread	n,1	3,1	6,1	9,1	12,1	3,1	6,1	9,1	12,1
VAR	p	3	3	2	3	3	3	2	3
Premium		0.0020	-0.0032	0.0044	0.0077	0.0020	-0.0032	0.0044	0.0077
LL		913.7194	895.3376	733.6827	727.9086	921.9183	895.7053	735.5292	728.2486
AIC		901.7194	883.3376	725.6827	715.9086	907.9183	881.7053	725.5292	714.2486
SBC		885.7957	867.4138	716.1049	701.6164	889.3406	863.1276	713.5570	697.5744
Eq. I	Auto(12)	15.2002	11.3809	9.2423	9.4160	8.4437	12.2696	9.1595	9.3133
	ARCH(6)	5.0013	10.597	3.2595	1.5550	2.2492	9.9950	2.4594	1.5245
	White	1.2182	1.2875	0.0337	0.0128	0.0032	0.9252	0.1353	0.0212
	Gr(1→ n)	2.2356	3.7273	0.0678	2.3001	6.8516	3.7996	0.0920	2.1442
Eq. II	Auto(12)	18.0500	11.5812	21.9080	19.4457	16.1170	12.3787	19.8230	20.1374
	ARCH(6)	**16.5860**	4.4306	**17.2500**	**18.5720**	**24.936**	5.7743	**19.3310**	**19.1430**
	White	2.0680	**48.0549**	**60.1729**	**48.5513**	9.3210	**50.3650**	**57.0261**	**45.0059**
	Gr(n →1)	7.6325	7.1378	0.0094	0.8757	7.6806	7.5256	0.0496	0.7336
Wald		×	×	×	×	**15.6376**	0.1197	2.9484	1.0239

Note: n,1 – model; p – augmentation lag in the VAR; LL, AIC, SBC – loglikelihood function, Akaike and Schwarz-Bayesian information criteria for the system of equations, Auto(r), ARCH(r) – LM test statistics for autocorrelation of order r and ARCH effects of order r [distributed as $\chi^2(r)$]; White – White test statistics for heteroscedasticity; Gr – Wald test statistics for Granger casualty, [distributed as $\chi^2(p-1)$], (1→ n) – casualty direction; Wald – Wald test statistics for the equality of the effects in the short (long) rate change caused by a positive and a negative deviation from the long run equilibrium relation [distributed as $\chi^2(1)$]; figures in bold – significant at the 5 per cent significance level.

Table 3. VECM and TVECM forecasting properties

Horizon	Eq.	Measure	Forecast							
			VECM				SK			
			Symmetric				Asymmetric			
			n,1							
			3	6	9	12	3	6	9	12
3 month	I	Bias	0.0016	-0.0008	-0.0013	-0.0018	-0.0013	-0.0009	-0.0018	-0.0020
		RMSE	0.0021	0.0016	0.0019	0.0023	0.0015	0.0016	0.0023	0.0025
		Theil%	3.7071	2.6723	3.1592	3.7803	2.5659	2.7028	3.7253	4.0270
	II	Bias	0.0008	-0.0029	-0.0022	-0.0017	-0.0012	-0.0029	-0.0026	-0.0019
		RMSE	0.0014	0.0031	0.0024	0.0018	0.0017	0.0031	0.0027	0.0020
		Theil%	2.5801	5.6064	4.3343	3.1762	2.9835	5.6235	4.8957	3.5692
6 month	I	Bias	0.0053	0.0012	0.0000	-0.0009	-0.0017	0.0010	-0.0012	-0.0013
		RMSE	0.0067	0.0026	0.0017	0.0017	0.0019	0.0024	0.0017	0.0018
		Theil%	11.0278	4.0888	2.6446	2.6053	3.0873	3.8695	2.6213	2.8478
	II	Bias	0.0041	-0.0011	-0.0010	-0.0007	-0.0015	-0.0011	-0.0019	-0.0010
		RMSE	0.0054	0.0023	0.0017	0.0013	0.0020	0.0023	0.0021	0.0014
		Theil%	9.2737	3.9013	2.9314	2.2079	3.3760	3.8828	3.5613	2.4384

Horizon	Eq.	Measure	Forecast							
			BS				MC			
			Asymmetric				Asymmetric			
			n,1							
			3	6	9	12	3	6	9	12
3 month	I	Bias	0.0002	-0.0009	-0.0021	-0.0020	-0.0003	-0.0008	-0.0016	-0.0019
		RMSE	0.0018	0.0017	0.0026	0.0024	0.0015	0.0017	0.0022	0.0024
		Theil%	3.0835	2.7506	4.1986	3.9246	2.5782	2.7741	3.6667	3.9273
	II	Bias	-0.0007	-0.0030	-0.0029	-0.0017	-0.0007	-0.0029	-0.0025	-0.0019
		RMSE	0.0023	0.0032	0.0030	0.0018	0.0015	0.0032	0.0026	0.0019
		Theil%	4.1007	5.8747	5.4715	3.2447	2.7404	5.7742	4.7411	3.4756
6 month	I	Bias	0.0054	0.0017	-0.0006	-0.0013	0.0056	0.0013	0.0009	-0.0090
		RMSE	0.0080	0.0031	0.0019	0.0019	0.0087	0.0027	0.0029	0.0017
		Theil%	13.2492	5.0045	3.0199	2.8867	14.3740	4.3632	4.6220	2.7236
	II	Bias	0.0035	-0.0009	-0.0015	-0.0009	0.0040	0.0010	-0.0004	-0.0007
		RMSE	0.0060	0.0025	0.0021	0.0015	0.0065	0.0023	0.0022	0.0014
		Theil%	10.2472	4.2593	3.6060	2.5310	11.1190	3.9580	3.7323	2.3826