TREASURY’S 3-MONTH BORROWING RATE

Analysis of the Demand Pressures

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1. INTRODUCTION

This study aims to inquire the factors affecting the Treasury’s (3-month) borrowing rate with an emphasis on the demand, particularly the banks’ demand for the Treasury bills (T-bills), and to determine a constant parameter equation for the borrowing rate.

Almost all of the Treasury’s borrowing, in Turkey, before September 1992, was through the auction market, in which the commercial banks were the major participants. Starting from September 1992, Treasury has also been borrowing from the public, in addition to auctioning, and the auction rate have played an indicative role for the Treasury's rate offer for the direct sales to the public. Because of the crucial role of the auction rate, the commercial banks’ behavior is considered to be prominent in determination of the Treasury’s borrowing rate.

The analysis of the Treasury’s borrowing rate with reference to the demand only is misleading when the amount of the Treasury’s borrowing is endogenous, and the supply of T-bills is a function of the borrowing rate. If this is the case, the borrowing rate would be determined by the interaction of the demand and supply for the T-bills. Therefore, modelling supply and the demand interactions in a larger model, comprising the Treasury’s financing policies and the demand side pressures together is necessary in order for a valid inference about the dynamics of the borrowing rate. In this respect, this study is not conclusive but a preliminary for a more comprehensive analysis. However, its findings are still considered to provide useful insight for the policy authority into the market pressures on the borrowing rate.

Organization of the paper is as follows: The model is explained in the following section. The estimation results are presented in section 3. Exogeneity test results are presented in section 4, and the adequateness of the estimated equation for alternative uses are evaluated on the basis of those test results. Implications of the estimated equation for the dynamics of the borrowing rate are discussed in section 5. Finally, the results are summarized in section 6.

2. MODEL

The commercial banks' demand for the government borrowing papers was analysed in Gürgenci (1993) in a short-run profit maximization framework under uncertainty. The banks' demand for the government papers derived from the optimization problem was positively related to the expected amount of the bank resources available for the purchases of the government papers, and the returns to those papers, while it is negatively related to the overnight borrowing rate from the interbank market, and the returns to the alternative uses of the available bank resources. Since, in Gürgenci (1993), only the resources and the usages denominated in Turkish lira were taken into account, the banks' foreign exchange operations were only effective indirectly through the changes in returns and costs of those operations. Any increase in the cost of holding open position results in a decrease in the demand for government papers or increases the rate bidded by the banks. On the basis of these findings, the 3-month T-bill rate bidded by the banks can be represented by the following functional relationship, provided that their T-bill demand is invertible:

(+) (-) (+) (+)

(1) BONF3 = f(RBONSTO, RRES, INTF, ALTRET)

where BONF3 is the 3-month T-bill auction rate, RRES is the real value of the bank resources denominated in Turkish lira, and RBONSTO is the real value of the banks' T-bill portfolio, INTF is the overnight borrowing rate from the interbank, ALTRET is the returns to the banks' earning assets which are alternative to the T-bills. The signs over the variables are the signs of the partial derivatives with respect to the related variables.

3. METHOD AND THE ESTIMATION RESULTS

By assuming linearity, the functional relationship in (1) can be represented by the following VAR system:

where Y= BONF3, RTD, INTF, RBONST, REX, CPI. ε is the vector of random disturbances to the system equations, $\varepsilon \sim N(0, \Omega)$. RTD is the real value of the time deposits, REX is the real exchange rate, defined as the Turkish lira per US dollar, CPI is the consumer price index, other variables are as defined in section 2. Real variables are deflated by the consumer price index. All variables, except for the interest rates are in logarithms.

Price homogeneity is not imposed in the estimation. Hence, CPI is included in (2), in addition to the variables included in (1). There is no a priori sign restriction on its coefficient. Real value of the time deposits, RTD, is used as a proxy for the bank resources available for the purchases of the T-bills. Its coefficient is expected to be negative according to the model in section 2. The real exchange rate is included for two reasons: First, it is effective on the long-run money market conditions, and hence on the determination of the long-run interest rates. Second, provided that the depreciation expectations are based on the past changes of the (real) exchange rate, including the real exchange rate in the model enables us to capture the expected changes in the returns to the foreign exchange holdings. The sign of the coefficient of the real exchange rate is ambiguous. By monetary theory, the higher is the real exchange rate, the higher the income is. Thus, other things being equal there is an excess demand for money and excess supply of bonds. So, higher interest rate is required for the equilibrium in money market. However, according to the portfolio approach, which assumes that assets denominated in foreign exchange (FX-assets) are alternatives to the assets denominated in Turkish lira, i.e the correlation between the borrowing rate and the real exchange rate is negative: The higher is the real exchange rate, the higher the value of the FX-assets in terms of domestic currency. Thus there is an excess demand for assets denominated in Turkish lira, and excess supply of FX-assets. Therefore, other things being equal, lower interest rate is required for the portfolio equilibrium.

In the following, a constant parameter error-correction equation for the T-bill rate is derived from the system (2) by general to specific methodology. First, order of integration of the series are examined in section 3.a. Then, cointegration relations among the I(1) series are tested, and a conditional error correction equation is derived by sequential reduction in section 3.b. Monthly data over 1987/6-1993/12 is used for the estimations, and the forecasts are over 1994/1-1995/8.

3.a. Order of Integration of the Series

Unit root tests for the the variables of the system (2) is presented in Table 1. For each series, the deterministic components to be included in the unit roots tests were determined by utilizing Dickey and Fuller’s (1983) likelihood ratio tests, Φ 2 and Φ 3, which are also presented in Table 1.

For all of the series in the system (2), except for the interbank overnight borrowing rate, the unit root test statistics are highly significant at 5 percent. So, unit root hypotheses for those variables are accepted at higher than 5 percent significance levels. However, for the overnight rate, the unit root hypothesis can only be marginally accepted at 5 percent significance (Table 1). The first differences of all the series are stationary, indicating that they are integrated of order one, I(1).

TABLE 1

Unit Root Tests(*)

AR-χ (2) Φ 3 Φ 2 AR-χ (2) τ μ

BONF3 (0,0) 0.34 (0.846) 2.81 4.82 0.74 (0.690) -1.43

RBONST (0,0) 0.62 (0.732) 2.22 6.43 0.61 (0.736) -1.31

RTD (1,1) 1.49 (0.475) 1.80 15.24 1.37 (0.504) -1.44

INTF (0,0) 1.53 (0.465) 5.53 8.06 2.46 (0.292) -2.93

REX (1,1) 2.67 (0.263) 1.03 15.31 2.31 (0.315) -1.22

CPI (1,1) 2.16 (0.340) 4.47 51.39 4.98 (0.080) -0.12

(*) 11 centered seasonal dummies are included in all the equations. The numbers in parantheses next to the variables are the number of their lagged differences included in the (augmented) model with and without a trend respectively. AR-χ (2) is Chi-square test statistic for second order autocorrelation tests of the residuals of those models, and the number in parantheses are the corresponding probabilities of Chi-square distribution.

Φ 3 and Φ 2 are the LR-test statistics of Dickey and Fuller (1983), and τ μ is Dickey and Fuller's (1976) unit root test statistic when a constant is included in the model. Their critical values at 95% significance level are:

Sample Φ 3 Φ 2 τ μ

50 6.73 5.13 -2.93

100 6.49 4.88 -2.89

3.b. Cointegration Analysis and the Conditional Error Correction Equation

Since all the variables of the system (2) are I(1), there might appear stationary combinations of them which correspond to the long-run equilibrium relations among those variables. In this section, first the cointegration among the variables is tested by Johansen’s ML-procedure, and then a conditional error correction equation is estimated by general to specific methodology. Due to the possible misspecification of (2), in the final analysis, T-bill stock is omitted from the system.

Cointegration test results, and the conditional error correction equation estimation results for the six variable system in (2) are presented in Table 2. According to the trace-criteria, there are three significant cointegration vectors. Of those, only the signs of the coefficients of the third are compatible with the underlying banks’ demand model, which is summarized in section 2, while those of the second is compatible with a more general demand model comprising the households and the firms in addition to the banks. However, in the first cointegration vector, the coefficient of the T-bill stock is negative contrary to a demand model, which might reflect Treasury’s control over the borrowing rate, by controlling the amount of the new issues. Hence, the third, and probably the second cointegration vectors might represent the relevant long run relationships for a demand analysis. The first cointegration vector, though it is the most likely long run relation given the observed data, should be interpreted with caution in a demand analysis.

The adjustment coefficients of all the variables of the six variable VAR system are significantly different from zero. So, a full system analysis is required for efficient inference about the cointegration relations. However, the difficulty is with the estimation of the long run parameters only, and once β is estimated from the full system, one can go through the single equation estimation, by keeping β fixed and utilizing the usual inference procedures.

The conditional error correction equation (3) in Table 2 is derived by general to specific methodology, starting from the general model, comprising the first lags of the cointegration errors estimated by Johansen's ML procedure, and the current values and four lags of the first differences of the six variables. Its residuals are normally distributed, and do not display systematic movements such as autocorrelation, heteroscedasticity in the form of ARCH or in squares of the dependent variable. However, the one-step Chow tests (Graph 2) and recursive estimates of some of the coefficients indicate parameter non-constancy.

Both the non-constancies in the parameters of the error correction equation (3) and the sign reversals in the first cointegration relation might be an indication of a possible misspecification arising from the omission of the Treasury's behavior who is able to gain control over the borrowing rate for certain periods through controlling the amount of the new issues. In other words, the variations of the T-bills stock seem to provide information about the supply rather than the demand for the T-bills. Thus, including the T-bill stock in the demand analysis might reduce the efficiency of the estimates, even though its inclusion increases the explanatory power of the regression by extending the information set. By this consideration, T-bill stock is omitted from the system in order to provide parameter constancy, and hence to increase the reliability of the inference about the dynamics of the borrowing rate.

TABLE 2

Cointegration Tests, Cointegration and Adjustment Vectors

for the Six Order, Six Variable VAR System

Variables: BONF3, RBONST, INTF, RTD, CPI, REX

Deterministic Components: Unrestricted Constant

Sample: 87/6-93/12

Cointegration Tests

λ 0.598 0.479 0.378 0.183 0.081 0.003

Max-λ 66.61 47.57 34.71 14.73 6.14 0.235

Trace 170.00 103.39 55.82 21.10 6.37 0.235

Cointegration Vectors Adjustment Vectors

β 1 β 2 β 3 α 1 α 2 α 3

BONF3 1.000 1.000 1.000 -0.140 -0.157 -0.029

RBONST 0.041 -0.128 -0.171 -0.532 0.002 1.236

INTF -1.199 -0.489 -0.859 -0.152 1.019 0.807

RTD -1.320 -0.679 0.223 -0.077 0.148 -0.086

CPI 0.294 -0.224 -0.147 0.056 -0.100 0.033

REX 1.360 -0.696 -0.415 -0.044 0.321 -0.148

Residual Diagnostic Tests

BP-Q (12) ARCH(7) J-B NORM.

BONF3 22.396 12.893 1.887

RBONST 22.116 5.632 3.249

INTF 12.073 8.431 3.107

RTD 8.024 7.696 0.469

CPI 19.857 3.479 2.236

REX 8.635 4.251 0.638

Conditional Error Correction Equation for the 3-month Borrowing Rate(*)

(3) Δ BONF3t = -1.641 -0.051 ECM1t-1 -0.250 ECM2t-1 -0.155 ECM3t-3

(-5.832) (-3.624) (-4.646) (-3.961)

+ 0.193 Δ INTFt -0.109 Δ INTFt-2 -0.457 (Δ LREXt-1-Δ LREXt-4)

(5.516) (-3.244) (-3.540)

-0.052 (Δ LRMBONSTt-1+Δ LRMBONSTt-2) + 0.611 Δ LRTDt

(-3.016) (3.611)

-0.725 Δ LRTDt-1 - 0.391 Δ LRTDt-4 + 0.479 Δ BONF3t-1

(-4.298) (-2.575) (5.043)

+ 0.844 (Δ LCPIt - Δ LCPIt-1) + 0.618 Δ LCPIt-2 + 0.413 Δ LCPIt-4

(3.914) (3.898) (1.937)

Sample 88/1-93/12

R2 =0.700 DW = 2.30 Mean of Dep.= 0.004

SD-Dep.Var.= 0.041 SE-Reg. = 0.025

AUTOCOR-F(5,52) =1.434 (0.228) RESET-F(1, 59) = 0.279 (0.599)

NORM-χ 2 = 0.840 (0.657) ARCH-F(5, 47) = 0.428 (0.827)

(*) t-statistics of the regression coefficients, and the probability values of the test statistics are in parantheses.

Cointegration test results for the five variable system excluding the T-bill stock in banks' portfolios are presented in Table 3. For this system, desirable properties of the residuals are obtained at the seventh lag, at which there are two cointegration relations. All the cointegration coefficients are plausible for a T-bill demand equation. Only two of the adjustment coefficients, namely the adjustment coefficients related to the borrowing rate and the real exchange rate are significantly different from zero, indicating that the real value of time deposits, the interbank overnight borrowing rate, and the consumer prices are weakly exogenous for the long run parameters of interest. The estimated cointegration and adjustment vectors under weak exogeneity restrictions for those variables are also presented in Table 3, following the unrestricted estimates.

TABLE 3

Cointegration Tests, Cointegration and Adjustment Vectors

for the Seventh Order, Five Variable VAR System

Variables: BONF3, INTF, RTD, CPI, REX

Deterministic: Constant

Sample 86/7-93/12

Cointegration Tests

λ	0.422	0.279	0.192	0.136	0.006
Max-λ	39.50	23.59	15.33	10.54	0.46
Trace	89.43	49.93	26.33	11.00	0.46

Cointegration Vectors

	β 1	β 2	β 3	β 4	β 5
BONF3	1.000	1.000	1.000	1.000	1.000
INTF	-0.494	-1.485	-3.539	2.242	-0.331
RTD	-1.440	-0.183	-1.358	0.366	0.769
CPI	-0.178	-0.127	-0.814	-1.089	-0.202
REX	-0.571	-0.427	-4.283	-1.876	-0.647

Adjustment Vectors

	α 1	α 2	α 3	α 4	α 5
BONF3	-0.188	-0.095	0.046	0.014	0.010
INTF	0.287	0.216	0.204	0.000	0.038
RTD	0.053	0.001	-0.010	0.014	-0.025
CPI	-0.040	0.035	-0.007	0.000	0.022
REX	0.199	0.095	0.024	0.002	-0.008

Residual Diagnostic Tests

BP-Q (11) ARCH(7) J-B NORM.

BONF3 23.923 7.003 0.593

INTF 6.537 10.517 5.169

RTD 7.252 5.930 0.776

CPI 14.793 4.459 1.266

REX 12.135 3.163 4.042

Cointegration and the Adjustment Vectors provided that

INTF, RTD, AND CPI are Weakly Exogenous

β 1 β 2 α 1 α 2

BONF3 1.000 1.000 -0.221 -0.153

REX -0.389 -0.173 0.128 -0.079

INTF -0.315 -1.500

RTD -1.491 -0.191

CPI -0.144 -0.061

The following error correction equation is reached by sequential reduction from the general model in Table 4, which includes four lags of each variable in differenced form in addition to the first lags of the two cointegration erros estimated by Johansen's ML-procedure under the weak exogeneity assumption (Table 3).

(4) Δ BONF3t = -1.028 -0.100 ECM1t-1 -0.118 ECM2t-1 + 0.156 Δ INTFt

(-4.484) (-3.449) (-5.249) (4.133)

-0.074 Δ INTFt-2 + 0.572 (Δ LSDOLt-4) + 0.459 Δ LRTDt

(-2.016) (3.117) (2.768)

- 0.795 Δ LRTDt-1 + 0.824 Δ LCPIt - 0.614 (Δ LCPIt -1- Δ LCPIt-2)

(-5.308) (3.656) (-3.596)

+ 0.342 Δ BONF3t-1 - 0.220 Δ BONF3t-2 - 0.203 Δ BONF3t-4

(3.440) (-2.347) (-2.524)

Sample: 88/1-93/12

R2 =0.617 DW = 2.32 Mean of Dep.= 0.004

SD-Dep.Var.= 0.041 SE-Reg. = 0.028

AUTOCOR-F(5,54) =0.956 (0.453) RESET-F(1, 58) = 0.489 (0.487)

NORM-χ 2 = 0.405 (0.817) ARCH-F(5, 49) = 0.509 (0.768)

The residuals of equation (4) do not display autocorrelation or heteroscedasticity, and are normally distributed. The break point and one step Chow statistics are below their critical values, indicating parameter constancy over the sample period (Graphs 4,5). Recursive coefficient estimation results (Graphs 6-18) also support the parameter constancy hypothesis.

TABLE 4

General Form of the Error Correction Equation for 3-month Borrowing Rate

Corresponding to the Cointegration Relations in Table 3

Lags 0 1 2 3 4 Σ

Δ BONF3 -1 0.354 -0.230 -0.062 -0.156 -1.090

(0.125) (0.134) (0.130) (0.095) (0.209)

C -1.066 -1.066

(0.386) (0.386)

ECM1 -0.104 -0.104

(0.051) (0.051)

ECM2 -0.123 -0.123

(0.051) (0.051)

Δ LRTD 0.473 -0.621 -0.258 0.173 -0.312 -0.545

(0.205) (0.236) (0.259) (0.262) (0.227) (0.340)

Δ LCPI 0.847 -0.661 0.518 0.001 0.715 1.420

(0.355) (0.377) (0.400) (0.428) (0.392) (0.508)

Δ INTF 0.162 0.029 -0.094 0.045 -0.039 0.103

(0.049) (0.072) (0.060) (0.060) (0.051) (0.186)

Δ LREX -0.063 -0.292 0.192 -0.326 0.849 0.359

(0.290) (0.251) (0.254) (0.265) (0.266) (0.522)

(*) Standard errors are in parantheses.

Diagnostic Tests for the Residuals

AR-F(5, 40) = 1.462 (0.224) ARCH-F(5,35) = 0.323 (0.896)

NORM-χ 2 (2) = 1.059 (0.589) RESET-F(1,44) = 0.300 (0.586)

Graph of the actual and fitted values of the first differences of the borrowing rate (Graph 20) displays that estimates capture most of the turning points in the first differences, except for the second half of 1990 and the first half of 1991, where the turning points of the estimated differences are exactly in reverse of the observed data. Of the one step forecasts over 1994/1-1995/8, fourteen out of twenty forecasts are within two standard error band. Examination of the Graphs 21 and 23 indicates that forecasts miss only six turning points in the levels.

Most of the one step forecast errors in levels are negative (Graph 23). Furthermore, following a high forecast error (positive or negative), forecasts coincide with the actual values. This result is considered to be compatible with an equation of the demand side pressures on the borrowing rate, when the Treasury's supply behavior is also effective on its determination.

4. EXOGENEITY TESTS

For the validity of conditioning on overnight borrowing rate, time deposits and the consumer price index in equation (4), those variables should be weakly exogenous (W.E.) for the parameters of interest. The adjustment coefficients of those variables estimated by Johansen's procedure are not significantly different from zero, indicating that they are W.E. for the long run parameters. In order to test their W.E. for the short run parameters, following marginal processes are estimated.

(5) Δ INTFt = 0.004 - 0.138 Δ INTFt-1 + 0.315 DUMINTF

(0.522) (-1.724) (9.0)

R2 =0.561 DW =2.04 Mean of Dep.= 0.004

SD-Dep.Var.= 0.104 SE-Reg. = 0.070

AUTOCOR-F(5,64) = 0.428 (0.828) RESET-F(1,68) = 0.002 (0.963)

NORM-χ 2 = 6.28 (0.043) ARCH-F(5,59) = 1.343 (0.259)

where DUMINTF is equal to 1 when the rate of change of the interbank overnight borrowing rate is equal to or over 27 percent (at May, 1989 and March 1991) and -1 when it is equal to or lower then -27 percent (at November, 1988 and May, 1991).

(6) Δ RTDt = -0.001 + 0.338 Δ RTDt-1 + Centered Seasonal Dummies

(-0.392) (3.172)

R2 =0.453 DW =1.83 Mean of Dep.= -0.004

SD-Dep.Var.= 0.031 S E-Reg. = 0.023

AUTOCOR-F(5,53) = 1.353 (0.257) RESET-F(1,57) = 1.125 (0.293)

NORM-χ 2 = 0.634 (0.728) ARCH-F(5,48) = 0.162 (0.975)

(7) Δ CPIt = 0.042 + 0.048 Δ CPIt-1 - 0.055 Δ CPIt-12 + Centered Seasonal Dummies

R2 =0.716 DW =1.66 Mean of Dep.= 0.043

SD-Dep.Var.= 0.023 SE-Reg. = 0.011

AUTOCOR-F(5,52) = 2.180 (0.071) RESET-F(1,56) = 2.132 (0.150)

NORM-χ 2 = 4.732 (0.094) ARCH-F(5,47) = 0.160 (0.976)

In order for testing weak exogeneity of the overnight borrowing rate, time deposits and the consumer price index, the residuals of the marginal processes (5)-(7) are tested as omitted variables in equation (4). None of them are found significant, indicating that they are W.E. for the short run parameters of interest in addition to being W.E. for the long run parameters.

Weak exogeneity of the conditioning variables for the parameters of interest, enables us the evaluation of the dynamics of the borrowing rate with reference to equation (4). However, weak exogeneity is not sufficient for using this equation for policy analysis. For policy analysis, parameter invariance in addition to the W.E., i.e. super exogeneity of the conditioning variables is also necessary. Parameters of the marginal processes (5)-(7) are not constant as indicated by the one step Chow statistics in Graphs 24-26, while the parameters of the equation (4) are constant, implying the super exogeneity of the conditioning variables. As an additional test for super exogeneity, the parameter constancy of the inverse regressions of the equation (4) with respect to the interbank borrowing rate, the consumer price index and the real value of the time deposits are estimated. One step Chow statistics for the inverse regressions are also significant at some observations, supporting the super exogeneity hypotheses. Thus, the equation (4) is suitable for a policy analysis. However, Granger causality tests reported in Table 5 indicate there are significant feedback effects from the regressors to the borrowing rate. Those feedback effects should also be modelled if the equation (4) will be used for multi-step forecasting purposes.

TABLE 5

Causality Tests

Own Lags of Causality Tests

Lags1 Bonf3 F-Stat. p-value

DLCPI[2] 1, 12 1,2,....,8 F(8,49) =1.50 (0.182)

2, 5, 6[3] F(3,54) = 3.92 (0.014)

DINTF[4] 1 1,2,....,8 F(8,59) = 1.19 (0.322)

4, 5, 6^3 $F(3,64) = 2.97$ (0.038)

DLREX 1 1,2,....,8 $F(8,61) = 1.03$ (0.422)

1, 5, 7^3 $F(3,66) = 2.29$ (0.086)

DLRTD 1 1,2,....,8 $F(8,61) = 0.96$ (0.478)

1, 2, 5^3 $F(3, 66) = 1.87$ (0.144)

DLRTDY 1 1,2,....,8 $F(8,60) = 0.52$ (0.840)

4^3 $F(1,67) = 1.20$ (0.277)

DLSDOL[5] 1,12 1,2,....,8 $F(8,59) = 0.88$ (0.535)

5, 7 $F(2,65) = 2.74$ (0.140)

1 Chosen as to eliminate the autocorrelation of the residuals.

2 11 centered seasonal dummies are also included in the regressions.

3 Lags with high t-statistics.

4 The equation (5).

5 Also included a dummy variable which is equal to one at 1991/3 when Turkish lira depreciated 12 percent.

5. LONG RUN DETERMINATION AND THE DYNAMICS OF THE TREASURY'S 3-MONTH BORROWING RATE

5.a. Long Run Determination of the 3-month Borrowing Rate

There are two cointegration relations among the 3-month borrowing rate, the real exchange rate, the interbank overnight borrowing rate, the real value of the time deposits denominated in Turkish lira, and the consumer prices. Of the five variables, only the 3-month borrowing rate and the real exchange rate are error-correcting, i.e. adjusts towards the long run relation in response to any deviations from that relation.

For the borrowing rate, both of the adjustment coefficients are correctly signed, i.e. imply a movement toward the equilibrium, while for the real exchange rate, only the first adjustment coefficient is correct (Table 3). The signs of the coefficients of the both cointegration vectors are compatible with a T-bill demand equation, as explained before. However, the signs of the coefficients of the first cointegration vector, except for that related to the real value of the time deposits, are also compatible with a long run real exchange rate relation.

The inspection of the adjustment and the cointegration coefficients indicates that the first cointegration vector might either represent the long run real exchange rate equation or might represent a three month borrowing rate equation in combination with the second cointegration vector. Though, further research is required for the correct identification of the relation represented by the first cointegration vector, the magnitude of the adjustment coefficients also provide information. Assuming that the variables adjust faster to their own disequilibrium than they adjust to the disequilibriums in the other sectors, the first cointegration relation is interpreted as to represent the equilibrium relation for the 3-month borrowing rate.

Equally weighting the two cointegration vectors, the following long run relation for the 3-month borrowing rate is reached;

(8) BONF3 = 0.281 REX+0.908 INTF + 0.841 RTD + 0.103 CPI

which indicates high long run sensitivity of the 3-month borrowing rate with respect to the interbank overnight borrowing rate and the real value of the time deposits. Equally weighted average adjustment coefficient of the 3-month borrowing rate corresponding to the long run relation (8) is -0.19, indicating that approximately one fifth of any deviation from this relation is removed in the following period, by the adjustment of the 3-month borrowing rate.

5.b. The Short Run Dynamics of the 3-month Borrowing Rate

Short run dynamics of the three month borrowing rate is represented by the conditional error correction equation (4). In the short run, an increase in the interbank overnight borrowing rate increases the borrowing rate immediately, and some of the initial increase is reversed with two periods lag. Impact effect of an increase in the time deposits is positive. However, it leads to a decrease more than the initial increase with one period lag. The impact effect of the inflation is high. One percentage point increase in the consumer prices leads to approximately one percentage point increase in the borrowing rate. However, a slowdown in the inflation rate in the previous period also puts an upward pressure on the borrowing rate. Depreciation of the Turkish lira positively affects the borrowing rate with four periods lag. The effect of the lagged changes of the borrowing rate is positive in the first lag, and then reversed with two and four period lags. In addition to this short run effects, borrowing rate also responds to the disequilibrium in the portfolios, indicated by the negative adjustment coeficients related to the first and the second cointegration vectors.

6. CONCLUSION

In this study, the factors effective on the three month T-bill borrowing rate are examined with an emphasis on the demand for the T-bills. The banks are the major participants in the auction market and the auction rate has an indicative role for the Treasury's offer rate for direct sales to the public. Thus the focus of the analysis is on the factors affecting the banks' demand for the T-bills. First, cointegration relations are tested. Then, a constant parameter conditional error correction equation is estimated.

In the long run, the three month borrowing rate is positively related to the interbank overnight borrowing rate, the real value of the time deposits, the real exchange rate, and the consumer price index. In the short run, the rate of inflation has a high positive impact effect on the borrowing rate, while the depreciation of the Turkish lira has lagged positive effect. The total short run multiplier for the time deposits is negative and moderate, while the total short run multiplier for the interbank rate is positive and small. The effect of the lagged changes of the borrowing rate is positive in the first lag, and then reversed with two and four period lags. In addition to these short run effects, the borrowing rate also responds to the disequilibrium in the portfolios.

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