Are domestic banks' pass through higher than foreign banks? Empirical evidence from Pakistan

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Are Domestic Banks' Interest Rate Pass through Higher than Foreign Banks? Empirical Evidence from Pakistan

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Abstract

This study contributes to the literature by estimating Interest Rate Pass Through (IRPT) using Pakistani aggregate banks' lending and deposit rate data. Lending and deposit rates are estimated to be sluggish in terms of their response to a change in monetary policy rate. There is also evidence of asymmetry in the pass through of four types of banks (i.e., privatized, nationalized, foreign and specialized). Overall, the domestic banks' pass through is estimated to be higher than that of foreign bank. Although the IRPT is estimated to be incomplete, the degree of lending rate pass- through is not very low. This study provides evidence of an increase in the adjustment speed when the lending rate is below equilibrium after January 2005. However, there was no significant change in the pass through after January 2005 which coincided with the constant increase in the Treasury bill rate by the State Bank of Pakistan.

Keywords:

1. Introduction:

Interest rate is one of many tools of monetary policy. The Interest Rate Pass-Through (IRPT) is defined as the transmission of policy rate to lending and deposit rates in the economy. The pass through is complete only if an immediate transmittal of policy rate change to lending and deposit rates exists. Thus, estimation of IRPT duration is very important. A complete IRPT implies that monetary policy is very effective and that the central bank can influence macroeconomic variables.

This study utilizes Pakistani data on weighted average lending and deposit rates from 2001 – 2009 from four types of banks (i.e., private domestic, foreign, nationalized and specialized) in order to compute IRPT. This study contributes to the literature by estimating IRPT with respect to bank type. Gross loans and deposits are used as a weight to measure weighted average loans and deposit rates. Qayyum and Sajawal (2005) utilized weighted averge of outstanding loans and deposits in their study.. However, new loan and deposit contracts are excluded in this type of weighting scheme. New contracts are important for banks and their adjustment is more likely than outstanding loans and deposits. Their results may have a bias. On the contrary, our study uses data sets which include new contracts of loans and deposits in the weighting scheme

The estimates from this type of data set may provide more robust results. Since banks tend to change the lending rates on new contracts more frequently than outstanding ones.

2.1 Literature Review:

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There is no consensus regarding a complete pass through in the literature. The literature can be grouped into three major categories. In the first group,studies reported a complete pass through process with respect to an official monetary policy instrument (Kagan, 2009; Liu et al., 2008; Bondt, 2002, 2005; Graeve and Vennet, 2004; Hoffman and Mizen, 2004; Paula, 2009; Crespo and Thomas, 2006; Sorensen and Werner,2006). In the second group, studies reported incomplete IRPTs. However, the degree of stickiness was different across banks and banking products (Aydin, 2007; Qayyum and Sajawal, 2005; Rebucci and Espinosa, 2003; Leuven and Leuven, 2001; Cottarelli et al., 1995). In the third group, studies attempted to find reasons for IRPT stickiness. For example, Weth (2002) reported institution size as a factor in IRPT stickiness. Cottarelli et al. (1995) showed that IRPT stickiness was due to constraints on competition and financial markets. This study also reported that the degree of stickiness decreased after liberalization. Rebucci and Espinosa-Vega (2003) considered market power as the primary reason for incomplete pass throughs in Chile. Leuvensteijn et al. (2008) used bank data from1994 - 2004 to examine the positive relationship between competition and IRPT. This study provided evidence that competition pressure is more likely to exist in the loan rather than the deposit market. Graeve et al. (2004) cited measurement and aggregation errors in retail rates data as a major factor with regard to rigid consumer loan and savings deposit rates.

3. Methodology:

Panel data techniques will be utilized in this study. Panel Unit Root tests will first be applied to assess for stationary data. Pedroni Panel Cointegration tests will then be applied to assess the long run relationship between Treasury Bill (TB), lending and deposit rates. Finally, the Phillips and Loretan method (1991) will be applied with cross section dummy variables.. The Error Correction model will be estimated to capture short run dynamics.

3.1 Panel Unit Root Tests

This study will utilize three panel unit root tests to assess stationary data of lending, deposit and TB rates (Levin et al., 2002; Im et al., 2003; Hadri, 2000).

The Levin, Lin and Chu (LLC) test assumes that persistence parameters remain the same across cross sections. This means that $\psi_i = \psi$ for all i. Alternatively, the Im, Pesaran and Shin (IPS) test allows ψ to vary across all cross sections.

The LLC model allows for fixed effects and unit specific time trend along with common time effects. The structure of their model is shown below:

$$\Delta y_{it} = \alpha_i + \delta_i t + \theta_t + \rho_i y_{i,t-1} + \xi_{it,} \qquad\qquad i=1,2...N, t=1,2...T$$
(1)

The unit specific fixed effect is important to capture heterogeneity since the coefficient of the lagged dependant variable is homogeneous across all cross sections in equation 1. The LLC tested the null hypothesis: $H_0 : \rho_i = 0$ for all i against the alternative $H_A : \rho_i = \rho < 0$ for all i. The LLC test assumes that errors are independent across all cross sections.[1] Im et al. (2003) extended the LLC framework by allowing heterogeneity in ρ_i under the alternative hypothesis. The Lagrange Multiplier tests of Hadri (2000) has a different null hypothesis than other panel unit root tests. It posits that all unit roots are stationary, which is opposite to LLC and IPS. This is similar to univariate KPSS tests, and the test statistic is distributed standard normal under the null hypothesis. In our case, the comparison of the results from all three types of tests will be an interesting estimation.

3.2 Panel Cointegration:

This study attempts to use the Pedroni (1999, 2004) panel cointegration test to estimate a long run relationship between bank and TB rates. Pedroni derived nearly seven tests which are within- and between-dimensions. In order to calculate within- dimension statistics, the numerator and denominator are summed up by *N* separate cross section regressions. The between-dimensions statistics are derived by

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[1] For more technical details see Banerjee Anindya (1999)

dividing the numerator and denominator before summing N cross sections. Pedroni's tests are residual based, similar to the Engle Granger tests. The slope coefficients vary over cross section units, thereby allowing heterogeneity within the model. The following panel equation is estimated:

$$Y_{it} = \alpha_i + \delta_{it} + \beta_i X_{it} + \varepsilon_{it}$$
(2)

whereas, $i = 1, 2, \ldots\ldots N$ cross sectional units, $t = 1, 2, \ldots\ldots\ldots T$ time periods, and X_{it} represents the column vector which consists of M independent variables for each ith unit. M represents the number of independent variables. Similarly, β_i represents the column vector for each cross section i. The variables Y and X are considered to be non stationary, I (1) integrated of order one. The residual ε_{it} will be non stationary, I(1), under the hypothesis of no cointegration. The parameters α_i and δ_{it} tend to capture cross sectional fixed effects and deterministic trends, respectively. The separate slope coefficients β_i ensure that cointegrating vectors may also be heterogeneous.

In order to compute the required panel cointegrating statistic, Equation 1 is estimated by OLS, for every individual cross section. The within-dimension based estimates are panel ρ and panel t statistics. They are derived by computing the first difference of all variables.

$$\Delta Y_{it} = \beta_{1i} \Delta X_{1it} + \beta_{2i} \Delta X_{2it} + \cdots \ldots\ldots \beta_{mi} \Delta X_{mit} + \pi_{it}$$
(3)

3.3 Phillips and Loretain (PL, 1991) Method

The marginal cost pricing model can be explained by the following equation[2]

$$Y_{it} = \alpha_i + \beta X_{it} + \varepsilon_{it}$$
(4)

$i = 1, 2, \ldots.., N$ and $t = 1, 2 \ldots\ldots T$

Where Y_{it} represents bank lending or deposit rate; X_{it} , the monetary policy instrument, TB rate, money market rate or federal fund rate; ε_{it}, the residual term; α_i and β measure the mark up and long run degree of pass through respectively.

Liu et al. (2008) estimated the following triangular system of equations to model long run relationship between policy rate and market rates;

$$Y_{it} = \alpha_i + \beta X_{it} + U_{1it}, \qquad t = 1, 2, \ldots\ldots, T$$
(5)

X_{it} $= X_{it-1} + U_{2it}$
(5a)

Where $U_{it} = [u_{1it}, u_{2it}]'$ is a stationary vector.

The estimation of equation 1 requires both interest rates to be non stationary. If the U_{1it} is not stationary then U_{2it} interest rates will not cointegrate, thereby, resulting in a spurious estimate.

Liu et al. reveals that even if U_{1it} is stationary, OLS estimates of equations 1 and 1a do not have standard distribution when U_{1it} and U_{2it} are correlated. Phillips and Loretan (1991) suggested inclusion of leads and lags of the first difference in X_t, ΔX_t. They estimated the following equation:

$$Y_{it} = \alpha_i + \beta_i X_{it} + \sum_{k=1}^{K} d1k (Y_{it-k} - \alpha_0 - \beta_i X_{it-k}) + \sum_{i=-1}^{L} d2i \Delta X_{it-i} + v_{i1t}$$
(6)

The parameter estimates are unbiased asymptotically and normally distributed. Use of this model provides two additional advantages. First, this model considers structural changes, if they should occur. Second, it addresses past policy surprises and future policy settings with regard to policy instrument and bank rates.

3.4 Short term dynamics:

A structural error correction model is used to measure short term dynamics. It is suitable to measure the contemporaneous effect of changes in policy rates on bank rates (e.g., deposit and lending rates).

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[2] Rousseas (1985) and Bondt Gabe De (2002, 2005)

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This study utilizes the following error correction (ECM) framework based on the general ADL (p,q) model:

$$\Delta y_{it} = \beta_0 \Delta X_{it} + \delta(Y_{it-1} - \alpha_0 - \alpha_1 X_{it-1}) + \sum_{i=1}^{q} \beta_i \Delta X_{it-i} + \sum_{i=1}^{p} \gamma_i \Delta Y_{it-i} + v_{it} \qquad (7)$$

Where Δ represents the first difference operator; $\hat{\varepsilon}_{it-1} = (Y_{it-1} - \alpha_0 - \alpha_1 X_{it-1})$ represents bank rates (e.g., deposit and lending rates) disequilibrium at time with one lag. The $\hat{a}_0$ measures impact passes through rate; β_i and γ_i are dynamic adjustment coefficients and δ captures error correction adjustment speed when the rates are away from equilibrium. The sign of δ is negative because interest rates are mean reverting.

The mean adjustment lag can be calculated for the ADL (1, 1) model with the following formula:

$$MAL = (\beta_0 - 1)/\delta$$
(8)

which measures complete pass through from policy rate (e.g.,TB or money market rate) to bank rate (e.g., deposit and lending rate). For general ADL (p,q), the MAL can be calculated as a weighted average of all lags. This measures the speed in which bank rates are adjusted towards a change in policy rate. Asymmetry (i.e., different adjustment speeds) occurs when rates are above and below the equilibrium. To test its existence in the bank rates (deposit and lending) a dummy variable (λ) will be added to equation 2, which is 1 if residual lag, $\hat{\varepsilon}_{t-1}$, is positive and 0 otherwise. The following equation captures asymmetric adjustments:

$$\Delta Y_{it} = \beta_0 \Delta X_{it} + \delta_2 \lambda \hat{\varepsilon}_{t-1} + \delta_3 (1-\lambda)\hat{\varepsilon}_{t-1} \qquad + \qquad \sum_{i=1}^{q} \beta_i \Delta X_{t-i} + \sum_{i=1}^{p} \gamma_i \Delta Y_{t-i} + \eta_t$$
(9)

where $1-\lambda$ measures error correction adjustment speed when rates are above the equilibrium and δ_3, when rates are below the equilibrium. Furthermore, the Wald test can be used to assess if δ_2 is significantly different from δ_3.

Therefore, two mean adjustment lags (MAL), above and below equilibrium, can be calculated using the following formula:

$$MAL^+ = (\beta_0 - 1)/\delta_2 \text{10}$$

where MAL^+ represents bank rates above equilibrium.

$$MAL^- \qquad\qquad = \qquad\qquad (\qquad\qquad \beta_0 - 1)/\delta_3$$
(11)

where MAL⁻ represents bank rates below equilibrium. The State Bank of Pakistan (SBP) began increasing the TB rate after January 2005. Thus, it is useful to estimate the change in slope after January 2005. It is also important to estimate speed of adjustment after 2005. In order to capture these effects, a modified version of equation 6 has been estimated:

$$\Delta Y_{it} = \beta_0 \Delta X_{it} + \delta_2 \lambda \hat{\varepsilon}_{t-1} + \delta_3 (1-\lambda)\hat{\varepsilon}_{t-1} + \delta_4 \lambda_1 \varepsilon_{t-1} + \delta_4 (1-\lambda_1)\varepsilon_{t-1} \qquad +$$
$$\sum_{i=1}^{q'} \beta_i \Delta X_{t-i} + \sum_{i=1}^{p'} \gamma_i \Delta Y_{t-i} + \beta_{00} \lambda_1 \Delta X_{it} + \eta_t$$
(12)

4. Results

4.1 Panel Unit Root Tests

Table 1 provides the summary of Panel Unit Root tests applied to assess stationary data of lending, deposit and TB rates. In most of the cases, computed probabilities were not significant ($p< 0.05$) for unit roots at each level. However, unit root at first difference was significant in most of the cases, thereby implying that the variables are non stationary at levels but stationary at first difference, hence integrated of order one. This occurs only with the TB rate, which is stationary at second difference according to the Hadri test. However, the LLC and IPS tests show that the TB rate is stationary at first difference. Since two tests show TB rate as I (1), it is considered to be stationary at first difference.

4.2 Pedroni (1999, 2004) Panel Cointegration Tests

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The residual based Pedroni's panel cointegration test between lending and TB rates are summarized in Table 2. In the within-dimension test, seven of eight tests showed cointegration ($p< 0.05$). Similarly, the two of three between-dimension tests showed cointegration. The group ADF stat has a p value of 0.06. Overall, there is ample evidence of a long run relationship between lending and TB rates.

Table 3 shows Pedroni's residual based panel cointegration tests for deposit and TB rates. In eight within-dimension tests, the computed probabilities are estimated to be very high. However, there was no significant evidence of cointegration in all cases. Hence, there is no evidence of a long run relationship between deposit and TB rates according to within-dimension tests. Similarly, in three between-dimension tests, the computed probabilities showed no significant cointegration for deposit and TB rates. Kok and Thomas (2006) reported similar results for saving deposits in the Euro area using the Pedroni residual based test. This study suggested that the adjustment in saving deposit is so sluggish that there is no cointegration with the market rate.

4.3 PL (1991) estimates with slopes and intercepts dummies:

Table 4showsthree types of estimated equations for both lending rates. Equation 1 allows three slopes and intercept dummies with overall slope and intercept. In Equation 1, the slope and intercept dummy of specialized banks is omitted to avoid the dummy variable trap. Equation 2 includes the slope and intercept dummy of specialized banks but omits nationalized banks. Equation 3 has all the slopes and intercept dummies and excludes overall slope and intercept.

Equation 1 for lending rate estimates the overall slope to be 0.22, which is not close to one. The slope dummies of nationalized, foreign and private banks are significant with a positive coefficient. The slope dummies of nationalized, privatized and foreign banks are 0.5, 0.42 and 0.33, respectively. I estimated that these slope dummies are equal using the Wald coefficient restriction test. The F test value of this test implies that these slopes are indeed equal. The results imply that nationalized banks have the highest IRPT, followed by private and foreign banks. The IRPT of the weighted average lending rate is not complete, but is moderate since the slope dummies of three types of banks are greater than 0.5. This implies heterogeneity in the response of weighted average lending rate changes when the TB rate is changed as a tool to implement monetary policy. A time dummy was also added (i.e., 0 before January 2005 and 1 after that). This dummy variable represents the time when SBP began to raise TB rates in response to higher inflationary pressure. I combined this dummy variable with the first difference of TB to capture the slope effects after January 2005 and each equation showed no significant differences (data not shown).

In equation 2, dummies were switched by adding slope and intercept dummies of specialized banks and skipping the dummies of nationalized banks. The overall slope is 0.70 and the slope dummy of specialized banks (i.e.,TB-SB) is -0.50. However, the slopes of private and foreign banks are estimated to be insignificant. In equation 3, all dummies were utilized; however, overall slope and intercept were excluded. The IRPT of nationalized, private, foreign and specialized banks are 0.72, 0.70, 0.60 and 0.3, respectively. All intercepts are negative and significant. However, the slope dummy after January 2005 is insignificant.

4.5 Impulse Response of Deposit to TB rate

Table 5 illustrates the impulse response of DDEP, first difference of deposit rate to one standard deviation shock in DTB and first difference of TB rate. Since DDEP and TB have no cointegration, the VAR model was estimated in first difference form. The graph shows that innovations to DTB have a positive impact on DDEP since it does not go below zero. Since ordering of the variables is important, variables were used in this order: DTB, DDEP. This graph shows both upward and downward trends, however, overall results remain positive. A peak is reached in the sixth month and touches the zero line in the 13th, 18th, 20th and 22nd months. It is nearly extinct after 13 months.

4.6 Evidence of Asymmetric Adjustment in short run:

This study estimates the asymmetric short run

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speed of adjustment (Table 6), similar to Liu M.H et al (2008). The λ represents the parameter below the equilibrium

when the estimated residual, ECL is negative. The parameter $(1-\lambda)$ captures the effect when

ECL is positive. Table 10 shows that both parameters are insignificant. Table 10 shows that $\lambda 1$ is significant at 5%. The parameter $\lambda 1$

captures the speed of adjustment when the lending rate is below equilibrium after the January 2005 period.

The $(1-\lambda 1)$ parameter is insignificant due to its low t and high p values. Thus, both parameters are equal.

The speed of adjustment after January 2005 increased when the lending rate is estimated to be below

the equilibrium level.

5. Conclusion

This study provides estimates of IRPTs using Pakistani aggregate banks' deposit and lending rates.Results showed that deposit, lending and TB rates are non stationary at levels in the aggregate bank type data. Cointegration test revealeda long run relationship between lending and TB rates,however, deposit and TB rates were not cointegrated. Estimation of the first difference VAR model for deposit and TB rate showed that the TB parameter was significant at the 1st, 2nd and 4th lag. The highest short run IRPT was estimated to be 0.12, which is very low. This result is consistent with other studies in the literature. Banks probably tend to adjust deposit rates very slowly. The SBP strategy paper mentions the fact that most deposits remained negative in real terms whereas the banks' margins remained high.

The PL (1991) estimates of aggregate lending rates reveal that the pass through of three types of banks is moderately more than 0.5 but less than one even in the long run. The highest lending rate IRPT was for nationalized banks, followed by privatized, foreignand specialized banks. The Wald test estimates revealed significant differences in IRPTs of all bank types. Thus, the monetary policy affects lending rate more than deposit rates in Pakistan, even for years to come.

There is evidence of heterogeneity among four types of banks. Furthermore, a shift in IRPT after January 2005 was not evident. Estimates of short run asymmetric adjustments in the lending rate showed no evidence of change in the speed of adjustment whether the lending rates were below or above the equilibrium for the overall period. However, evidence proved that the banks' speed of adjustment increased after January 2005 when lending rates were below the equilibrium.

References

Baltagi Badi H. (2000) "Non stationary panels, panel cointegration and dynamic panels: Advances in Econometrics, Vol. 15. ELSEVIER SCIENCE inc.

Bernanke, B., and Alan Blinder (1992) "Credit, Money, and Aggregate Demand" *American Economic Review* 82, 901–21

Bernanke, B., and Mark Gertler (1995) Inside the Black Box: The Credit Channel of Monetary Policy Transmission. *Journal of Economic Perspectives* 9:4, 27–48.

Bondt, G. (2002) Retail Bank Interest Rate Pass-through: New Evidence at the Euro Area Level. Frankfurt: European Central Bank. (ECB Working Paper No. 136.)

Cottarelli, C., and Angeliki Kourelis (1994) "Financial Structure, Bank Lending Rates, and the Transmission Mechanism of Monetary Policy" *IMF Staff Papers*

41:4, 587–623.

Gropp Kok Sørensen, and Lichtenberger(2007) " The Dynamics of Bank spreads and Financial Structure." *European Central Bank*, Working paper series no. 714.

Hanan, T., and Allen Berger (1991) The Rigidity of Prices: Evidence from the Banking Industry. *American Economic Review* 81:4, 938–945.

Mishkin, Frederic S. (1995) Symposium on the Monetary Transmission

Mechanism. Journal of Economic Perspectives 9:4, 3–10.

Hofmann, B., Mizen, P., 2004. Interest rate pass-through and monetarytransmission: Evidence from individual financial institutions' retailrates. Economica 71, 99–123.

ulsewig Oliver et al (2006) "Bank loan supply and monetary policy transmission in Germany: An assessment based on matching impulse responses." Journal of Banking and Finance 30 (2006) 2893-2910.

Kashyap, A.K., Stein, J., 2000. What do a million observations on bankssay about the transmission of monetary policy? American EconomicReview 86, 310–314.

Kleimeier, S., Sander, H., 2006. Expected versus unexpected monetarypolicy impulses and interest rate pass through in euro zone's retail banking markets. Journal of Banking and Finance30, 1839–1870.

Leuvensteijn Michiel van et al (2008) "Impact of bank competition on the interest rate pass through in the Euro area." European Central Bank, Working Paper Series NO 885 / MARCH 2008

Leuven and Leuven (2001)" Bank lending rate pass through and differences in transmission of a single EMU monetary policy." Katholieke University, Center for Economic studies discussion paper series (DPS)01.17

Levin, Lin and Chu (LLC, 2004)" Unit root   tests in panel data: asymptotic and finite sample properties." Journal of Econometrics 108 (2002) 1-24

Liu M.H et al (2008) "Monetary Policy transparency and pass through of retail interest rates." Journal of Banking & Finance 32 (2008) 501–511

Mojon, B. (2000) "Financial Structure and the Interest Rate Channel of ECB Monetary Policy" Frankfurt: European Central Bank (ECB Working Paper No. 40)

Orsal Deniz Dilan Karaman (2007)" Comparison of Panel Cointegration tests". SBF 649 Discussion Paper 2007-029 Humboldt-Universität zu Berlin, Germany

Pedroni Peter (2004)" Panel Cointegration: Asymptotic and Finite sample properties of pooled time series with an application to the PPP hypothesis". Econometric Theory 20, 2004, 597-625

Pedroni Peter (1999)" Critical values for cointegration tests in heterogeneous panels with multiple regressors."   Oxford Bulletin of Economics and Statistics, special issue (1999)

Phillips, P.C.B., Loretan, M., 1991. Estimating long-run equilibria. TheReview of Economic Studies 58, 407–436

Qayyum, Khan and Khawaja (2005) " Interest rate pass through in Pakistan: Evidence from Transfer Function Approach. *The Pakistan Development Review* 44: 4 Part II (Winter 2005)

Romer, C., and D. Romer (1989) Does Monetary Policy Matter? A New Test in the Spirit of Friedman and Schwartz. *NBER Macroeconomic Annual* 4, 121–170

Sander and Kleimeir (2004)"Interest rate pass through in an enlarged Europe: the role of banking market structure for monetary policy transmission in transitional countries." Unpublished Mimeo

Tieman Alexander (2004)" Interest rate pass through in Romania and other Central European economies". IMF Working Paper WP/04/211.

Vega, E., and Alessandro Rebucci (2003) Retail Bank Interest Rate Pass-through: Is Chile Atypical? International Monetary Fund (IMF Working Paper (WP/03/112)

Table 1: Panel Unit Root Test

Method	Null Hypothesis	Lend		Deposit		TBill	
		Stat	Pro	Stat	Pro	Stat	Pro

			Statistic	Prob	Statistic	Prob	Statistic	Prob
LLC- t* Stat	Level	Unit Root (common process)	-1.57	b. 0.057	-1.00	b. 0.15	-1.05	b. 0.14
	1st Diff		-20.43	0.00*	-6.41	0.00*	-3.88	0.00*
Hadri-Z* stat	Level	Stationarity	7.34	0.00	9.7	0.00	4.9	0.00
	1ST Diff		-1.24	0.10*	0.82	0.21*	0.09	0.00*
IPS-W Stat	level	Unit Root (individual process)	0.37	0.64	2.05	0.98	0.65	0.74
	1st Diff		-21.32	0.00*	-7.11	0.00*	-6.03	0.00*
Hadri Z	level	Stationarity	7.39	0.00	9.5	0.00	4.9	0.00
	1st Diff		1.45	0.07*	0.87	0.20*	0.09#	0.00*

Lend is weighted average lending rate, weighted average Deposit is deposit rate and TB is Treasury Bill rate

Table 2: Pedroni Residual based Panel Cointegration Test

Variables: Lending rate and TB rate.

Ho: No Cointegration				
Ha: with-in-dimension	Statistic	Prob	Weighted Stat	Prob
Panel V Stat	1.63	0.05**	1.37	0.08***
Panel rho-Stat	-3.39	0.0003*	-3.05	0.001*
Panel PP-Stat	-2.71	0.003*	-2.49	0.006*
Panel ADF-Stat	-2.06	0.01*	-2	0.02*
Ha: Between Dimension				
Group rho-Stat	-2.21	0.01*		

Group PP-Stat	-2.22	0.01*
Group ADF-Stat	-1.5	0.06***

Note: *, ** and *** are significant at 1, 5 and 10 percent respectively.

Table 3: Pedroni Residual Based Panel Cointegration Test

Variables: Deposit and TB rate

Ho: No Cointegration				
Ha: with-in-dimension	Statistic	Prob.	Weighted Stat	Prob.
Panel V Stat	-0.86	0.81	-0.56	0.71
Panel rho-Stat	0.32	0.63	0.75	0.77
Panel PP-Stat	-1.07	0.14	0.40	0.66
Panel ADF-Stat	-1.09	0.14	0.31	0.62
Ha: Between Dimension				
Group rho-Stat	1.82	0.97		
Group PP-Stat	1.39	0.92		
Group ADF-Stat	1.30	0.90		

Note: None of computed probabilities less than 0.10, not significant.

Table 4: PL (1991) Estimates with dummy variables

	Lending		
	Eq-1	Eq-2	Eq-3
Cons.	5.5	4.3	
	[3.9]*	[2.8]*	

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TB (PL)	0.22	0.70	
	[2.4]*	[3.7]*	
TB-FB	0.33	-0.14	0.60
	[1.8]***	[-0.9]	[3.5]*
TB-NB	0.50		0.72
	[2.7]*		[3.9]*
TB-PB	0.42	-0.05	0.70
	[4.6]*	[-0.4]	[7.4]*
TB-SB		-0.50	0.30
		[-2.3]*	[2.7]*
DTB	-0.02	-0.02	-0.02
	[-0.2]	[-0.2]	[-0.3]
DERL	0.5	0.50	0.50
	[18.4]*	[18.8]*	[18.4]*
C1-FB	-0.8	0.4	-1.5
	[-1.7]***	[-0.9]	[-3.4]
C2-PB	-1.09	0.11	-1.7
	[-4.7]	[0.3]	[-7.4]*
C3-NB	-1.3		-1.9
	[-2.7]*		[-1.9]*
C4-SB		1.2	-0.7
		[2.5]*	[-2.8]*
			[-2.8]*
R-Sq	0.98	0.98	0.97
DW	1.81	1.81	1.75

TB-FB=slope dummy for foreign banks, TB-DNB=slope dummy for domestic Nationalized banks, TB-DPB=slope dummy for domestic privatized banks
TB-DSB=slope dummy for domestic specialized banks. C1-C4, Intercepts dummies for 4 cross section banks. DERL and DERD are first difference of residual from EG-OLS equation for lending and deposit rates.

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DERL and DERD are first difference of residual from EG-OLS equation for lending and deposit.
Note: Equations include AR (1) and AR (2) terms

Figure5: Impulse Response DDEP to DTB

Response of DDEP to Cholesky
One S.D. DTB Innovation

Note: DTB=TB-TB(-1), First difference of TB rate

DDEP=DEP-DEP(-1), First difference of deposit rate

Table 6: Short Run IRPT and asymmetric speed of adjustment

DLEND = -0.09 + 0.40*DTB –0.04*(λ)–0.01*(1-λ) -0.13*DLEND (-1)
$\qquad$ (-1.2) $\quad$ (2.5)** $\qquad$ (-0.96) $\qquad$ (-0.3) $\qquad$ (-2.1) **

$\qquad$ + 0.14*DTB(-1) - 0.21*DTBMP $\quad$ -0.11*λ1 $\quad$ -0.08*(1-λ1)
$\qquad$ (1.4) $\qquad$ (-0.7) $\qquad$ (-1.99)** $\qquad$ (-0.6)

$\qquad$ R-Sq=0.33 $\qquad$ F-Stat-2.1 $\quad$ Wald-F (C8=C9)=2.41 Prob=0.09

Note: DECL= dummy variable DECL=1 when ECL <0. DECLL=1-DECL
whereas ECL is residual saved from lending and TB equation. *,**,***implies
significant at 1, $\quad$ 5 and 10 %. Respectively.DMP is time dummy =1 after January
2005 and 0 otherwise. DTB=DMP*TB, slope time dummy. DTBMP=DTB*DMP
slope dummy interacted with time. λ=DECL*ECL(-1), λ1=DECL*DMP*ECL(-1),
1-λ1=(1-DECL)*DMP*ECL(-1)

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