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Pass-through of Policy Interest Rate to Bank Deposit and Lending Rates in India

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Abstract: Pass-through of policy rate to deposit and lending rates of banks is a prerequisite for effective monetary policy transmission, which becomes even more important in an economy like India where banks are predominant financial intermediaries. This paper finds a stable long-run relationship between policy repo rate and bank deposit/lending rates. The pass-through of policy rate to bank rates is incomplete and asymmetric; the asymmetry, however, has reduced over the years. The long-term impact of a 100 basis points change in policy rate on bank deposit/lending rates is 70/65 basis points with the short-term impact being lower around 60 basis points during 2006-2019.

Keywords: Monetary transmission, pass-through ofpolicy rate, bank lending rate, threshold autoregressive model.

JEL classification: C31, E43, G21.

I. Introduction

Modern central banks conduct monetary policy primarily by changing their policy interest rate to influence the ultimate objectives of price stability and stable growth. The policy rate generally is a very short-term interest rate ranging from overnight to a few weeks. This way central banks influence money market conditions and thereby steer money market interest rates. However, how changes in policy rate transmit to interest rates in other segments of the financial market is critical for overall monetary transmission. In the transmission chain, pass-through of policy rate to interest rates in money and bond markets may be straight forward but pass-through to bank lending and deposit rates could be complex. Transmission to bank rates becomes even more important in the case of emerging market and developing economies (EMDEs) such as India as banks are predominant entities in credit intermediation.

A bank's decision on its lending rates has an impact on the expenditure and investment behavior of borrowers and thus the real economic activity. In other words, a better pass-through of policy rate to market interest rates and in turn to banks' interest rates strengthens monetary policy transmission and helps monetary authority to achieve the desired inflation and output objectives. If an increase (or decrease) in policy rate is translated into bank interest rates

* Views expressed are those of the authors and not of the institution to which they belong.

with similar magnitude of increase (or decrease) then pass-through could be considered as complete. But, such ideal outcome is rarely borne out by experience. It is seen that interest rate pass-through is incomplete in general, under which any change in policy rate leads to change in banks' interest rates in same direction but less in magnitude (Wang *et al.*, 2009).

Incomplete pass-through happens reflecting various factors such as the level of financial market integration, contractual nature of loan/deposit, adverse selection and switching cost. The other issues are asymmetry in the degree of pass-through between rising and declining policy interest rate scenarios and the speed of adjustment in market interest rates in the short-to-long-term. This also gives rise to methodological challenge to correctly assess the long-run relationship between policy rate and bank interest rates. Methods for studying long-run pass-through of interest rate premised on linear (symmetric) relationship could be biased towards rejecting long-run relationship if the relationship indeed is non-linear (asymmetric). Hence, the literature on this subject has focused on two aspects – measurement and country-experience.

Against this backdrop, this paper examines the long-run relationship between policy interest rate and banks' lending/deposit rates in India for the 14-year period from 2006 to 2019 coinciding with a transition period towards market determined interest rate. In terms of methodology, we test for asymmetric pass-through by using threshold autoregressive (TAR) model, supplemented by autoregressive distributed lag (ARDL) model, to quantify the magnitude of pass-through. The empirical results revealed a long-run relationship between policy rate and banks' lending and deposit rates. However, the pass-through is asymmetric and incomplete.

This paper is organized as follows. Section II briefly reviews the literature related to interest rate pass-through focusing essentially on bank deposit/lending rates. Section III captures the evolution of bank lending rates in India. Data and modelling framework are explained in Section IV. Empirical results are discussed in Section V. Section VI concludes.

II. Literature

Since interest rate is the key policy instrument for most monetary authorities across advanced and emerging market economies, pass-through of policy rate (PR) to market interest rate including retail bank rate is studies more generally as a part of overall monetary policy transmission. Hence, the literature is vast. Given the scope of this paper, our focus is limited to empirical literature on transmission of monetary policy rate to bank deposit/lending rates.

Wang *et al.* (2009) examined interest rate pass-through from money market rates to retail interest rates under possible cointegration in the presence of asymmetric pass-through, which arises due to rigidity in transmission, for the United State (US) and nine Asian countries. Method used for the study

was asymmetric cointegration test proposed by Enders *et al.* (2001). They found complete pass-through only for the US in the case of retail deposits; asymmetric cointegration was found for lending in the case of three countries - Hong Kong, Philippines and Taiwan; and for deposit rates for two countries – Malaysia and Singapore. In a study of six Asian countries, Tai *et al.* (2012) found slow and sluggish transmission from money market rate into deposit and lending rates though the adjustment rate vary across countries. Zulkhibri (2012) found asymmetric and incomplete pass-through to lending rates in Malaysia.

Mishra *et al.* (2014) studied the transmission of monetary shocks to lending rates of banks in a heterogeneous group of a large sample of countries comprising advanced, emerging and low-income countries using panel vector autoregressive (PVAR) model and found wide variation in the response of bank lending rates to a monetary policy innovation across countries. Low-income countries score poorly as compared to advances and emerging economies as far as transmission of monetary policy shocks to banks' lending rates are concerned.

Haughton *et al.* (2012) studied Caribbean Single Market Economy (CSME) countries and found asymmetric interest rate pass-through for deposit and lending for three countries. A downward adjustment rigidity was seen in case of lending rate whereas deposit rate had upward adjustment rigidity in some of CMSE countries.

Sander *et al.* (2004) found heterogeneity across the euro zone in interest rate pass-through to retail bank interest rates. de Bondt (2002) found the immediate pass-through of changes in market interest rates to bank deposit and lending rates to be at most 50 per cent with the long-run pass-through close to 100 per cent for lending rate at the euro area level. A survey of empirical literature covering more recent period for euro zone countries, Andries *et al.* (2016), shows incomplete pass-through and impairment of transmission subsequently reflecting the financial and sovereign debt crisis.

Singh (2011) estimated pass-through from the policy rate to a variety of short- and long-term financial market interest rates in India and found that the transmission of changes in monetary policy rate was instantaneous and large for money market as compared with the longer maturity instruments. Mohanty (2012) examined the effectiveness of interest rate channel of monetary policy in India by using structural vector autoregressive (SVAR) model and found that rise in policy rate has a negative effect on output growth and a moderating impact on inflation. Sengupta (2014) examined monetary policy transmission in India using VAR model and found a structural break in the post-reform period corresponding to the introduction of Liquidity Adjustment Facility (LAF) in 2000. She also observed that the banks' lending channel remains an important means of transmission of monetary policy in India, but it has weakened in the post-LAF period. The

interest rate and asset price channels have become stronger and the exchange rate channel, although weak, shows a mild improvement in the post-LAF period. Das (2015) studied monetary policy transmission in India by using a two-step vector error correction model and found a significant, albeit slow, pass-through of policy rate changes to bank interest rates. She also found that the extent of pass-through to the deposit rate is larger than that to the lending rate, and the deposit rate adjusts more quickly to changes in the policy rate.

III. Evolution of Bank Lending Rate in India

Bank lending rates as well as the allocation of bank credit were closely regulated by the Reserve Bank of India (RBI) till the late 1980s. Furthermore, there were a number of sector-specific, programme-specific and purpose-specific credit stipulations. With the initiation of financial sector reforms in the early 1990s, various steps were taken to deregulate the lending rates of commercial banks. First, the credit limit size classes of scheduled commercial banks, on which administered rates were prescribed, were compressed into three slabs in April 1993. Second, a system of prime lending rate (PLR), the rate charged to the prime borrowers of the bank, was introduced in October 1994. The PLR system went through several modifications from a single PLR to multiple PLRs and then to a Benchmark PLR (BPLR) in April 2003. However, the BPLR system evolved in a manner that did not meet the intended objectives. Competition in an environment of excess liquidity had forced the pricing of a significant proportion of loans far out of alignment with BPLRs undermining its role as a reference rate.

The lack of transparency in the BPLR system also hindered transmission of monetary policy signals. Following the recommendations of a Working Group, a Base Rate system of loan pricing replaced the BPLR system in July 2010. The Base Rate system gave flexibility to banks to determine their lending rate essentially based on their cost of funds and assessment of credit risk in a transparent and non-discriminatory manner. The flexibility accorded to banks in determination of cost of funds – average, marginal or blended cost – caused opacity in determination of lending rates by different banks and rendered the assessment of monetary transmission difficult. In order to improve monetary transmission the RBI initiated a marginal cost based lending rate (MCLR) for banks from April 2016. Subsequently banks were required to link their retail lending rates to external benchmarks such as policy repo rate from October 2019.

It could thus be seen that determination of bank lending rate in India remains a work in progress with the underlying objectives of greater transparency and better transmission of monetary policy. A snapshot of the evolution of lending rate deregulation in the bank credit market is given in Table 1.

Table 1
Evolution of Lending Rate Structure in India

Sep. 1990	The structure of lending rates was rationalized into six size-wise slabs. Of these, banks were free to set interest rates on loans of over ₹ 200,000 with minimum lending rates prescribed by RBI.
April 1992	Slabs compressed into four.
April 1993	Slabs compressed into three.
Oct. 1994	Lending rate for loans with credit limits of over ₹ 200,000 deregulated. Banks were required to declare their Prime Lending Rates (PLRs).
Feb. 1997	Banks allowed to prescribe separate PLRs and spreads over PLRs, both for loan and cash credit components.
Oct.1997	For term loans of 3 years and above, separate Prime Term Lending Rates (PTLRs) were required to be announced by banks.
April 1998	PLR converted as a ceiling rate on loans up to ₹ 200,000.
April 1999	Tenor-linked Prime Lending Rates (TPLRs) introduced.
Oct. 1999	Banks were given flexibility to charge interest rates without reference to the PLR in respect of certain categories of loans/credit.
April 2000	Banks allowed to charge fixed/floating rate on their lending for credit limit of over ₹ 200,000.
April 2001	The PLR ceased to be the floor rate for loans above ₹ 200,000.Banks allowed to lend at sub-PLR rate for loans above ₹ 200,000.
April 2002	Dissemination of range of interest rates through the Reserve Bank's website was introduced.
April 2003	Benchmark PLR (BPLR) system introduced and tenor-linked PLRs discontinued.
Feb. 2010	Draft circular on Base Rate placed on RBI website for obtaining comments/suggestions from public/stakeholders.
April 2010	Base Rate system of loan pricing introduced effective July 2010. Rupee lending rate structure completely deregulated.
April 2016	Marginal Cost of funds based lending rate (MCLR) was introduced effective April 2016.
October 2019	Banks were required to link their new floating rate retail and personal loans and floating rate loans to micro and small enterprises to external benchmarks such as policy repo rate; and also to medium enterprise from April 2020.

IV. Data and Model

Data: Changes in policy rate follow the monetary policy transmission through the term structure in the money and debt markets and also the credit market. Of course, market interest rates are dependent on several other factors such as liquidity conditions, supply and demand for funds and credit risk premia. In India, interest rate as the principal instrument of monetary policy developed

in the early 2000s with the introduction of LAF as the principal short-term liquidity management tool of the RBI. It provided a corridor for overnight market interest rate to develop around the repo rate (policy rate), the rate at which banks could borrow from the RBI with pledge of securities.

Since the process takes some time to gain traction, we have chosen the time period for empirical investigation from the 2nd quarter of 2006 to the 4th quarter of 2019. This yields a quarterly data series of 55 data points spanning a 14-year period. Data on the monetary policy rate was measured by the policy repo rate (PR). The lending rate of scheduled commercial banks (BLR) was measured by the weighted average lending rate (WALR), published by the RBI annually until 2013 and quarterly subsequently. Annual WALR was interpolated at quarterly interval based on the movement observed in the average benchmark prime lending rate/base rate (BR) of five major banks, which is published by the RBI. Bank deposit rate (BDR) was proxied by the average interest rate paid on the term deposits with maturity above one year by five major banks.[1] Descriptive statistics on these rates are presented in Annex I.

Model: In a bi-variable model, long-run association is tested followingthe traditional approach given by Engle and Granger (1987). The first step is to test for unit root. If both the series are found to be integrated of order one (I(1)) and their linear combination becomes stationary (i.e., (I(0)) then it implies that both the series are cointegrated. The long-run relationship of the interest rate pass-through from policy rate(PR) to bank deposit (lending) rates [BD(L)R] in the presence of cointegration is estimated by using the following linear regression model:

$$BD(L)\ R_t = \theta_0 + \theta PR_t + u_t \quad (1)$$

Where, both $BD(L)R_t$ and PR_t series are I(1), whereas, the residual u_t is stationary.

Under the traditional unit root test given by Engle and Granger (1987), first difference of residual (Δu_t) obtained from the equation (1) is regressed over it own lag as follows:

$$\Delta u_t = \rho u_{t-1} + \varepsilon_t \quad (2)$$

In equation (2), present value of error term (u_t) is always changes by $\tilde{n}u_{t-1}$ irrespective of error term being positive or negative, implying that the cointegrating relationship is symmetric over time. However, there are various research which have found that many macroeconomic variables do not symmetrically adjust over time (Enders *et al.*, 1998; Wang *et al.*, 2009; Haughton *et al.*, 2012). In this scenario, Engle and Granger (1987) cointegration test is misspecified. Hence, it is imperative to study the cointegration between two variables after accounting for asymmetric relationship, if any. In this context, Threshold Autoregressive (TAR) model given by Enders *et al.* (2001) which provides for consideration of asymmetric relationship is an appropriate tool.

Following Enders *et al.* (2001), the equation (2) can be modified into a TAR model for asymmetric cointegration test for interest rate pass-through as follows:

$$\Delta u_t = I_t \rho_1 u_{t-1} + (1 - I_t)\rho_2 u_{t-1} + \varepsilon_t \tag{3}$$

Where, ρ_t is independently and identically distributed with mean zero and constant variance. I_t is an indicator function defined as:

$$I_t = \begin{cases} 1 \; if \; u_{t-1} \geq 0 \\ 0 \; if \; u_{t-1} < 0 \end{cases} \tag{4}$$

In presence of autocorrelation, equation (4) can be modified as:

$$\Delta u_t = I_t \rho_1 u_{t-1} + (1 - I_t)\rho_2 u_{t-1} + \sum_{i=1}^{m} \beta_i \Delta u_{t-i} + \varepsilon_t \tag{5}$$

The necessary condition for cointegration is $-2<(\rho_1, \rho_2)<0$. Petrucelli *et al.* (1984) showed that the necessary and sufficient conditions for the stationarity of u_t is $\rho_1 < 0$, $\rho_2 < 0$ and $(1+\rho_1)*(1+\rho_2)<1$. Following Enders *et al.* (2001), if the condition that $\rho_1 = \rho_2 = 0$ does not get accepted at a standard level of significance then there exists asymmetric cointegration between policy rate and bank rates. If $|\rho_1| > |\rho_2|$ then interest rate pass-through has upward adjustment rigidity and if $|\rho_1| < |\rho_2|$ then interest rate pass-through has downward adjustment rigidity.

The long-run relationship between policy and bank rates under asymmetric adjustment framework as explained above was supplemented by modelling the interest rate pass-through at the first difference by using the autoregressive distributed lag (ARDL) model given as:

$$\Delta BD(L)R_t = \alpha + \sum_{i=1}^{p} \beta_i \Delta BD(L)R_{t-i} + \sum_{j=0}^{q} \gamma_j \Delta PR_{t-j} + u_t \tag{6}$$

Where, short-run and long-run impact of change in policy rate on bank rates were estimated as $\Sigma_{j=0}^{q} \gamma_j$ and $\frac{\Sigma_{j=0}^{q} \gamma_j}{\left(1 - \Sigma_{i=1}^{p} \beta_i\right)}$, respectively.

V. Empirical Results

Test for Unit Root

Results of both Augmented Dickey–Fuller (ADF) as well as Phillips–Perron (PP) tests indicate that all the four variables under study viz., BDR, BLR,PR and BR have unit root at level and become stationary at first difference (Table 2).

Table 2
Unit Root Test

Variable	*ADF Test*		*PP Test*	
	Level	*First difference*	*Level*	*First difference*
BDR	-2.064 (0.260)	-4.230 (0.001)	-1.904 (0.328)	-4.135 (0.002)
BLR	-2.096 (0.247)	-4.705 (0.000)	-1.788 (0.382)	-4.587 (0.001)
PR	-2.523 (0.116)	-4.177 (0.002)	-1.926 (0.318)	-4.030 (0.003)
BR	-1.268 (0.638)	-6.690 (0.000)	-1.350 (0.600)	-6.694 (0.000)

Note: Number given is parenthesis is their p-value (if p-value is lower than the level of significance then null hypothesis cannot be accepted).

Estimation of relationship at level with possible cointegration

The empirical results summarised in the Table 3 show that both the standard cointegration tests viz., Engle-Granger and Johansen failed to reject null hypothesis of no cointegration of policy rate with banks deposit and lending rates at 5 per cent level of statistical significance. However, these tests assume symmetric relationship among variables over time and hence these tests are miss-specified in the case of presence of asymmetric adjustment. The alternative test for possible cointegration provided by Enders *et al.* (2001) which incorporates asymmetric adjustment confirms the presence of cointegration of policy rate with both bank deposit and lending rates. Moreover, adjustment in banks' interest rates to policy rate are asymmetric and the pass-through is found to be incomplete. Since BLR was estimated based on the trends in BR, for robustness we test for cointegration between policy rate and BR and compare the results between policy rate and BR. The magnitude of change in BR to change in policy rate was comparable to that in BLR.

The recursive estimates of adjustment speed in the cointegrating framework shows that in the initial years in the sample period there was a downward adjustment rigidity in the case of both lending and deposit rates which seems to be waning in recent years. Second, the speed of adjustment in falling policy rate scenario has not changed much in recent years, but, it has declined in case of rising policy rate scenario. Third, banks tend to correct faster for changes in policy rate in their lending rate as compared to deposit rate in the both rising as well as and declining policy rate scenarios (Charts 1-3 and Annex II).

Table 3
Empirical results of cointegration

		Dependent variable		
		BR	*BLR*	*BDR*
Cointegration test				
Engle-Granger cointegration test				
tau-statistics		-1.490 (0.768)	-3.221 (0.083)	-2.347 (0.361)
Johansen's cointegration test				
No. of lags		2	2	2
Trace Statistics	Non	9.937 (0.286)	14.027 (0.082)	9.107 (0.356)
	At most 1	2.285 (0.131)	4.027 (0.045)	3.908 (0.048)
Max Eigenvalue Statistics	Non	7.651 (0.415)	10.000 (0.212)	5.200 (0.717)
	At most 1	2.285 (0.131)	4.027 (0.045)	3.908 (0.048)
Lon-run equation: $BL(D)\ R_t = \theta_0 + \theta PR_t + u_t$				
Estimated coefficients	θ_0	8.022$^{\$}$ (0.000)	6.715 (0.000)	3.046 (0.001)
	θ	0.617$^{\$}$ (0.000)	0.682 (0.000)	0.688 (0.000)
TAR model: $\Delta u_t = I_t\rho_1 u_{t-1} + (1-I_t)\rho_2 u_{t-1} + \Sigma_{i=1}^{m}\beta_i\,\Delta u_{t-i} + \varepsilon_i;$				
Where, $I_t = 1$ if $u_{t-1} \geq 0$ and zero if $u_{t-1} < 0$.				
Estimated coefficients	ρ_1	-0.18 (0.086)$^{\#}$	-0.318 (0.009)$^{\#}$	-0.215 (0.016)$^{\#}$
	ρ_2	-0.360 (0.000)$^{\#}$	-0.253 (0.047)$^{\#}$	-0.081 (0.434)$^{\#}$
Stationarity condition*	$(1+\rho_1)*(1+\rho_2)$	0.524	0.510	0.721
Test for asymmetric cointegration among interest rates; Null hypothesis: $\rho_1 = \rho_2 = 0$ (i.e. relationship is symmetric)				
F-statistics		7.934 (0.001)	9.930 (0.000)	8.824 (0.001)

Note: Number given is parenthesis is their p-value (if p-value is lower than the level of significance then null hypothesis cannot be accepted).

* Petrucelli and Woolford (1984) showed that the necessary and sufficient conditions for the stationarity of u_t is $\rho_1 < 0$, $\rho_2 < 0$ and $(1+\rho_1)*(1+\rho_2) < 1$.

#: P-value is based on non-parametric LR test because residual did not follow normal distribution.

$: To control for change in PLR to base rate, a time dummy was incorporated which takes value one for the period Sep-2010 quarter onwards, otherwise zero. The estimated impact of the dummy was (-)1.792 with p-value 0.000.

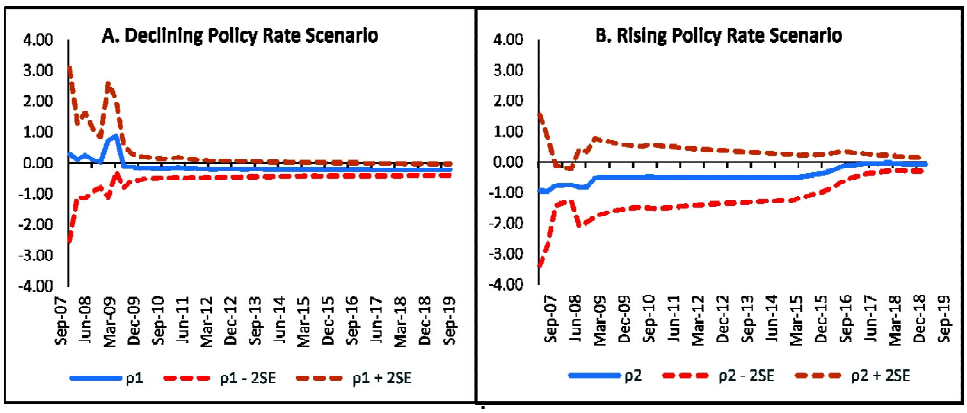

Chart 1: Recursive Estimation of Interest Rate Pass-through – Deposit Rate(BDR)

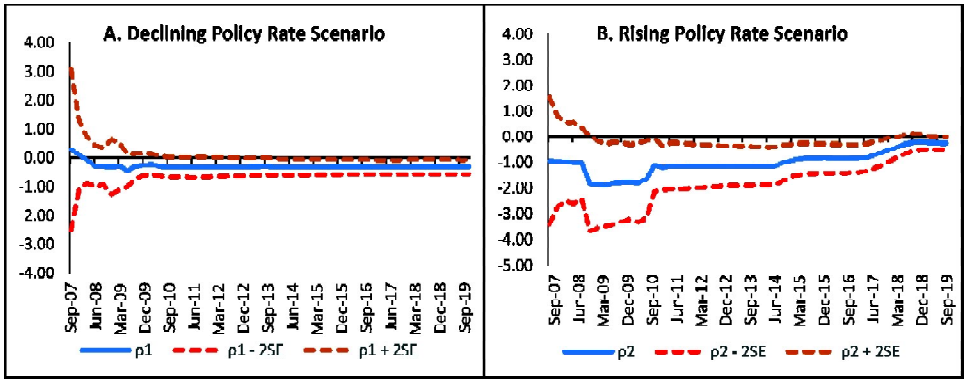

Chart 2: Recursive Estimation of Interest Rate Pass-through – Lending Rate (BLR)

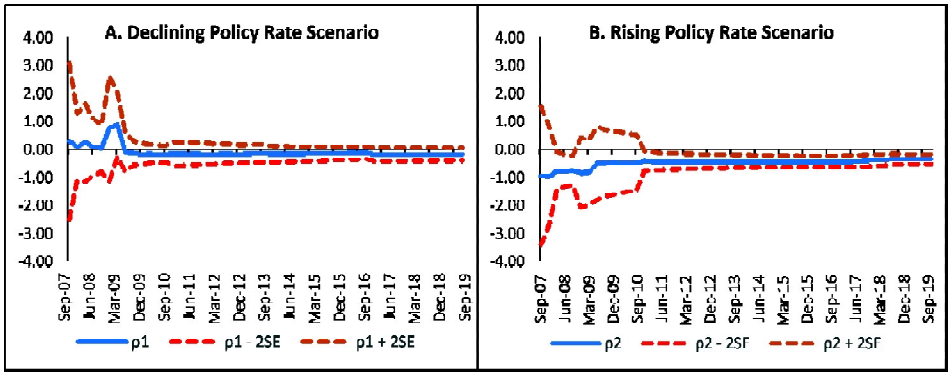

Chart 3: Recursive Estimation of Interest Rate Pass-through – PLR/Base Rate (BR)

Estimation of relationship at the first difference

The empirical results of ARDL model which was estimated at first difference of variables, supplement the findings of the level equation. The pass-through of policy rate to both lending and deposit rates was statistically significant yet incomplete. In the short-term, one percentage point change in policy rate leads to change in both bank lending and deposit rates by 59 basis points. In the long-run, one percentage point change in policy rate leads to change in lending and deposit rates by 65 basis points and 70 basis points respectively (Table 4).

Table 4
ARDL Model- Results

	Dependent variable		
	BR	*BLR*	*BDR*
α	0.042 (0.148)#	0.000 (0.995)	0.002 (0.931)
β_1	0.034 (0.473)#	0.089 (0.436)	0.150 (0.093)
γ_0	0.424 (0.000)#	0.310 (0.000)	0.334 (0.000)
γ_1	0.237 (0.002)#	0.281 (0.00)	0.259 (0.004)
Dummy_Sep-10	-4.115 (0.000)#		
No. of Obs.	53	53	53
R-square	0.89	0.62	0.66
Adj. R-square	0.88	0.59	0.64
LM Test (P-value)	0.095	0.473	0.697
Short term impact	66%	59%	59%
Long term impact	68%	65%	70%

Note: Number given is parenthesis is their p-value (if p-value is lower than the level of significance then null hypothesis cannot be accepted).
#: P-value is based on non-parametric LR test because residual did not follow normal distribution.

VI. Conclusion

Modern central banks conduct monetary policy primarily through interest rate charges to influence the ultimate objectives of price stability and stable growth. A better pass-through of policy rate to market interest rates in general and to banks' retail interest rates strengthens monetary policy transmission and helps monetary authority to achieve its desired objectives. However, the interest rate pass-through to retail bank rate is affected by several other factors such as legal contract of loan/deposit, financial integration, policy regime, adverse selection, switching cost, risk profile of borrowers besides the policy rate.

The empirical results for India show cointegration between policy rate and banks' lending/deposit rates when provided for asymmetry. The pass-through was found to be incomplete. One percentage point change in policy rate leads to change in lending and deposit rates of banks by 65 and 70 basis points, respectively, over the long-run. In the initial years in the sample period there was a downward adjustment rigidity in the case of both lending and deposit rates which seems to be waning in recent years reflecting improved transmission of monetary policy.

Note

1. Annual data showed that term deposits over one year accounted for 61.5 per cent of total deposits in 2006-07 and 58 per cent in 2018-19. Since the other component of deposits, for example, current account deposit did not earn any interest rate and savings bank deposit rate remained low and fixed initially by regulation and later by banks' own choice the variability in these rates either not present or not aligned with policy rate. Hence, term deposit rates with maturity over one-year can be considered a good proxy for overall cost of deposits for banks.

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Annex I: Descriptive Statistics

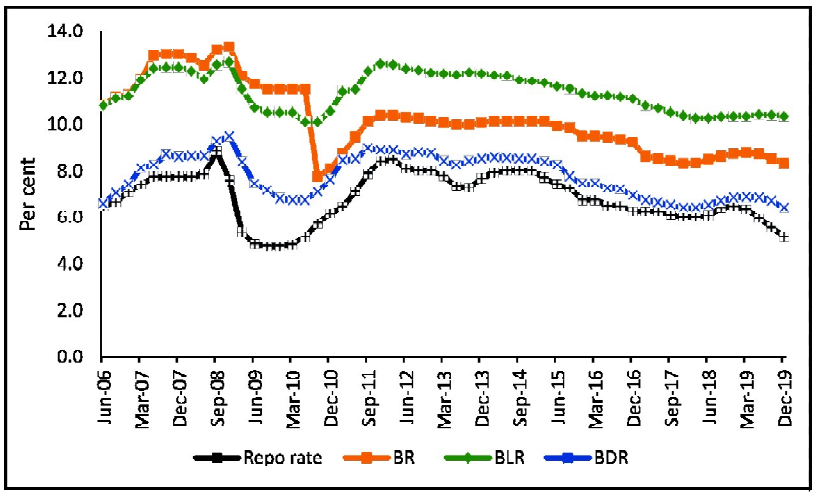

Chart I.1. Interest Rate Movement

Table I.1
Interest Rate: Descriptive Statistics

	PR	*BR*	*BLR*	*BDR*
Mean	6.8	10.2	11.4	7.8
Median	6.8	10.1	11.4	7.8
Maximum	8.9	13.3	12.7	9.5
Minimum	4.8	7.8	10.1	6.4
Std. Dev.	1.1	1.5	0.8	0.9
Skewness	-0.3	0.5	0.0	0.0
Kurtosis	2.2	2.3	1.5	1.5
Jarque-Bera	2.5	3.3	5.0	4.9
Probability	0.3	0.2	0.1	0.1
Sum	376.7	561.4	626.2	426.9
Sum Sq. Dev.	62.1	123.1	37.6	44.6
Observations	55	55	55	55

Table I.2
Interest Rate: Correlation matrix

	PR	*BR*	*BLR*	*BDR*
PR	1.00			
BR	0.31	1.00		
BLR	0.88	0.57	1.00	
BDR	0.81	0.54	0.94	1.00

Note: PR: Policy Rate
BR: Benchmark Prime Lending Rate/ Base Rate
BLR: Bank Lending Rate
BDR: Bank Deposit Rate

Annex II
Recursive estimates of asymmetric adjustment speed in interest rates

Quarter	*PR and BR*		*PR and BLR*		*PR and BDR*	
	$\rho 1$	$\rho 2$	$\rho 1$	$\rho 2$	$\rho 1$	$\rho 2$
Mar-09	0.87	-0.82	-0.29	-1.86	0.87	-0.82
Jun-09	-0.12	-0.51	-0.45	-1.89	-0.12	-0.51
Sep-09	-0.13	-0.51	-0.29	-1.79	-0.13	-0.51
Dec-09	-0.18	-0.49	-0.24	-1.77	-0.18	-0.49
Mar-10	-0.17	-0.49	-0.23	-1.77	-0.17	-0.49
Jun-10	-0.18	-0.49	-0.30	-1.79	-0.18	-0.49
Sep-10	-0.18	-0.49	-0.33	-1.66	-0.18	-0.49
Dec-10	-0.16	-0.40	-0.32	-1.10	-0.17	-0.49
Mar-11	-0.16	-0.43	-0.33	-1.21	-0.15	-0.47
Jun-11	-0.17	-0.43	-0.33	-1.14	-0.18	-0.50
Sep-11	-0.17	-0.44	-0.32	-1.15	-0.18	-0.50
Dec-11	-0.17	-0.43	-0.33	-1.14	-0.20	-0.49
Mar-12	-0.17	-0.43	-0.33	-1.14	-0.20	-0.49
Jun-12	-0.17	-0.43	-0.32	-1.14	-0.20	-0.50
Sep-12	-0.17	-0.43	-0.32	-1.14	-0.20	-0.50
Dec-12	-0.18	-0.43	-0.32	-1.14	-0.20	-0.50
Mar-13	-0.17	-0.43	-0.32	-1.14	-0.20	-0.50
Jun-13	-0.15	-0.43	-0.31	-1.14	-0.20	-0.50
Sep-13	-0.15	-0.43	-0.29	-1.15	-0.20	-0.50
Dec-13	-0.16	-0.43	-0.32	-1.14	-0.20	-0.50
Mar-14	-0.16	-0.43	-0.33	-1.15	-0.20	-0.50
Jun-14	-0.16	-0.43	-0.33	-1.15	-0.20	-0.50
Sep-14	-0.16	-0.43	-0.33	-1.12	-0.20	-0.50
Dec-14	-0.16	-0.43	-0.33	-1.01	-0.20	-0.50
Mar-15	-0.15	-0.43	-0.33	-0.93	-0.20	-0.50
Jun-15	-0.16	-0.43	-0.32	-0.87	-0.20	-0.50
Sep-15	-0.15	-0.43	-0.32	-0.85	-0.21	-0.50
Dec-15	-0.15	-0.43	-0.32	-0.85	-0.21	-0.49
Mar-16	-0.14	-0.43	-0.32	-0.84	-0.21	-0.45
Jun-16	-0.13	-0.43	-0.32	-0.86	-0.21	-0.41
Sep-16	-0.14	-0.43	-0.32	-0.86	-0.21	-0.37
Dec-16	-0.13	-0.43	-0.32	-0.86	-0.21	-0.29
Mar-17	-0.18	-0.43	-0.32	-0.85	-0.21	-0.19
Jun-17	-0.18	-0.43	-0.33	-0.82	-0.21	-0.12
Sep-17	-0.18	-0.42	-0.33	-0.74	-0.21	-0.10
Dec-17	-0.18	-0.40	-0.32	-0.63	-0.21	-0.06
Mar-18	-0.18	-0.38	-0.32	-0.50	-0.21	-0.05
Jun-18	-0.18	-0.38	-0.32	-0.41	-0.21	-0.06
Sep-18	-0.18	-0.36	-0.31	-0.28	-0.21	-0.04
Dec-18	-0.18	-0.36	-0.31	-0.22	-0.21	-0.05
Mar-19	-0.18	-0.36	-0.31	-0.20	-0.21	-0.06
Jun-19	-0.18	-0.36	-0.31	-0.24	-0.21	-0.08
Sep-19	-0.18	-0.36	-0.32	-0.25	-0.22	-0.08
Dec-19	-0.18	-0.36	-0.32	-0.25	-0.22	-0.08